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ATHENS 2004



Mass Gatherings and Public Health

The Experience of the Athens 2004 Olympic Games

Edited by:

Agis D. Tsouros and Panos A. Efstathiou



Ministry of Health
and Social Solidarity



EUROPE

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ABSTRACT

Large-scale mass gatherings, such as the Olympic Games, represent significant challenges for the entire health sector of host countries. Emerging global public health threats of natural or deliberate nature increase considerably the health and safety vulnerability of mass gatherings. Major areas of public health responsibility include health care capacity and mass-casualty preparedness; disease surveillance and outbreak response; environmental health and food safety; public information and health promotion; public health preparedness and response to incidents potentially involving the deliberate use of explosives, biological and chemical agents or radionuclear material; and leadership, operations and unified command. This book comprehensively and systematically presents the experience of and lessons learned from the public health aspects of the preparations and conduct of the Athens 2004 Olympic Games. Documenting this experience can be a source of valuable information and knowledge for governments at all levels and communities in building their capacity for not only large-scale events but also preparing to deal with the avian influenza pandemic threat or other emergencies such as flooding and phenomena often associated with climate change.

Keywords

ANNIVERSARIES AND SPECIAL EVENTS
PUBLIC HEALTH
COMMUNICABLE DISEASE CONTROL
DISEASE OUTBREAKS – PREVENTION AND CONTROL
ENVIRONMENTAL HEALTH
DISASTER PLANNING
HOSPITAL PLANNING
EPIDEMIOLOGIC SURVEILLANCE
SPORTS
GREECE

EU/07/5062470

ISBN: 978 92 890 7288 5

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Scherfigsvej 8
DK-2100 Copenhagen Ø, Denmark

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CONTENTS

Foreword	viii
<i>Marc Danzon</i>	
Foreword	ix
<i>Dimitris L. Avramopoulos</i>	
Foreword	x
<i>Jacques Rogge</i>	
Special recognition	xi
Acknowledgements	xi
Contributors.....	xii
Preface	xviii

Part I. International experience and framework of the Athens 2004 Olympic Games

1. Overview and framework	3
<i>Andy Stergachis and Agis D. Tsouros</i>	
2. Operational framework for health and for the national and subnational jurisdictions for public health for the Athens 2004 Olympic Games	29
<i>Athina Kirlessi, Agis D. Tsouros, Michael S. Sabatakakis, Ellie Tragakes, Theodora Stavrou and Panos A. Efstathiou</i>	

Part 2. Epidemiological surveillance and response and public health preparedness for the Athens 2004 Olympic Games

Introduction	46
<i>George Saroglou</i>	
3. Preparing epidemiological surveillance and response for communicable diseases	49
<i>Nikoletta Mavroidi, Takis Panagiotopoulos, Xanthi Dedoukou, Paraskevi Tsonou, Efthimios Kalabalikis, Evangelia Piperaki, Vasiliki Pityriga, Katerina Karageorgou, Sophia Hatzianastasiou, Agoritsa Baka, Olga Daligarou, Maria Tseroni, Georgia Nikolopoulou, Elpidophoros Sotiriades, Christopher Bartlett and George Saroglou</i>	

4.	Experience of epidemiological surveillance and response for communicable diseases	67
	<i>Takis Panagiotopoulos, Nikoletta Mavroidi, Georgia Spala, Johannes Schnitzler, Eleni Kalamara, Helen Triantafyllou, Asimoula Oikononopoulou, Theano Georgakopoulou, Athina Spilioti, Kassiani Mellou, Ioanna Magaziotou, Stefanos Bonovas, Kostas Danis, Denis Coulombier and George Saroglou</i>	
5.	Syndromic surveillance system	81
	<i>Urania Dafni, Kassi Gkolfinopoulou, Aggeliki Lambrou, Dimitrios Papamichail, Giannis Karagiannis, Kostas Athanasakis, Georgios Ferentinos, Olga Adrami, George Kouvatseas, Zoi Tsourti, Demosthenes Panagiotakos, Vassilios Raftopoulos, Tracee Treadwell, Scott D. Williams, George Saroglou and Sotirios Tsiodras</i>	
6.	Public health preparedness for incidents involving the potential deliberate use of biological and chemical agents or radionuclear material	97
	<i>Agoritsa Baka, Petros Isaakidis, Georgios Ferentinos, Nikoletta Mavroidi, Vasiliki Panagiotopoulou, Dimitrios Iliopoulos, Kalliopi Papadima, Maurizio Barbeschi and George Saroglou</i>	

Part 3. Addressing the environmental health challenges of the Athens 2004 Olympic Games

	Introduction	128
	<i>Christos Hadjichristodoulou and Jenny Kourea-Kremastinou</i>	
7.	Environmental health surveillance and management of food and water safety	131
	<i>Christos Hadjichristodoulou, Varvara Mouchtouri and Jenny Kourea-Kremastinou</i>	
8.	Food safety and the role of the Hellenic Food Authority	161
	<i>Despina Vassiliadou, Christos Apostolopoulos, Dimitra Panteleaki, Konstantinos Barberis and Nikos Katsaros</i>	
9.	Monitoring drinking-water quality in holding tanks at Olympic venues	177
	<i>Nicholaos D. Katsiris, Olga I. Kavoura, Georgios A. Zervas, Ioanna P. Damikouka</i>	
10.	Laboratory support in environmental health monitoring	185
	<i>Emmanouil N. Velonakis, Seraphem Lukussias, Elias Papadopoulos, Anna Katsiafiaka, Sophia Vourli, Despina Perimeni and Alkiviadis Vatopoulos</i>	
11.	Mosquito surveillance and control	193
	<i>Nikolaos Vakalis, Eleni Patsoula and Anna Samanidou-Voyadjoglou</i>	

Part 4. Prehospital and hospital preparedness and care and disease prevention and health promotion activities for the Athens 2004 Olympic Games

	Introduction	210
12.	Preparedness of emergency medical services	211
	<i>Anastasia Zygoura, Michalis Syndos and Vasilios Kekeris</i>	

13. Olympic hospital preparedness and the case of Sismanogleion General Hospital	225
<i>Marianthi Vafeiadou and Adamantia Egglezopoulou</i>	
14. Health Services Department of the Athens 2004 Olympic Games Organizing Committee	237
<i>Costas Parisi, Demetrios Pyrros, Konstantinos Ditsios, Polydoros Chios, Spyros Spyrou, Eleftherios Thireos and Athanasios Papamichos</i>	
15. Disease prevention and health promotion activities	253
<i>Agis D. Tsouros, Maroulio Lekka, Panos Minogiannis and Andy Stergachis</i>	

Part 5. Coordination, international cooperation and overall conclusions and lessons from the Athens 2004 Olympic Games

16. Health sector command, coordination and communication	269
<i>Panos A. Efstathiou, Agis D. Tsouros, Ann Knebel and Maurizio Barbeschi</i>	
17. International cooperation for public health	285
<i>Agis D. Tsouros, Panos A. Efstathiou, Agoritsa Baka, Maurizio Barbeschi and Ann Knebel</i>	
18. The Athens 2004 Olympic Games and public health: main conclusions and lessons learned	303
<i>Agis D. Tsouros, Andy Stergachis, Maurizio Barbeschi, Sotirios Tsiodras, Ann Knebel and Panos A. Efstathiou</i>	

Annex 1.

Standard operating procedures for reviewing public health signals and reports during the Athens 2004 Olympic Games	311
--	-----

Annex 2.

Examples of daily situation reports for the Athens 2004 Olympic Games	321
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Annex 3.

Sample daily report on the results of environmental health inspections and laboratory tests and of epidemiological surveillance at the Athens 2004 Olympic Games	329
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Annex 4.

Outlines of five key operational plans for the Athens 2004 Olympic Games: health sector coordination; quarantine measures; mass-casualty management; mass prophylaxis planning; and crisis communication	339
<i>Panos A. Efstathiou, Ann Knebel and Agis D. Tsouros</i>	

Foreword

The World Health Organization (WHO) has a long-standing association with the Olympic Games. Most notably, the smoke-free Olympic Games (Seoul in 1988 and Barcelona in 1992) and a host of co-sponsored events to promote active living, physical activity and sports for all span a period of almost 25 years. The Olympic Movement intrinsically echoes many of the values and principles for which WHO stands: equity, fairness, peace, solidarity, tolerance, friendship, healthy living, the pursuit of excellence and the pursuit of a healthy mind in a healthy body. In addition, the Olympic Games, because of sheer size, duration, international participation, popular interest and mass-media attention, require an exceptionally high level of public health preparedness. Host countries are expected to strengthen and expand the capacity of their health systems to be able to deal with a very wide range of health problems and emergencies, either natural or human-made. The global threats of communicable diseases and those related to the deliberate use of explosives, biological and chemical agents or radionuclear material would make the task of public health preparedness remarkably challenging for any country, large or small. The task of creating a healthy and safe mass gathering such as the Olympic Games can never be business as usual. It requires not only applying known methods and processes but also developing and testing new ideas and systems that are as relevant to the public health aspects of the event as they are to the international community as a whole.

International cooperation is essential in this context both in preventing and also in responding to major public health incidents and emergencies. WHO was pleased to support the request from Greece's Ministry of Health and Social Solidarity for cooperation in the preparation of the Athens 2004 Olympic Games. Building on the partnership links WHO has had for many years with the International Olympic Committee, this was a good opportunity to be involved in all aspects of country-level public health preparations for the Olympic Games and to contribute our knowledge and alert systems. It was also an opportunity to learn and advance our understanding and experience in this field of high importance for public health. WHO shared its knowledge and advice on issues such as epidemiological surveillance and response, preparedness for the potential deliberate use of explosives, biological and chemical agents or radionuclear material, health sector coordination and command measures and disease prevention and health promotion activities.

Sports speak to people more than any other human activity. They embody and convey wellness and health in its full sense and thus can profoundly affect people's attitudes and habits. The burden of disease from tobacco use and obesity has reached untold levels world-wide. Huge athletic gatherings such as the Olympic Games possess a unique potential, which is not limited to the duration of the Games, to promote healthy eating and physically active lifestyles.

I was very encouraged to learn that the public health legacy of the Athens 2004 Olympic Games has since proved most valuable in Greece in effectively handling emergencies, including avian influenza incidents among wild birds and poultry, heat-waves and situations with many casualties. This publication contains a plethora of useful strategic and technical information as well as insights and advice that will be a valuable reference for future organizers of mass gatherings and for countries that want to strengthen their health systems.

Marc Danzon

WHO Regional Director for Europe

Foreword

For me personally, the thrilling journey to the Athens 2004 Olympic Games started very early when I received the Olympic Flag at the Sydney 2000 Olympics in my capacity as Mayor of Athens. The great success and the high standards of the health sector performance during the Athens 2004 Olympic and Paralympic Games was the result of an immense collective effort across many agencies and professional disciplines at all levels. The City of Athens has been an active member of the WHO European Healthy Cities Network and has had a long-standing commitment to partnership-based efforts for health and sustainable development. Every corner of the health sector was affected by the Olympic Games preparations, which required an advanced and sophisticated level of preparedness to deal not only with the intense conventional health care and public health issues and emergencies normally expected for such a mass gathering but also to have the capacity and ability to deal with potential incidents involving the deliberate use of biological and chemical agents or radionuclear material. Greece was the first country to organize summer Olympic Games after the events of 11 September 2001. It is difficult to find the words to describe the sense of pride and high level of professionalism and cooperation that prevailed among everyone who worked to make the Athens 2004 Olympic Games safe and healthy. It was an effort that matched the high ideals and the very spirit of the Olympic Games.

The smooth and efficient performance of the health sector very significantly contributed to the astounding success of the Athens Olympics. Moreover, the wide range of health sector infrastructure, skills and processes developed for the Olympic Games proved very valuable also after the Games. They boosted significantly the public health and emergency response systems, creating significant capacity to deal with natural and human-made health care and public health crises. Greece was able to deal very efficiently with avian influenza incidents and several medical emergencies thanks to the expertise developed and investment made for the Olympic Games.

Very often the experience and lessons learned from addressing the public health aspects of such mass gatherings are either never reported or published unsystematically in either assorted scientific journals or internal reports that would never reach interested decision-makers and professionals in a coherent shape and form. I am therefore delighted that it was possible to put together this book, which I am sure can be a source of valuable information and insight to future organizers of mass gatherings. I would like to congratulate the editors, Agis D. Tsouros and Panos A. Efstathiou, and the many contributors for this excellent publication.

Lastly, I would like to refer to the establishment of the World Union of Olympic Cities in 2002 (under the auspices of the International Olympic Committee and the World Mayors' summit) with the aim of preserving the Olympic principles and the character of the Olympic cities, as monuments of the history of the Olympic movement. I took this initiative deeply convinced that Athens, as the host city of the first Olympic Games of the third millennium, had the moral obligation and the historic duty to play a special role beyond the organization of the 2004 Olympic Games.

Dimitris L. Avramopoulos

Minister of Health and Social Solidarity
Greece

Foreword

It is with great pleasure that I introduce this important work on mass gatherings and public health published by WHO, with which the International Olympic Committee (IOC) has maintained an efficient partnership for more than a decade.

The protection of athletes' health and hygiene, as well as those of spectators at the Olympic Games, has always been one of the IOC's main concerns.

The IOC, through its Medical Commission, works for seven years in close cooperation with each organizing committee to ensure that all the events take place in an exemplary fashion as regards health and hygiene.

All the procedures are meticulously studied and analysed. Participation by the public authorities is always very important, as they are responsible for many of the structures set up on the occasion of these major events.

Athens did not deviate from the norm. The structures presented on the occasion of the 2004 Olympic Games lived up to the IOC's expectations perfectly.

No major incidents sullied these Games, and medical treatments for athletes and spectators were all provided in a very professional manner.

It was the same story with the collaboration between the Athens 2004 Olympic Games Organizing Committee and the public authorities as regards controlling the air, water and food distributed in the Olympic Village as well as the official accommodation venues and the restaurants in general.

I am convinced that this work will become a reference tool for both the organizers of sports events and public authorities as well as for the medical environment of all athletes.

In conclusion, I would like, once again, on behalf of the IOC, to congratulate and thank all the people who made the Athens Games 100 per cent "healthy".

Jacques Rogge

President
International Olympic Committee

Special recognition

I would like to express my gratitude to: Costas Stefanis, who as Minister of Health and Welfare in Greece in 2003, initiated the request to WHO for my secondment to the Government of Greece to provide technical support on the public health aspects of the Athens 2004 Olympic Games; and Marc Danzon, WHO Regional Director for Europe, for his encouragement and immense support.

Agis D. Tsouros

Acknowledgements

This book would not have been published without the enthusiasm and painstaking efforts of the public health protagonists of the Olympic Games. So many people have generously offered their ideas, assistance and support during the two and a half years the book was being prepared. Our gratitude and appreciation go to all the contributors for the many hours they devoted to this publication and for their patience and high professionalism. In particular, we would like to mention Christos Apostolopoulos, Agoritsa Baka, Maurizio Barbeschi, Denis Coulombier, Urania Dafni, Christos Hatjichristodoulou, Nikos Katsaros, Nicholaos D. Katsiris, Ann Knebel, Jenny Kremastinou-Kourea, Maroulio Lekka, Nikoletta Mavroidi, Takis Panagiotopoulos, Costas Parisis, Demetrios Pyrros, George Saroglou, Spyros Spyrou, Theodora Stavrou, Andy Stergachis, Eleftherios Thireos, Sotirios Tsiodras, Marianthi Vafeiadou, Nikolaos Vakalis, Despina Vassiliadou, Emmanouil N. Velonakis and Anastasia Zygoura. A very special thanks is due to Katerina Gargalianou-Tsekoura, who has worked tirelessly providing secretarial and administrative support in Greece. We are also indebted to Connie Petersen, who has been the administrative brains and heart of the book from the start. A word of appreciation for Anncatrine Petersen and Caryn Hall for their valuable technical help with the manuscript. Many thanks to Jason Kezios for designing the complex Fig. 2.2. We would like to express our wholehearted thanks to Lambrini Pappa for ensuring consistency of terms and definitions and to David Breuer for the meticulous text editing. The beautiful design of the book was possible thanks to the precious advice of Theodora Mantzari and the creative work of Maria Anastasiou. The last word of acknowledgement delightedly goes to the Board of the Hellenic Centre for Infectious Diseases Control for their generous financial support towards the editorial and production costs of the book.

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Preface

Our ambitious aim was to capture and document in one place the tremendous experience with the multifaceted public health aspects of the Athens 2004 Olympic Games. We were driven by the conviction that a systematic account of this work would be a valuable reference to many other organizers of mass gatherings. This is the first time that the whole public health and health care experience from an Olympic Games has been incorporated into one comprehensive publication. The book contains a wealth of strategic, technical and scientific information about essential functions such as epidemiological surveillance, environmental management, emergency and hospital care, preparedness for the potential deliberate use of explosives, biological and chemical agents or radionuclear material, disease prevention as well as coordination and unified command. The book also offers unique insights about the policy and organizational context and outcomes of the public health work for the Olympic Games.

The Olympic Games are probably the largest and one of the most popular international gatherings on the planet. They represent a unique occasion for the whole of humanity to celebrate physical excellence, cultural diversity, solidarity, fair competition and peace. From a public health perspective, they represent a challenge and a great opportunity. Athletes and spectators must feel safe and protected. This means they should be able to take for granted high standards of hygiene for food, water, accommodation and recreational areas. They should also be able to take for granted that high-quality and easily accessible health services will be there when they might need them. Finally, they should feel reassured that the country has the capacity to deal with public health or health care emergencies caused by either natural or human-caused events.

The whole public health sector in Greece was mobilized for this purpose under the leadership of Minister of Health and Welfare Costas Stefanis until March 2004 and of Minister of Health and Social Solidarity Nikitas Kaklamanis from March 2004. The challenge was to be ready to deal effectively with all kinds of health-related issues expected to occur naturally in such a large gathering lasting several days and to be prepared to deal with the unthinkable health consequences of the deliberate use of biological and chemical agents or radionuclear material. This was a formidable task that called for new ways of working and for building partnerships and cooperation between many agencies at all levels and professional groups. A tremendous spirit of togetherness, innovation and enthusiasm arose from these efforts to create healthy and safe conditions for the Olympic Games.

Preparatory and capacity-building work involved extensive institutional change and adaptation; strengthening existing and constructing new facilities; acquiring new technology; extensive training in table-top and real exercises focusing on hospital and public health personnel; and introducing standard operating procedures for a whole range of recognized threats. There were numerous difficulties, unforeseen developments and complications along the way. Introducing new epidemiological and environmental surveillance methods and standard operating procedures and establishing a unified command and coordination centre within the health sector for the first time in Greece required completely novel ways of addressing public health problems.

The Olympic Games are a very popular but also vulnerable global event and thus intrinsically raise the expectations of the international community on all aspects of preparedness, including public health. Dealing with and balancing external and internal pressures and demands to deliver healthy Olympic Games should never be

underestimated. Mass sports gatherings such as the Olympics can also be powerful platforms for promoting health messages, especially physical activity and active living, healthy nutrition and avoidance of smoking. This unique aspect of the Athens 2004 Olympic Games was not exploited and implemented to its full potential. However, important work was also implemented in this area. The effective and efficient way in which the health sector played its part contributed a great deal to the great success and smooth operation of the Olympic Games.

The book is divided into five parts. Part I sets the international and national context of the Athens 2004 Olympic Games and provides an overview of the key public health issues that need to be addressed when organizing mass gatherings. Part 2 provides an extensive account of the capacity-building work and the experience with epidemiological surveillance and response systems and also preparedness for incidents involving the potential deliberate use of biological and chemical agents or radionuclear material. Part 3 focuses on the crucial environmental health aspects of the Olympic Games, including food and water safety in different settings such as cruise ships used as floating hotels. Part 4 addresses all aspects of the health care services: primary care, ambulance and hospital services covering the needs of athletes, spectators and staff inside and outside the Olympic venues. It also focuses on the disease prevention and health promotion activities for the Olympic Games. Lastly, Part 5 covers two key issues: the health sector coordination, command and communication systems introduced for the Athens 2004 Olympic Games and the role of international cooperation in the period leading up to and during the Olympic Games. The final chapter synthesizes the conclusions and lessons learned and offers insights and strategic points for future organizers of mass gatherings.

The individual chapters of this book display the names of those who contributed to writing the chapters and who also had leading roles and responsibilities in their respective areas of work. Here we would like to pay tribute to the hundreds of individuals named and not named in this book who worked tirelessly and with a great sense of professionalism and dedication for the public health and health care aspects of the Athens 2004 Olympic Games.

Agis D. Tsouros and Panos A. Efstathiou

PART 1

**International experience and framework
of the Athens 2004 Olympic Games**

CHAPTER 1

Overview and framework

Andy Stergarchis and Agis D. Tsouros

Introduction

Mass gatherings, such as the Olympic Games, represent significant challenges for the public health system and the health care system. Mass gatherings are typically defined as more than 1000 people at a specific location for a defined period of time (1). Much of the literature, however, describes events with more than 25 000 attendees. The term special event medical care has also been used and has been defined as “the provision of preventive measures, or definitive, primary care, or hospital referral to persons attending or participating in major sports, recreational or political events” (2). Characteristics of mass gatherings that impact public health services include large attendance, duration of the event and security concerns. The incidence of illness and injury at mass gatherings is believed to be higher than would occur naturally in a population of comparable size (3). Environmental factors, such as weather, can contribute to large numbers of ill people. Further, the events of 11 September 2001 and the anthrax attacks of 2001 pose the need for special attention to preparedness and mitigation strategies and surveillance for the possible deliberate use of explosives, biological and chemical agents or radionuclear material. National and regional health authorities have a mandate to be advised of such risks early and to be part of security planning, and security planning conducted in isolation from public health may fail or be otherwise too late to be useful. Consequently, extensive planning and preparation is required for providing public health services at mass gatherings.

The goals for public health at mass gatherings include preventing or minimizing the risk of injury or ill health and maximizing safety for participants, spectators, event staff and residents. Doing this requires public health planning and emergency management

in dealing with the complexities and challenges of mass gatherings. Major areas of public health responsibility related to mass gatherings include health care capacity and mass-casualty preparedness; disease surveillance and outbreak response; environmental health and food safety; public information and health promotion; public health preparedness and response to incidents potentially involving the deliberate use of explosives, biological and chemical agents or radionuclear material; and leadership, operations and capacity for unified command. This chapter reviews the literature on the public health dimensions of mass gathering organized in accordance with these six areas of responsibility. The primary focus of this literature review is on large mass-gathering events, whereas most events conducted around the world are small or medium sized with different organizational needs.

The literature reviewed is a combination of experiences in the United States, the British Commonwealth and major events held throughout the world. It indicates that mass gatherings require specific planning in addition to the more generally applicable considerations. The literature can provide useful information to better protect people attending mass gatherings, and the lessons learned can provide valuable information and guidance for communities hosting large-scale events.

Literature retrieval methods used included a systematic search of Medline databases, using such key words as “mass gatherings” and “public health” to identify published studies. In addition, recent articles and other reports pertinent to the topic were identified via a Web search (via Google) using the same search terms. The Google search identified several

useful items, including manuals from Australia and Canada developed to prevent injury, suffering or death that may occur as a result of poor planning or

preventable misadventures at public events (4). Other searches were performed using specialized web sites (5–7).

Public health risks of mass gatherings

Mass gatherings can potentially generate greater health risks than normally expected for a natural gathering of similar size. Major anticipated health risks may include heat- or cold-related illness, foodborne and waterborne illness, communicable diseases and accidents and other types of injuries. International travel itself involves risk since communicable diseases that are not endemic to a venue might be imported to that location. The millions of meals served to athletes, staff and visitors highlight the opportunity for foodborne disease outbreaks. Further, mass gatherings are targets due to the large number of people, mass-media coverage and the high-profile impact if explosives, biological and chemical agents or radionuclide material were deliberately used.

Mass gatherings have been associated with significant morbidity and death, although this is relatively rare. Examples include the 11 deaths at the 1972 Munich Olympics and 1 death at the 1996 Atlanta Olympics (8) and crowd crushes at Hillsborough Stadium in the United Kingdom (9). Infections transmitted through the air and/or by droplets and even through contact sports have been reported (10). A large outbreak of meningococcal disease was reported among pilgrims from 12 countries who contracted the disease while attending the hajj in Mecca (11). In 1991, an outbreak of measles in the United States at the International Special Olympic Games involved athletes, spectators and volunteers (12). Cruise ships berthed in harbours near mass-gathering venues have the potential for experiencing outbreaks of disease, including gastroenteritis, Legionnaires' disease

(13), influenza and tuberculosis. Further, international travel itself provides the opportunity for a variety of communicable diseases to be imported. For example, in 1996 about 10 000 cases of malaria were reported to be imported into the European Union (EU) (14). Other health risks might emerge out of the existence of temporary structures and design aspects. In 1997, a temporary bridge to the stadium of the Maccabiah Games, the quadrennial Jewish Olympic Games, collapsed into a heavily polluted stream, killing four Australian athletes and injuring many more people. Finally, the competitors themselves might be more vulnerable and susceptible as a group to a range of illnesses due to the closed athletes' village. Important to the planning of emergency services and health care is knowledge of the types and incidence of health problems that may be seen. These problems depend on a number of factors, such as hot or cold weather, the ages of the people attending, the duration of the event and whether the crowd will be largely seated versus mobile (15). Table I.1 lists the number of medical encounters per 10 000 people in a variety of types of mass gatherings. Although every type of event is unique, Table I.1 gives a general idea as to the number of visits to expect, depending on the number of people attending the event. In general, the most common types of medical problems associated with mass gatherings include dermal and musculoskeletal (such as lacerations, abrasions, bruises, sprains and fractures), gastrointestinal (such as nausea, vomiting, diarrhoea and abdominal pain) and possible heart problems (such as chest pain, syncope, dizziness and loss of

Table 1.1
Number of medical encounters per 10 000 people in a variety of types of gatherings

Event	Location	Date	Number of people	Medical encounters per 10 000
Live Aid Concert	Philadelphia PA, USA	July 1985	590 000	33
Rock music concert	Toronto, ON, Canada	August 1980	30 000	167
Rock music concert	Holland, VT, USA	September 1982	35 000	69
Rock music concert	Devore, CA, USA	September 1982	410 000	64
National Football League	Denver, CO, USA	1978 season (10 games)	72 000 per game	4
Crosby Golf Tournament	Advance, NC, USA	May 1987 (four days)	80 000	22
World's Fair	Knoxville, TN, USA	May–October 1982	11 000 000	23
World Exposition	Vancouver, BC, Canada	May–October 1986	22 100 000	39
Summer Olympic Games	Los Angeles, CA, USA	July–August 1984	3 450 000	16
“The Open” Golf Championship	Several venues, United Kingdom	1981–1990	1 568 833	51
Special Olympic Games	Galveston, TX, USA	Spring 1989	777 athletes	347
Indianapolis 500 Road Race	Indianapolis, IN, USA	1983–1990	400 000 per year	3.5 average
Winter Olympic Games	Calgary, AL, Canada	February 1988	1 800 000	15.2

Source: adapted from *Provision of emergency medical care for crowds (15)*.

consciousness). Regarding heart problems, the importance of providing defibrillators at sports stadiums has been recognized (16). Alcohol is believed to increase the casualty rate. Heat-related illness is common during long-term outdoor events held in hot weather, and cold-related illness is common with winter sports.

The type of crowd largely determines the types of health problem. Crowds attend mass gatherings because of common interest in the event. The participants at the Olympic Games are likely to be very different from those attending a rock concert. For example, individuals under the influence of various recreational drugs are more likely to present at rock concerts than other types of events. Gatherings are often collections of healthy individuals, but some may not be. For example, the Concert for Life in Australia was held to benefit a heart research centre

and an AIDS service, attracting large numbers of people with heart disease, including transplant recipients, and people living with HIV (17).

Potential health risks identified prior to the Athens 2004 Olympic and Paralympic Games were identified and categorized according to cause (infectious and non-infectious) and likelihood of occurrence (high or low probability) (Table 1.2) (18). High-risk infectious diseases included traveller's diarrhoea, foodborne and waterborne diseases, airborne diseases and sexually transmitted diseases. High-risk illnesses with non-infectious causes included heat-related illness, motor vehicle accidents and drowning and other injuries. While low risk, attacks using explosives, biological and chemical agents or radionuclear material were identified as a potential public health risk for the 2004 Olympic Games. The top illnesses or injuries encountered by spectators at the 2002 Salt Lake City

Table I.2 Potential public health risks identified for the Athens 2004 Olympic Games

Risk category	High risk	Low risk
Infectious diseases	Travellers' diarrhoea	Hepatitis A
	Foodborne and waterborne diseases	Brucellosis
	Airborne diseases	Non-endemic diseases
	Sexually transmitted infections	Severe acute respiratory syndrome
		Deliberate use of biological agents
Non-infectious causes	Heat-related illness	Deliberate use of explosives, chemical agents or radionuclear material
	Road crashes	
	Drowning – other injuries	

Source: adapted from Hadjichristodoulou et al. (18).

Winter Olympic Games were sprain or strain, miscellaneous trauma, respiratory, miscellaneous medical and digestive, and the overall spectator medical

utilization rate was reported to be 26.9 per 10 000 people (19). For planning purposes, spectator care provisions require considerable local input.

Conceptual models

An article on the public health response for the 1996 Olympic Games (20) adopted the framework of the three broad public health functions highlighted by the Institute of Medicine in 1988 (21): assessment, policy development and assurance. For example, surveillance and environmental health services monitoring were described under assessment; health regulations and planning for public health emergencies were considered under policy development; and heat-related illness prevention and public education and information were described under assurance. A 2002 report from the Institute of Medicine (22) expanded the public health functions into six main areas: policy-making, financing, public health protection, collecting and disseminating information about health and health care delivery systems, capacity-building for population health and direct

management of services. The often-cited mission of public health is to promote physical and mental health and prevent disease, injury and disability (23).

Arbon (24) proposed a conceptual model for mass-gathering health as an inter-relationship between three domains: biomedical, environmental and psychosocial (Table I.3). A report from the 2002 Winter Olympics (25) identified five major areas of public health responsibility related to large-scale events: emergency medical services; environmental and food safety regulation; disease surveillance and outbreak response; public information and health promotion; and event operations and disaster preparedness.

Another conceptual framework is the Haddon matrix, developed by William Haddon and used for more

Table 1.3
A model for mass-gathering health care

Psychosocial domain	Biomedical domain	Environmental domain
Crowd: a. behaviour b. mood	Crowd and individual health status	Crowd: a. attendance b. density
Individual: a. motivation b. behaviour	Latent potential for illness and injury	Venue: a. bounded or unbounded b. extended or focused c. locale or terrain
Crowd interests, mores and culture	Crowd average age and sex	Type and nature of event
Rationale and reason for attendance	Activity level (participant or spectator)	Predominantly seated or mobile
Length of stay	Heat- or cold-related physiology	Outdoor or indoor weather (temperature and humidity)
Use of alcohol or drugs	Alcohol- or drug-related physiology	Availability of alcohol or drugs
	↓	↓
	Effect	Response
	Risk of injury or illness: a. patient presentation rate b. transport to hospital rate	Level and extent of health care services

Source: adapted from Arbon (24).

than two decades in injury prevention research and intervention. The Haddon matrix is a grid with four columns and three rows. The rows represent different phases of an injury (pre-event, event and post-event), and the columns represent different influencing factors (host, agent or vector, physical environment and social environment). Table 1.4 illustrates a basic application to public health preparedness (26); the phases of an event are depicted on the matrix as a continuum beginning before the event (pre-event), the event itself (event phase) and the results of the event (postevent phase). Effective public health emergency preparedness and response require appropriate pre-event, event (crisis phase) and postevent (consequence phase) activities. In the context of emergency readiness, pre-event activities include risk assessment, risk communication and primary prevention efforts (such as pre-event vaccination). Event-phase public health activities involve crisis risk communication and

community-based health interventions such as post-exposure prophylaxis and treatment, crisis mental health counselling and isolation or quarantine measures. Postevent activities involve consequence-phase disaster mitigation and treatment of longer-term physical and mental health effects along with ongoing risk communication and recovery efforts.

Although the literature on mass gatherings does not explicitly describe key functions of the public health infrastructure for emergency preparedness within mass gatherings, some could include: disease surveillance to detect outbreaks and to monitor trends; specialized laboratory testing to identify biological agents and chemical hazards – both in individuals and in environments; epidemiological methods to identify people at risk and to monitor the effectiveness of prevention and treatment measures; knowledge of disease processes in populations to determine

appropriate responses such as quarantine, decontamination or the dissemination of treatment recom-

mendations; and coordination with partners to establish effective planning and response.

Table I.4

The Haddon matrix and public health emergency readiness and response – a conceptual overview

Influencing factors				
Phase	Host	Agent or vector	Physical environment	Social environment and organizational culture
Pre-event	Risk assessment	Properties of biological and chemical agents or radionuclear material	Existing clinical infrastructure Vulnerability of food and water supplies	Need for culture of readiness among public health and other first-responders
	Pre-event risk communication	Capacity of agent as a weapon of mass destruction	Transport infrastructure	Knowing one's functional role(s) in emergency response
	Pre-event surveillance	Potential for re-engineering an agent to produce unexpected health effects		Demonstrating the use of communication equipment
	Primary prevention (such as pre-event vaccination)		Proximity of community to chemical and radiation facilities	Knowing one's communication role(s) in emergency response
	Preparedness training for public health responders			Identifying key system resources for referring matters that exceed one's personal knowledge and expertise
	Interagency first-response planning			Participation in readiness exercises and drills Baseline community trust in public health and other response agencies Public acceptance of pre-event risk communication Culturally based pre-event risk perception Public awareness of large-scale threats Demographics of the community
Event	Crisis risk communication	Disease or injury caused by agent	Emergency response clinic set-up and operations	Community responses to crisis risk communication
	Decontamination and treatment	Response of the agent to decontamination and treatment efforts	Emergency access to medical supplies (such as the Strategic National Stockpile)	Community adherence to public health guidance during event
	Sheltering	Potential for agent detection	Clinical surge capacity	Culturally based crisis-phase risk perception
	Postexposure prophylaxis	Psychosocial impact of agent during event	Shelter availability	Access of community to crisis response clinics

Table I.4 (cont.)

Influencing factors				
Phase	Host	Agent or vector	Physical environment	Social environment and organizational culture
	Crisis-phase mental health response			
	Crisis-phase interagency first response collaboration			
	Epidemiological work-up (including forensic epidemiology as applicable)	Acute health effects of agent	Emergency accessibility of transport	
	Evacuation			
Post-event	Consequence-phase risk communication	Long-term psychosocial impact of agent	Application of lessons learned to better safeguard vulnerable infrastructure	Community responses to post-event risk communication
	Application of lessons learned to improve response systems	Response of agent to mitigation and clean-up efforts		Willingness of public health responders to embrace the lessons learned
	Consequence-phase mental health response			Post-event community trust in public health and other response agencies
	Post-event health surveillance Mitigation and cleanup After-action assessment and follow-up			Culturally based consequence-phase risk perception

Source: adapted from Barnett et al. (26).

Experience from other mass gatherings

Much of the literature on mass gatherings is descriptive and anecdotal and limited to a single event or event type. Two literature reviews on mass gathering health care have been published, one in 1997 (27) and one in 2002 (28). The 1997 review analysed published accounts of 44 events occurring either in the British Commonwealth or in the United States. Rock concerts were the events most frequently reported (48%). Most events reported were single-day events (75%), occurred in hot weather conditions (68%) and occurred in the United States (66%). Papal masses, rock concerts, hot climactic conditions and events held in the British Commonwealth posed a significantly higher frequency of people seeking health care, including people transported to hospitals.

The 2002 review of the available literature from 1977 to 2002 on mass-gathering events (28) also identified variables associated with health care encounters, with important variables consisting of weather, event type, event duration, age, crowd mood and density, attendance, and alcohol and drug use. Excessive heat without adequate hydration has resulted in many people developing heat-related illnesses. Heat-related illnesses were experienced at the Summer Olympics in Atlanta. The literature review reported that events of large magnitude and long duration, such as the Olympics and world fairs, often have more extensive health care capabilities on-site. This article acknowledged that planning for health care coverage at Olympic events needs to consider not only public health issues but also the threat of the deliberate use of explosives, biological and chemical agents or radionuclear material.

At least 10 relevant articles have been published or presented at conferences since the 2002 literature review, reporting on the 2002 FIFA World Cup in the Republic of Korea and Japan (29,30), surveillance for the Salt Lake City 2002 Winter Olympics (28,31), surveillance for the 1998 FIFA World Cup in France (32), a concert held in Toronto, Canada (33), surveillance during the 2004 UEFA European Football Championship in Portugal (34), a mass gathering in Taipei (35) and reports on the Athens 2004 Olympic Games (18,36,37). Government agencies have also prepared manuals on safety aspects of mass gatherings (4,38,39).

Based on consideration of the literature, including relevant conceptual models, the framework for mass gatherings and public health adopted here consists of the following topics:

- epidemiological surveillance and response and public health preparedness for the potential deliberate use of biological and chemical agents or radionuclear material (Part 2);
- addressing the environmental health challenges (Part 3);
- prehospital and hospital preparedness and care and disease prevention and health promotion activities (Part 4); and
- coordination, international cooperation and overall conclusions and lessons learned (Part 5).

The remainder of this chapter introduces each of these topics, emphasizing previous reports in the literature.

Disease surveillance and outbreak investigation

Public health surveillance at mass gatherings might help in detecting outbreaks or the possible deliberate use of explosives, biological and chemical agents or radionuclear material and enable prompt public health intervention. The risk of transmission of infectious diseases is potentially increased at mass gatherings. To address this potential for increased risk, surveillance activities have been implemented during the Olympic Games and other mass-gathering events, such as football tournaments. Surveillance activities have included reinforcing existing routine surveillance systems. During mass-gathering events, public health should coordinate and assure adequate disease surveillance across multiple local jurisdictions such as notifiable disease surveillance, syndromic surveillance, sentinel site surveillance and injury surveillance. Multi-jurisdictional disease trend analysis should also be conducted, and coordinating and assuring adequate epidemiological event investigation and outbreak response is important. If surveillance methods identify an important event or significant trend, then a rapid epidemiological investigation would probably be warranted.

Surveillance activities have ranged from the use of passive systems for detecting specific pathogenic microbes in the environment to the development of syndromic surveillance programmes for mining existing emergency medicine, primary care or pharmaceutical databases to rapidly identify unusual clusters of suspicious symptoms. Identifying appropriate trigger or action levels in these surveillance systems is an ongoing challenge for health care and public health personnel. Syndromic surveillance involves collecting and analysing statistical data on health trends or sales of pharmaceuticals, focusing on symptoms rather than confirmed diagnosis, in contrast to traditional disease

surveillance systems. The performance of syndromic surveillance systems has been debated, raising some questions about its effectiveness (40,41). The Real-time Outbreak and Disease Surveillance system was implemented in Utah for the Olympic Games in just seven weeks. More than 114 000 acute care encounters were monitored between 8 February and 31 March 2002. No outbreaks of public health significance were detected. During the Olympics, the Utah Real-time Outbreak and Disease Surveillance system received real-time admission messages from 10 emergency departments and 20 walk-in clinics. It collected free-text chief complaints, categorized them into one of seven prodrome categories using natural language processing and provided a web interface for real-time display of time-series graphs, geographical information system output, outbreak algorithm alerts and details of the cases. The system detected two possible outbreaks that were eventually dismissed as the natural result of increasing rates of influenza. Australia implemented a comprehensive Olympic Health Surveillance System during the Sydney 2000 Olympic and Paralympic Games (42). Major components included enhanced surveillance of communicable diseases; patient presentations to sentinel emergency departments; health care encounters at Olympic venues; surveillance of cruise ships; environmental and food safety inspection; surveillance for the deliberate use of biological agents; and global epidemic intelligence. The system provided daily updates from these data sources over a 38-day period, commencing three weeks before the Opening Ceremony and finishing three days after the Closing Ceremony.

In July 2005, a daily syndromic sentinel surveillance system was implemented to monitor disease and

injury among about 43 000 people attending a 10-day camping event held by a national youth organization (43). Initial screening using questionnaires plus a daily syndromic sentinel surveillance system were used for rapidly detecting communicable disease outbreaks to enable prompt public health intervention. By following up on illness and injury clusters identified daily by syndromic surveillance throughout the event, the public health team was able to implement control measures for a gastrointestinal illness outbreak and recommended measures for preventing heat-related illness. Syndromic surveillance at a smaller outdoor gathering of a different group in Pennsylvania in 1999 identified diarrhoeal illnesses, musculoskeletal injuries and bites as the most common events for which participants sought care (44). An outbreak of shigellosis at a mass gathering in 1987 subsequently spread to the general public after the group had dispersed (45).

A surveillance system was established for the 2006 Winter Olympic Games in Torino, Italy to detect specific adverse health events early for prevention and control (46). It was established by collating pre-existing sources, by reinforcing routine surveillance and by establishing new surveillance systems covering the local health units, Olympic hospitals and related areas. Information sources consisted of statutory notifications of selected diseases (Box I.1), laboratory-based surveillance of invasive diseases, sentinel surveillance of influenza-like illness, syndromic surveillance (Box I.2) and toxic exposure surveillance. Toxic exposure surveillance can be accomplished via poison control and drug information centres where they exist (47). Post event surveillance and investigation is yet another component to be planned for mass gathering, should an infectious agent such as meningococcal meningitis be discovered in the latter days of a mass gathering.

Box I.1

List of diseases to be immediately notified, surveillance for the 2006 Winter Olympic Games, Torino, Italy, 2006

Anthrax	Rabies	Trichinosis
Measles	Viral hepatitis	Relapsing fever
Botulism	Typhus exanthematicus	Tularaemia
Plague	Viral haemorrhagic fever	Legionellosis
Cholera	Cluster of foodborne	Smallpox
Poliomyelitis	disease	Bacterial meningitis
Diphtheria	Yellow fever	Tuberculosis

Box I.2

List of syndromes under surveillance, surveillance for the 2006 Winter Olympic Games, Torino, Italy, 2006

Fever and respiratory symptoms	Sepsis or unexplained shock
Haemorrhagic illness	Lymphadenitis with fever
Gastroenteritis without blood	Acute coma
Botulism-like illness	Nervous system syndrome
Gastroenteritis with blood	Unexplained death
Localized cutaneous lesion	Acute-onset jaundice
Fever and rash	

Health care capacity and mass-casualty preparedness

A major issue for mass gatherings is the provision of health services to spectators and participants. Most large gatherings, such as Olympics and football tournaments, are scheduled years in advance, giving the health care and public health communities time to plan, practice and deliberate with other agencies. Many different agencies need to collaborate to plan for health care capacity and mass-casualty preparedness, including emergency medical services, firefighters, police, hospital leaders and public health officers. The Medical Director's Checklist identifies 15 components for planning for medical coverage at mass-gathering events (48). The Disaster Medical Services Subcommittee of the American College of Emergency Physicians developed *Provision of emergency medical care for crowds* (13), which identifies some of the complex planning needed to identify, for example, how many health care workers and types of medical supplies may be needed for mass-gathering events. Sanders et al. (49) carried out such an empirical analysis for 15 different types of events and produced some guidance. Table 1.5 summarizes the casualties associated with selected casualty events.

Of relevance to mass gatherings, such as the Olympics, is the need to ensure adequate venue and community emergency medical services capacity including staffing, vehicles, supplies and equipment; coordinating routine and emergency interagency communications; assuring adequate contingency capacity through mutual aid agreements; and assuring and coordinating adequate community and state-level disaster planning among emergency medical services agencies (17). Visitors need access to health services over a short period of time, and provisions should be made to plan for this and disseminate such

information. Hospitals are challenged to provide surge capacity due to factors such as just-in-time inventory systems that provide for the minimum on-site storage of sterile supplies, vital equipment and pharmaceuticals to meet immediate requirements, declines in the ratio of trained health care workers to patients, increases in personnel turnover and lack of rosters of immediately available medical specialists (50). The net result of these factors is that hospitals are currently structured with a very limited surge capacity, even for normal fluctuations in patient volume.

In the event of mass casualties, the initial casualty volume and pattern can be estimated and used to handle resource and staffing issues during a mass trauma event (Fig. 1.1) (51). For example, within 90 minutes following an event, 50–80% of the acute casualties are likely to arrive at the closest health care facilities, and other hospitals outside the area usually receive few or no casualties. The less-injured casualties often leave the scene under their own power and go to the nearest hospital. As a result, emergency medical services may not triage them at the scene. Determining how many casualties a hospital can expect after a mass trauma event requires knowing that casualties present quickly and that about half of all casualties arrive at the hospital within a one-hour window (Fig. 1.1). A hospital can expect twice the number of casualties the hospital receives in the first hour (total expected casualties = (number of casualties arriving in one-hour window) times 2). Nevertheless, many factors may affect the accuracy of this prediction, such as: transport difficulty and delays, security issues that may hinder access to victims and multiple explosions or secondary effects of explosion (such as a building collapse).

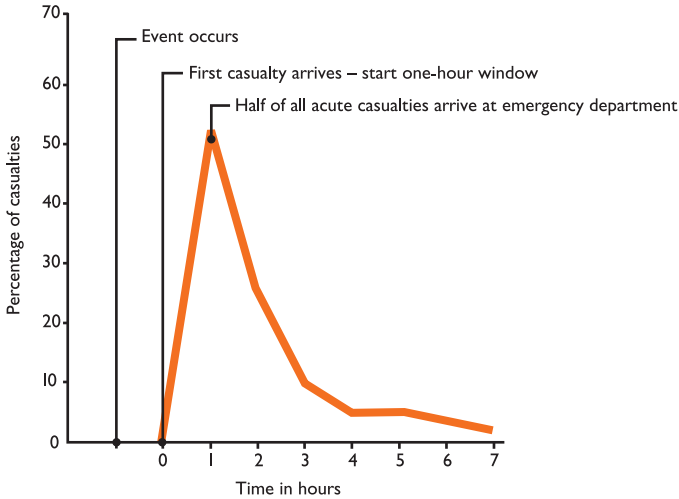
Table I.5**Summary of selected mass-gathering events resulting in casualties, 1988–1998**

Year	Location	Event	Cause	Deaths	Injuries
1988	Katmandu, Nepal	Soccer game	Crowd surge	90	700
1988	Ramstein, Germany	Air show	Crash into spectators	70	500
1988	Castle Donington, United Kingdom	Outdoor gathering	Crowd pressure	2	Unknown
1988	Omagh, Ireland	Bombing		8	29
1989	Hillsborough, United Kingdom	Soccer game (50 000 people)	Crowd craze	95	400
1989	Teheran, Islamic Republic of Iran	Funeral of Ayatollah Khomeini	Crowd violence	10	500
1990	Mecca, Saudi Arabia	Religious festival	Crowd surge	1426	“Thousands”
1991	Toronto, ON, Canada	Post-exhibition (300)	Street riot	0	3
1991	New York, NY, USA	Basketball game (1000)	Crowd craze	8	28
1991	Salt Lake City, UT, USA	Rock concert	Crowd surge	3	Unknown
1992	Toronto, ON, Canada	School party (2500)	Riot	0	8
1992	Hong Kong	Street festival (20 000)	Crowd surge	20	89
1992	Republic of Korea	Rock concert	Crowd pressure	1	50
1993	Rio de Janeiro, Brazil	Concert (3 000 000)		Unknown	Unknown
1993	Madison, WI, USA	Football game (12 000)	Crowd crush	0	69
1994	Athlone, South Africa	Political rally (20 000)	Crowd surge	3	21
1994	Mecca, Saudi Arabia	Religious festival (2 500 000)	Crowd surge	270	Unknown
1994	Baytown, TX, USA	Sports event	Grandstand collapse	1	17
1994	Saugerties, NY, USA	Rock festival (350 000)		2	7500
1995	Rio de Janeiro, Brazil	Rock concert (3 500 000)		Unknown	Unknown
1996	Cleve, Australia	Circus	Stand collapse	0	48
1997	Mecca, Saudi Arabia	Religious festival	Fire	343	2000
1997	Tel Aviv, Israel	Sports event	Bridge collapse	4	Unknown
1997	Ciudad del Este, Paraguay	Political rally	Structural collapse	38	100+
1998	Mecca, Saudi Arabia	Religious festival	Crowd surge	118	Unknown

Source: *Safe and healthy mass gatherings: a health, medical and safety planning manual for public events (4)*.

Attendance figures, if available, are shown in parentheses in the event column. Casualty figures are as provided to the mass media by official sources. Casualty figures for rock festivals traditionally have included everyone presenting for medical care, including such minor complaints as blisters, bruises, etc. Deaths include those who died of natural causes during the event.

Fig. 1.1. Predicted emergency department casualties in a major event



Source: United States Centers for Disease Control and Prevention (51).

Developing a region's surge capacity involves three major categories: workforce, resources and facilities. For example, if an event produces hundreds of casualties, hospitals would not only need to worry about moving their non-critical patients to another location to make room for the acutely injured people and

keep track of where they went and provide proper medical instructions to ensure continuity of care, but would also need to think about the number of ventilators or isolation units if needed or even whether they will have enough workers to continue working in high-risk situations.

Environmental health and food safety

The large number of athletes, staff and visitors temporarily at the Olympic Games makes environmental and food safety important. Selected public health responsibilities pertaining to environmental and food safety for mass gatherings such as the Olympics include assuring adequate Olympic venue and community public health capacity to inspect and enforce the following activities and services: food preparation and service, drinking-water, air quality, wastewater, solid and hazardous waste and other mass-gathering

requirements; monitoring environmental and food violations across the jurisdiction for systemic trends; facilitating the resolution of systemic problems with event organizers; and coordinating interagency communication. Food safety teams should conduct site inspections and selective sampling and microbiological testing of foods throughout the mass-gathering event. Preparations for and operations of Olympic Games involve arranging for enough food inspectors to inspect and monitor food vendors as well as adequate

inspectors for environmental health services, such as water testing, sanitation services and solid waste disposal (52). Importing unprocessed food into Olympic villages may pose food safety challenges (53).

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Public information and health promotion

Public information and health promotion activities during mass gatherings have been described. Numerous Olympics have been declared smoke-free (54,55). Hot, humid temperatures during summer mass gatherings can lead to heat- and sun-related illness. Participants in certain mass gatherings, such as Olympic Games athletes, may be at risk of contracting communicable diseases, such as measles and sexually transmitted infections. At the Atlanta 1996 Olympic Games, physicians and public health workers initiated a safe-sex campaign to limit the spread of sexually transmitted infections by using posters, pamphlets and buttons in multiple languages to communicate a safe-sex message and by distributing 50 000 condoms in the Olympic colours.

Heat-related illnesses were the most commonly reported preventable health problem among the 2.2 million athletes, staff and spectators at the Atlanta 1996 Olympic Games, where the temperature reached 35°C (95°F) (56). Based on anticipated high temperatures and humidity, continued crowding and the provisional data in this report, public health agencies recommend that spectators and staff at the Olympic events and at other summertime sporting events take precautions to prevent heat-related illness. These precautions include wearing loose-fitting, light-coloured clothing; wearing a protective hat; increasing intake of nonalcoholic beverages; maximizing time spent in an air-conditioned environment; and spending time in shaded areas both inside and outside the venues. The Georgia Department of Public Health implemented a comprehensive

approach to prevent heat-related morbidity statewide during the Olympics, including modifying environmental health regulations to require the availability of free water at events with greater than 50 attendees and undertaking an aggressive mass-media and public information campaign. In addition, local government agencies and volunteer organizations cooperated to establish facilities to provide water, protective hats and sunscreen.

During the 2002 Salt Lake City Olympics, there was significant concern about increased air pollution due to traditional winter temperature inversions resulting in periodically observable increases in air pollution in the Salt Lake Valley (25). The organizers informed the public and Olympic participants of any potential dangers and asked for the public's assistance in helping reduce the pollution levels. The 2002 Winter Olympic Games were the first Olympics to sponsor a community health initiative, A Healthier You 2002. This programme used inspiration from Olympic athletic excellence to motivate Utah residents towards healthier behaviour. By January 2002, 14 305 Utah adults had walked in 117 separate Gold Medal Mile events, 67 000 nutrition trackers and 109 000 safety cards were distributed in both English and Spanish and 15 000 healthy behaviour trackers had been produced. Other activities included mass-media events, fitness success stories and the installation of 30 permanent walking routes throughout the state (57).

Soteriades et al. (58) reported on the impact of the Athens 2004 Olympic and Paralympic Games on

the development and implementation of population-based health promotion programmes and related activities. They reported on programmes implemented by the Olympic Games Organizing Committee

(a nonsmoking policy and the distribution of condoms free of charge in the Olympic Village Polyclinic) as well as health promotion programmes implemented by other agencies and municipalities.

Public health preparedness and response to potential incidents involving the deliberate use of biological and chemical agents or radionuclear material

Careful consideration must be given to the possibility of casualties from the deliberate use of explosives, biological and chemical agents or radionuclear material during mass gatherings (Box I.3). The capacity for managing the health risks of potential incidents involving the deliberate use of explosives, biological and chemical agents or radionuclear material is based on the capacity of the health, emergency management, security and other sectors to coordinate planning activities and respond to these incidents. At the

Munich 1972 Olympic Games, Palestinians attacked the Israeli Olympic team, resulting in the deaths of 11 Israeli athletes. The Atlanta 1996 Olympic Games were marred by a pipe-bomb explosion that killed one person and injured 110 others. The challenges of preparing for and responding to the deliberate use of explosives, biological and chemical agents or radionuclear material are significant (59). Cooperation among public health officials, emergency managers, first-responders and health care providers

Box I.3

Biological and chemical agents or radionuclear material that affect health and their deliberate use

Biological agents are living organisms (such as bacteria, viruses, rickettsia or fungi) or toxins of biological origin that can infect or poison humans or other organisms.

Chemical agents are toxic chemicals in gas, liquid or solid form that, through their chemical action on life processes, can cause death, temporary incapacity or permanent harm to humans or other organisms.

Radionuclear material is substances that cause excessive radiation exposure among humans and other organisms and affect the environment. Excessive exposure may be due to external exposure or contamination by being near or handling radionuclear material or due to internal contamination by ingestion, inhalation or trauma.

Deliberate use means acts (or the threat thereof) involving the intentional release of biological and chemical agents or radionuclear material to cause harm.

is a top priority, and the role each plays in mitigating and responding to an emergency is essential to minimize loss-of-life and control the spread of disease and chaos.

When heads of state and other world political and business leaders attend mass gatherings, planning needs to include responding to potential incidents involving an attack with conventional weapons, biological and chemical agents or radionuclear material. A growing awareness of the unique requirements for preparedness for the potential deliberate use of explosives, biological and chemical agents or radionuclear material has brought local public health agencies together with other first-responders, including law enforcement. In many communities, public health agencies are learning about such issues as incident command and preservation of evidence, while law enforcement agencies are becoming aware of the requirements for information and data exchange in epidemiological investigations. For the Sydney 2000 Olympic Games, training in the awareness of emergencies related to the deliberate use of biological and chemical agents or radionuclear material and explosives occurred throughout the community; hospitals developed mass-casualty decontamination facilities; and personal protective equipment and pharmaceutical supplies were distributed to major hospital sites (60).

Disaster planning was a key component of the preparations for the Atlanta 1996 Olympic Games (61). The City of Atlanta and the State of Georgia are prone to natural disasters, such as hurricanes and tornadoes, but of greater concern was the potential for a major deliberate use of explosives, biological and chemical agents or radionuclear material. The recent bombings in Oklahoma City and at the World Trade Center had shown that the United States was prone to such incidents. The large-scale attack with sarin in Tokyo in 1995 killed 12 people and sent more than 5000 others to local hospitals. Local agencies and institutions within Atlanta worked

extensively on disaster planning. As well as revising disaster plans, many health care institutions developed educational programmes to address mass-casualty incidents. Emergency room staff and pre-hospital personnel were trained in managing patients exposed to biological and chemical agents or radionuclear material, and disaster drills were conducted. The Georgia Emergency Management Agency and the Department of Human Resources coordinated state disaster preparedness.

In terms of the deliberate use of biological agents, many infectious disease agents are often difficult to identify initially, as the signs may be nonspecific (62). An ever-increasing number of individuals are likely to present at physicians' offices, emergency rooms and community pharmacies. Illnesses may be scattered geographically and occur in several different jurisdictions at once, depending on the source and the mechanism of initial infection. Mounting an effective, timely and coordinated response requires health information and involving a variety of health professionals. Training in awareness for emergencies related to the use of explosives, biological and chemical agents or radionuclear material should take place prior to mass gatherings. In association with the Sydney Olympics, several hospital sites developed mass-casualty decontamination facilities, and protective equipment and pharmaceutical supplies were distributed to the major hospital sites (63).

The literature has paid little attention to preparations for mass prophylaxis with pharmaceutical counter-measures for mass gatherings, although there is recognition that response capacity to the large-scale deliberate use of biological agents may be limited by the ready availability of antibiotics and/or vaccines (64). The United States Federal Government has created the Strategic National Stockpile, comprising several ready-to-deploy push packs containing medical supplies to treat thousands of patients affected by the highest-priority disease-causing agents (the United States Centers for Disease Control and

Prevention Category A agents), as well as pre-designated pharmaceutical supply caches and production arrangements that may be used for large-scale ongoing prophylaxis and/or vaccination campaigns (managed inventory) (65). Considerable planning needs to occur for dispensing operations to get prophylactic medication and vaccines to affected populations (66,67).

The Athens 2004 Olympics Games were held against the backdrop of growing concerns about the potential for the deliberate use of explosives, biological and chemical agents or radionuclear material. International cooperation to share lessons learned was a major asset (see Chapters 6 and 18). The Government of Greece engaged several countries with experience in organizing mass gatherings and also in dealing with deliberate events for various types of assistance, through the creation of the Olympic Advisory Group, which included Australia, France, Israel, the Russian Federation, Spain, the United Kingdom and the United States and cooperated closely with WHO, NATO and the European Commission. In 2001, the United States began planning its security assistance for the 2004 Summer Olympics, responding to the heightened worldwide

anxiety following the events of 11 September 2001 and Greece's request for international advice on its security plan (68).

Identifying the agents used in incidents involving the deliberate use of biological and chemical agents may involve sophisticated tests that take several hours to days to obtain results. Initial signs and symptoms in victims of the deliberate use of biological agents may present as common disease processes. Not thinking about the possibility of these more lethal or infectious diseases runs the risk of secondary spread and additional cases of epidemic proportions. Early warning of potential threats will stimulate earlier screening of potentially exposed individuals for intoxication or infection and a more rapid public health response. This is even more important if multiple biological agents or combined biological and chemical agents are suspected. Traditional medical teaching is to try to explain a clinical condition by a single disease process. Containing the disease outbreak or the chemical contamination is the most important public health responsibility of consequence management of the deliberate use of biological and chemical agents. Timely and accurate pre-incident intelligence is essential to achieve this goal.

Leadership, operations and capacity for unified command

Managing such diverse health risks implies the coordination of many national independent, interdependent and interoperating elements. These elements can be clustered into systems, subsystems and organizations, as follows (2):

- systems operating at each administrative level (such as national, subnational and local);
- sectors (such as health, emergency management, security and transport and agriculture);
- specific risk-based systems (such as civil defence for natural and technological hazards and the potential deliberate use of biological and chemical agents or radionuclear material);
- systems for specific functions or services (such as health surveillance, risk communication, emergency response, mental health and laboratories); and

- organizations that contribute to these systems by providing coordination and the capacity to perform functions.

An important element of planning is establishing and utilizing an incident command system, which provides a clear delineation of roles, functions and duties for those involved in responding to large public events. Such formalized systems, such as a public health command centre to ensure rapid and coordinated response to public health issues, have been established during mass gatherings, such as the Olympics. For example, the security implications of the potential deliberate use of biological and chemical agents or radionuclear material require health agencies at all levels to collaborate closely with partners performing intelligence, defence, law enforcement and emergency management functions. Fig. 1.2 shows the multiple stakeholders of an incident involving the potential deliberate use of explosives, biological and chemical agents or radionuclear material.

Typically, public health command centres are staffed 24 hours per day and function to coordinate responses to all public health issues in conjunction with other response and planning partners. Plans for public health-related leadership and unified command during mass gatherings should address:

- establishment of a planning committee, including identifying and involving key partners, stakeholders, and local elected officials;
- command, control and management procedures;
- mobilizing necessary staff, resources and their availability;
- surveillance and epidemiological investigation procedures, including contact identification and tracing, vaccination of contacts, mobilizing laboratory resources and alerting and training health care providers about identifying and reporting suspected cases of interest;
- legal powers for quarantine and selecting possible isolation sites and plans for how they will be used;
- plans for communicating with health care providers, the public and the mass media;
- training identified health care staff and other first-responders (such as police and firefighters) for controlling outbreaks; and
- establishing security procedures in conjunction with local police and other law enforcement agencies, including operational procedures for essential functions such as maintaining essential systems that include water, electricity and waste disposal.

For the Salt Lake City 2002 Olympic Games, the United States federal response plan was implemented to help meet the needs of the state and local communities. Included was the pre-deployment of federal teams to Salt Lake City throughout the Olympiad to help with management oversight, logistic, communication and coordination support; rapid response operations to ensure immediate access to the resources of federal agencies; emergency information staff to work in the joint information centre assisting with the national and international press corps; and pre-deployment of urban search and rescue task forces, which were on standby in case of any collapsed-structure incident.

An interactive manual from the Center for Biosecurity of the University of Pittsburgh Medical Center on anticipating and avoiding dilemmas that can arise in a public health emergency (69) provides guidance for government leaders. The manual is designed to advise leaders of issues that should be considered in response to the deliberate use of biological agents and epidemic response planning, including what defines leadership during an epidemic or deliberate use of biological agents and what lead-

Fig. 1.2. An incident during the Olympic Games involving the potential deliberate use of explosives, biological and chemical agents or radionuclear material would have required complex interaction and coordination among many agencies



ership dilemmas may arise in a deliberate epidemic and how might they be averted.

Reliable communication networks and processes are essential to successfully managing the public health aspects of mass gatherings. Communication must occur within agencies as well as among different agencies, departments, etc. Examples of the latter are communication among emergency medical services providers, hospitals and command centres. Different agencies must be able to communicate with each other; communicate between staff outside and inside the venue to get a proper overview of the overall situation; and communicate with command centres.

At the Atlanta 1996 Olympics, extra radios were provided to emergency medical services workers, a communication protocol was distributed to hospital emergency departments prior to opening ceremonies and multiple methods of communication were deployed, including routine telephone and fax lines and radios (70). Communication strategies must be multimodal and not rely on one single system and should also have their own back-up power supply. In addition to tactical communication, agencies involved in public health aspects of mass gatherings must have staff skilled in communicating to the public. Requirements for multiple languages need to be considered.

Summary

Mass gatherings, such as the Olympic Games, represent significant challenges for the public health and the health care delivery systems. Major areas of public health responsibility related to mass gatherings include health care capacity and mass-casualty preparedness, disease surveillance and outbreak response, environmental health and food safety, public information and health promotion, public health preparedness and response to the use of biological and chemical agents or radionuclear material and explosives and leadership, operations and capacity for unified command. In the light of emerging global

public health threats from natural or deliberate events, mass-gathering public health and disaster preparedness concepts are closely connected, and this is why these terms are sometimes used interchangeably. Effective planning for and response to mass-gathering events can be achieved through collaboration among event planners, agencies and members of the affected communities. The success of the Olympic Games depends in part on how governments, agencies, communities and other stakeholders prepare for the public health aspects of such mass gatherings.

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CHAPTER 2

Operational framework for health and for the national and subnational jurisdictions for public health for the Athens 2004 Olympic Games

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Former Mayor of Athens Dimitris L. Avramopoulos (currently Minister of Health and Social Solidarity) receives the flag of the Olympic Games at the closing ceremony of the Sydney 2000 Olympic Games and, in the background, Gianna Aggelopoulou-Daskalaki, President of the Athens 2004 Olympic Games Organizing Committee

On 1 September 2000, the Ministry of Health and Welfare (renamed the Ministry of Health and Social Solidarity in March 2004) and the Athens 2004 Olympic Games Organizing Committee signed a memorandum of understanding and developed an action programme entitled: Olympic Games 2004 – Health. The main goal of this programme was the appropriate planning, scheduling, implementation and follow-up of all activities relating to the health sector and its response to the needs relating to the organization of the Athens 2004 Olympic and Paralympic Games. This agreement was finalized in March 2001, and the plan was implemented according to a predefined time schedule.

The health planning framework of the Athens 2004 Olympic Games

The strategic aims of the plan evolved around five main priority axes:

1. hospital care
2. primary health care
3. emergency health care
4. public health and hygiene
5. organization and coordination of the health system.

Each priority axis in turn included four main priority areas for intervention and corresponding action: operational, organizational enhancement of building and equipment infrastructure and human resources.

Axis 1: hospital health care

The main goal of axis 1 was the preparedness of selected hospitals in Olympic cities to respond to the need for health services created by the 2004 Olympics. Twenty-four hospitals in Greater Athens were initially designated as Olympic hospitals and in five more Olympic cities. Eight of those were designated as core Olympic hospitals based on the need for state-of-the-art response capabilities during the Olympic period. Projects under axis 1 included interventions and improvements in infrastructures such as the general building, the emergency rooms and acquisition of medical equipment.

Axis 2: primary health care

The main goal was the primary health care coverage of the Olympic family, the VIP guests, the media family and the visitors and volunteers of the Olympic Games in all Olympic cities. The main points where this care was provided were the Olympic Village Polyclinic and the primary care health centres scattered around the Olympic cities. Eleven facilities were used as first-aid stations in several geographical locations. Projects under axis 2 covered improvements in building infrastructure and the acquisition of medical equipment.

Axis 3: emergency health care

The main goal was a series of organizational and functional interventions in the National Centre for Emergency Care to improve the capacity for state-of-the-art prehospital care and the capacity to respond to emergency situations especially mass-casualty incidents. Projects under axis 3 covered the acquisition of new ambulances, motorcycles and mobile units for emergency prehospital care and special vehicles to act as mobile coordination centres in a mass-casualty incident; the acquisition of emergency care equipment and the organization of a wide range of educational programmes for the emergency

care personnel in the following thematic areas: emergency care, basic life support and automatic defibrillation, life support of victims exposed to hazardous material (hazardous material life support), advanced trauma life support, advanced cardiac life support and defending against the deliberate use of biological and chemical agents or radionuclear material.

Axis 4: public health and hygiene

The main action included the epidemiological surveillance and control of communicable diseases, food safety, environmental surveillance and control of waters, public places and areas providing services to the public and coordinating participating agencies. The main goal was to provide public health of the highest standards during the Olympics. A major challenge was the development of a unified, integrated public health service system ensuring coordination and effective communication among the departments and agencies involved. A master operational programme entitled: Athens 2004 Olympic Games – Public Health and Hygiene was put forward in March 2001 with four main subthematic axes:

- prevention and control of communicable diseases
- food safety
- environmental hygiene
- networking of public health agencies.

Axis 5: organization and coordination of the health system

The main goal was the administrative coordination of the health sector overall to be more effective in responding to emergency situations such as natural or human-made disasters, especially the deliberate use of explosives, biological and chemical agents or radionuclear material. The main activity under this axis was the organization (equipment and operating procedures) of the Health Coordination Command Centre. This Centre was in charge of the coordination of all agencies under the jurisdiction of the Ministry of Health and Social Solidarity as well as the security of vital structures of the health sector. The Health Coordination Command Centre was created in the premises of the Ministry of Health and Social Solidarity.

A partnership-based action programme

The programme was implemented by a wide range of agencies under the jurisdiction of the Ministry of Health and Social Solidarity, the Ministry of Development and the Ministry of the Interior, Public

Administration and Decentralization. Table 2.1 provides an overview of the main actors by action thematic area. This chapter also provides brief profiles of all the agencies involved.

Table 2.1

Main agencies and thematic areas for the Athens 2004 Olympic Games – public health and hygiene programme

Thematic area	Main agencies involved
Hospital care	Ministry of Health and Social Solidarity Regional health authorities
Primary health care	Ministry of Health and Social Solidarity Regional health authorities
Prehospital and emergency care	National Centre for Emergency Care Ministry of Health and Social Solidarity
Communicable disease control	Hellenic Centre for Infectious Diseases Control Ministry of Health and Social Solidarity
Food safety	Hellenic Food Authority National School of Public Health Central Public Health Laboratory Prefectural departments of public health
Environmental hygiene	National School of Public Health Prefectural departments of public health Ministry of Health and Social Solidarity
Coordination and unified command	Ministry of Health and Social Solidarity National Board of Public Health Hellenic Centre for Infectious Diseases Control National Centre for Emergency Care

The plan for responding to the potential deliberate use of biological and chemical agents or radionuclear material

Under the overall Athens 2004 Olympic Games health planning framework, several plans were developed to address preparedness and response issues at all levels. Preparedness to respond to the potential deliberate use of biological and chemical agents or

radionuclear material was a dominant aspect of the whole process. For this purpose, the Ministry of Health and Social Solidarity developed a specific plan called Philoctetes (named after a hero in Greek mythology), which represented the overall plan for Greece's

capacity-building to address the health aspects of potential incidents involving biological and chemical agents or radionuclear material. The purpose of Philoctetes (Fig. 2.1) was to support and enhance Greece's health services against any potential incidents involving biological and chemical agents or radionuclear material. Thus, it would protect and rehabilitate the health of civilians using appropriate infrastructure and personnel in case of the deliberate use of biological or chemical agents or radionuclear material. The Philoctetes plan was appropriately linked to other existing plans for emergencies, including plans for responding to natural disasters such as earthquakes and flooding. The Philoctetes plan was confidential, and the Health Coordination Command Centre was in charge of its implementation. The plan's scope was wide and yet detailed and included aspects such as:

- coordinating and activating all the health structures;
- coordinating and activating the health care staff;
- organizing decontamination units within the Olympic hospitals;

- ensuring the preparedness of the infection units and the negative pressure units at the Olympic hospitals;
- training all health care staff members;
- ensuring the national stockpile of essential vaccines, drugs and medical devices;
- implementing special task forces against incidents involving biological and chemical agents or radionuclear material; and
- performing exercises in real time.

The plan covered a wide range of activities for which several bodies and agencies were responsible (Table 2.2).

The Philoctetes plan included several additional provisions related to risk assessment, criteria for plan activation, health information management, preventive and screening services, protective equipment, psychological support for victims, veterinarian support and coordination of assistance from other sectors, such as the military or international assistance.

Fig. 2.1. Cover of Philoctetes, the operational plan of the Ministry of Health and Social Solidarity for the potential deliberate use of biological and chemical agents or radionuclear material



Table 2.2

Main areas of responsibility of agencies

Body or agency	Main areas of responsibility
Health Coordination Command Centre	• Organizing health system units regarding personnel, infrastructure and equipment
	• Collecting, analysing and disseminating health information
	• Coordinating the rapid assessment, stabilization and transfer of victims in a mass-casualty incident
	• Organizing (or participating in intersectoral) tabletop, functional and full exercises for preparedness for incidents involving biological and chemical agents or radionuclear material; together with collaborating government agencies and the directorates of the Ministry of Health and Social Solidarity, issuing standard operating procedures for emergency response and help for victims
	• Stockpiling material to be used in incidents involving biological and chemical agents or radionuclear material: medicines, vaccines, tents, blankets and instruments or medical equipment
	• Coordinating the provision of expert scientific health care personnel at the scene of an event; supporting decision-making about control measures for outbreaks of communicable diseases and minimizing the effects of environmental hazards
	• Coordinating health sector actions in response to mass casualties, including control measures inside temporary living quarters and coordinating and guiding border control measures to avoid importing a highly contagious communicable disease, such as public health action at airports and coordinating on-call activities to deal with such emergencies
	• Coordinating the deployment of special decontamination units and decontamination areas and activating quarantine measures
	• Providing liaison staff to command centres operated by the Ministry of Public Order and Ministry of the Interior, Public Administration and Decentralization
	• Ensuring the application of standard operation procedures and protocols for dealing with different types of incidents related to biological and chemical agents or radionuclear material
National Centre for Emergency Care	• Provide prehospital care, stabilization and safe transport
	• Act as first-responders to any health emergency, including a mass-casualty incident and incidents involving biological and chemical agents or radionuclear material with specialized teams to provide triage, stabilization and transport of victims along with assistance in decontaminating non-ambulatory people
Hellenic Centre for Infectious Diseases Control	• Communicable disease surveillance, including organizing event-specific surveillance (Olympic syndromic surveillance) targeting the early detection of the deliberate use of biological agents
	• Trained personnel participating in the response to a suspicious incident involving biological and chemical agents or radionuclear material, assessed and advised on the need to give chemoprophylaxis, transported the samples for biological testing to laboratories of the national laboratory network
	• Trained personnel were on-call, part of the public health mechanism of response to outbreaks of diseases following specific protocols
Designated Olympic hospitals	• The Ministry of Health and Social Solidarity and the Hellenic Centre for Infectious Diseases Control promoted emergency planning based on specific guidelines developed by their emergency response committees, including a system of first notification and activation of alert and a system of implementation and evolution of the response plan
	• Intensive training and exercise testing in implementing the plan was mandatory and designed to test several sectors of the hospital: emergency room, wards, intensive-care unit, imaging facilities, pharmacy, forensic services, decontamination units, laboratories, kitchen, laundry, communication and security

Greece's public health and health care systems during the Athens 2004 Olympic and Paralympic Games

This section describes the main stakeholders within the public health and health care systems of Greece that participated in organizing the Athens 2004 Olympic and Paralympic Games and in providing public health and health care services throughout the Olympic period.

Ministry of Health and Social Solidarity

The Ministry of Health and Social Solidarity is the umbrella institution responsible for the overall planning, implementation and assessment of activities in public health, health care services and social welfare. Its central administration at the time of the Games consisted of three general directorates (Fig. 2.2).¹ In addition, a number of specialized agencies dealing with various aspects of public health and health care services fall under its jurisdiction (Fig. 2.2).

Central administration of public health under the Ministry of Health and Social Solidarity

The public health responsibilities of the (former) Directorate of Health Services included the development of public health policies and strategies, carrying out measures within the framework of national

public health policy, regulating and evaluating public health services under the Ministry of Health and Social Solidarity, coordinating the activities of all public health agencies and overseeing the enforcement of EU and WHO public health regulations (now under the Directorate of Public Health).

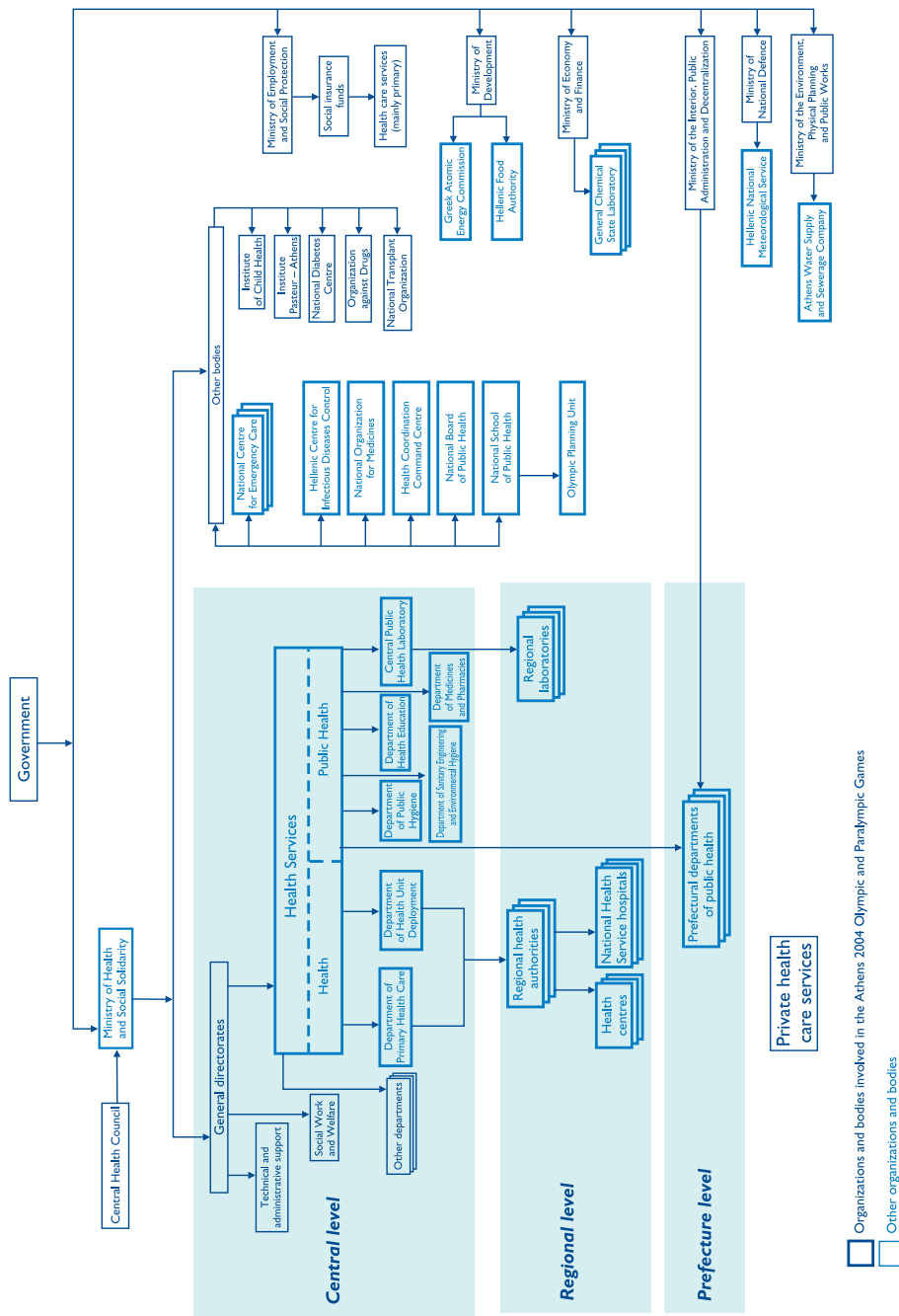
The departments that played a public health role in the periods prior to and during the Games were: the Department of Public Hygiene, Department of Sanitary Engineering and Environmental Hygiene, Department of Medicines and Pharmacies, the Department of Health Education and the Central Public Health Laboratory.

Department of Public Hygiene

This Department is generally responsible for receiving epidemiological monitoring, formulating immunization and nutrition policies along with national guidelines on various diseases and enforcing health regulations, coverage of the population with necessary vaccines and globins and supervision of various organizations (such as the National School of Public Health, the Institute Pasteur – Athens and (at the time of the Olympic Games) the Hellenic Centre for Infectious Diseases Control). In addition, it is involved in promoting health, preventing chronic diseases and in tobacco control, maternal and child health and school and oral health.

¹ As of 2005, the Directorate for Health Services was divided into the Directorate for Health, responsible for providing health services, and the Directorate for Public Health, responsible for public health activities.

Fig. 2.2. Overview of the organizational structure of the overall health sector of Greece at the time of the Games. The figure emphasizes the key participating bodies, each of which appears in boldface boxes. Each of these agencies will be discussed in turn.



The Department of Public Hygiene was engaged early on in public health planning for the Games, especially in formulating the action programme Olympic Games 2004 – Health. It supervised the progress of the various projects that were part of this action programme and actively collaborated with the Health Coordination Command Centre – to be discussed below). It issued the policies that were in effect during the Games on tobacco advertising and the regulations related to food services. The Department was also responsible for the necessary supply of vaccines and immunoglobulins for public health emergencies along with implementing strategies for preventing heat-related illnesses. Regarding oral health and in cooperation with the Hellenic Dental Association, a network of dentists from the public and private sectors was established to cover possible dental emergencies. This Department was also part of an electronic communications network linking a number of organizations to the Olympic Planning Unit, as part of an environmental surveillance system created to respond to possible emergencies (to be discussed below).

Department of Sanitary Engineering and Environmental Hygiene

This Department's general responsibilities include sanitary control of water supplies and sewage systems, waste management (solid, liquid and gaseous forms), monitoring air and water quality, formulating anti-pollution measures and policies promoting clean air and water and sanitary control of health service provider units as well as all public areas.

The Department of Sanitary Engineering and Environmental Hygiene, like the Department of Public Hygiene, also participated in formulating the action

programme Olympic Games 2004 – Health. It continued to be actively involved in implementing this programme throughout the Games in its capacity as a sanitary inspection agency, carrying out numerous inspections in water supply systems and bottled water, and providing technical support, often in collaboration with the Athens Water Supply and Sewerage Company as well as the prefectural departments of public health (both these organizations are discussed below). Further, it collaborated with the Health Coordination Command Centre (discussed below). This Department also participated in the electronic communication network of the Olympic Planning Unit (see below).

Department of Health Education

This Department was involved with the Games by preparing and distributing circulars relating to health promotion.

Department of Medicines and Pharmacies

The responsibilities of this Department involved determining the necessary vaccine supplies and stocks needed in the event of incidents involving biological and chemical agents or radionuclear material in cooperation with the National Organization for Medicines (see below), which is under the supervision of this Department, as well as with the Department of Public Hygiene.

Central Public Health Laboratory²

The Central Public Health Laboratory is generally responsible for providing laboratory and technical support to public health services. It carries out laboratory testing of water quality (seawater, rivers and

² Since August 2005, the Central Public Health Laboratory has no longer been under the central administration of the Ministry, as it was placed under the Hellenic Centre for Infectious Diseases Control, which was renamed the Hellenic Centre for Disease Control and Prevention (to be discussed below).

lakes), processed waste products as well as foods and beverages, including milk and dairy products. It is responsible for identifying microbial pathogens in the event of epidemics. The Central Public Health Laboratory consists of a central laboratory in Athens, which oversees and coordinates the activities of a number of its regional laboratories, and has a supervisory role of all other public and private laboratories involved with activities relating to public health.

During the Games, the Central Public Health Laboratory was a key participant in the electronic communication network linking several organizations to the Olympic Planning Unit, as part of the environmental surveillance system (to be discussed below), as well as the national laboratory network for the response to the potential deliberate use of biological agents (ARES).

Central administration of health care services under the Ministry of Health and Social Solidarity

The general responsibilities of the (former) Directorate of Health Services with respect to provision of health care services included planning and regulation of primary health care, hospital care and mental health care (now under the Directorate of Health).

Two departments under this Directorate played a role in organizing health care services before and during the Games:

- the Department of Primary Health Care, in charge of all primary care units within the National Health Service, falling under the jurisdiction of the Ministry of Health and Social Solidarity;³ and
- the Department of Health Unit Deployment, in

charge of hospital care (National Health Service hospitals) and, during the Games, responsible for supervising all Olympic hospitals (see below).

At the time of the Games, Greece was divided into 17 health regions, each of which had a regional health authority (which are being abolished). The regional health authorities were responsible for all National Health Service units (primary, secondary and tertiary health care facilities) within their territory. Each regional health authority was responsible for coordinating and implementing the national health policy in its respective region, planning on behalf of the health care service units within its jurisdiction and managing primary, secondary and tertiary care delivery. The regional health authorities were not, however, autonomous decision-making entities with financial responsibility, and their activities remained subject to the authority of the Ministry of Health and Social Solidarity.

Mainly the regional health authorities within whose territory the Games were being held participated in preparing for the Games and providing services during the Games.

Health care services during the Games were organized around numerous providers:

- 24 National Health Service hospitals distributed among the Olympic cities, known as Olympic hospitals;
- the Olympic Village Polyclinic and 223 first-aid stations within the Olympic venues;
- primary health care centres throughout the Olympic cities; and
- emergency services (provided by the National Centre for Emergency Care and discussed below).

³ Social insurance funds provide considerable primary care and are under the jurisdiction of the Ministry of Employment and Social Protection, as shown in Fig. 2.2.

Public health at the prefectural level

Greece is administratively divided into 57 prefectures, each of which has a department of public health. The prefectural departments of public health are self-administered units (which are therefore not under the jurisdiction of the Ministry of Health and Social Solidarity) and are under the administrative supervision of the Ministry of the Interior, Public Administration and Decentralization and the scientific supervision of the Ministry of Health and Social Solidarity policy directives (Fig. 2.2). The prefectural departments of public health are responsible for environmental hygiene and food safety and conduct systematic testing of food, drinking-water and beverages.

Of the 57 prefectures, 11 hosted Olympic venues in their territory and therefore became known as the Olympic prefectures. In preparation for the Games, extensive training was provided for personnel of the Olympic prefectural departments of public health in the areas of epidemiological surveillance, environmental health and response to incidents involving the deliberate use of biological and chemical agents or radionuclear material. During the Games, the Olympic prefectural departments of public health were responsible for food safety outside the Olympic venues, while the Hellenic Food Authority (discussed later) was responsible for food safety within the venues. The Olympic prefectural departments of public health participated in the electronic communication network linking several organizations to the Olympic Planning Unit as part of the environmental surveillance system created for the purpose of responding to public health emergencies (to be discussed below).

Other bodies under the jurisdiction of the Ministry of Health and Social Solidarity

As Fig. 2.2 shows, several additional bodies under the Ministry of Health and Social Solidarity were involved in preparing the Athens 2004 Olympic Games from the Ministry of Health and Social Solidarity perspective.

National Centre for Emergency Care

The National Centre for Emergency Care was established in 1985; as part of Greece's National Health Service, it is supervised and financed by the Ministry of Health and Social Solidarity. The National Centre for Emergency Care is the authority responsible for emergency care, prehospital health care for all citizens and visitors in the Olympic cities and safely transporting people to health care facilities. The National Centre for Emergency Care is headquartered in Athens but provides coverage for the entire country through its 11 regional centres.

Hellenic Centre for Infectious Diseases Control

The Hellenic Centre for Infectious Disease Control was established in 1992, and at the time of the Games operated under the jurisdiction of the Ministry of Health and Social Solidarity.⁴ Its main responsibility is epidemiological surveillance of communicable diseases and intervention in the event of outbreaks or epidemics but also to coordinate and promote activities for preventing communicable diseases and successfully treating them. The Hellenic Centre for Infectious Diseases Control is involved with

⁴ In 2005, this organization was renamed the Hellenic Centre for Disease Control and Prevention and became an independent agency under the Minister of Health and Social Solidarity.

strategic planning and research, assessment and scientific advice on public health issues and evaluation of preventive measures; monitoring and preventing nosocomial infections, old-age nursing homes, health centres and all other institutions that provide health care services; provide training for its own personnel as well as prefecture and National Health Service personnel; planning information and health promotion campaigns for the broader public; and disseminating information, including a telephone service offering free counselling on communicable diseases.

During the preparedness phase for the Athens 2004 Olympic Games, the Hellenic Centre for Infectious Diseases Control participated heavily in planning for the management of potential threats to public health due to the possible deliberate use of biological or chemical agents or radionuclear material as well as for collaboration with numerous public health and health care service providers intended to facilitate exchange of information for developing and operating an enhanced epidemiological surveillance system. Partners included the Hellenic Food Authority, the prefectural departments of public health, other ministries in addition to the Ministry of Health and Social Solidarity (such as the Ministry of Mercantile Marine and the Ministry of Rural Development and Food), the National School of Public Health, provider institutions in the hospital sector and others.

National Organization for Medicines

The National Organization for Medicines is the authority under the Ministry of Health and Social Solidarity whose mission is to ensure public health and safety with regard to pharmaceutical products (for human and veterinary use), medicated animal foods, food additives and supplements, medical devices and cosmetics. In the period prior to the Olympic Games, the National Organization for Medicines participated in training events on epidemiological surveillance and response and participated in the work of determining the necessary vaccine supplies

and stocks needed in the event of an incident involving biological and chemical agents or radionuclear material as well as being responsible for procuring these pharmaceuticals (in cooperation with the Department of Medicines and Pharmacies and Department of Public Hygiene of the Ministry of Health and Social Solidarity).

Health Coordination Command Centre

The Health Coordination Command Centre, under the Ministry of Health and Social Solidarity, was established in April 2004 for the purpose of coordinating all health sector institutions and enhancing the effectiveness of their response to any possible emergency situation involving health effects or casualties. It comprises 1) an interagency committee with representatives of key health sector organizations as well as representatives outside the health sector, such as the Ministry of National Defence and the Ministry of Interior, Public Administration and Decentralization and 2) the command and control centre, equipped for communication with the relevant stakeholders and manned 24 hours a day. The overall objectives of creating the Health Coordination Command Centre were to coordinate the responsibilities and actions of each organization within the health sector at a time of crisis and to coordinate the final preparation activities of all these organizations in the period immediately before the Olympic and Paralympic Games. More specifically, the key functions of the Health Coordination Command Centre were to create a daily health status report during the Olympic period but also to report on health system indicator data for use in strategic decision-making; monitor events with possible health effects; provide health status information to other national and international command centres; and manage health system resources. The Health Coordination Command Centre also participated in the electronic communication network implemented by the Olympic Planning Unit (discussed below).

National Board of Public Health

The National Board of Public Health, established in 2003, is a scientific advisory body to the Ministry of Health and Social Solidarity. Its responsibilities include providing advice to the Ministry of Health and Social Solidarity and other ministries on public health issues and health risks; developing proposals for national public health strategies as well as on specific areas in the area of public health; assessing the quality and effectiveness of public health services; and advising on public health research priorities. In the periods before and during the Games, the National Board of Public Health had a central role in developing and operating the Health Coordination Command Centre.

National School of Public Health

The National School of Public Health evolved from the Athens School of Hygiene, established in 1929 for the purpose of providing education and training for sanitary control specialists. Over time, the National School of Public Health expanded its range of teaching activities in response to changing public health demands and extended its activities into research in public health issues as well as providing services in public health, health promotion, health system management and social policy. The National School of Public Health is under the jurisdiction of the Ministry of Health and Social Solidarity.

In the periods before and during the Games, the National School of Public Health was responsible for designing and implementing an environmental health surveillance system, resulting in the creation of the Olympic Planning Unit and the establishment of an electronic network linking key stakeholders involved with environmental surveillance (see below). The National School of Public Health was also responsible for ensuring the safety of drinking-water tanks in

Olympic venues in the event of an accident or deliberate use of biological and chemical agents or radionuclear material, with its Laboratory of Sanitary Engineering and Environmental Health systematically testing and monitoring water quality. Further, the National School of Public Health also undertook projects for preventing heat stroke and an insect surveillance project identifying potential risks and planning a programme for managing the mosquito population.

Olympic Planning Unit

The Olympic Planning Unit was established in 2001 by the National School of Public Health, in close cooperation with the Ministry of Health and Social Solidarity, for the purpose of designing and implementing an environmental health surveillance system for the Games. The Olympic Planning Unit consisted of a multidisciplinary team of public health professionals that documented the needs and deficiencies of public health agencies, identified potential public health risks and collaborated with various public agencies to strengthen the capacity of agencies involved with environmental health and food safety (in particular, the prefectural departments of public health). In addition, the Olympic Planning Unit became the centre of an electronic database communications network, or information hub, which was established for the purposes of sharing, reviewing and analysing the results of environmental inspections and tests being carried out throughout the Games. The organizations participating in the communications network included the Central Public Health Laboratory and its regional laboratories, the prefectural departments of public health, the Hellenic Food Authority (see below), the Department of Public Hygiene and Department of Sanitary Engineering and Environmental Hygiene of the Ministry of Health and Social Solidarity and the Health Coordination Command Centre.

Organizations and bodies outside the health sector

Fig. 2.2 shows several organizations under ministries other than the Ministry of Health and Social Solidarity that were involved in the planning, preparedness and work phase before and during the Athens 2004 Olympic Games, each of which is discussed below.

Hellenic Food Authority

The Hellenic Food Authority was established in 1999 and is under the jurisdiction of the Ministry of Development. The Hellenic Food Authority's structure consists of a central agency and 13 regional agencies.

Its primary responsibility is to protect consumers by controlling food quality, regulating the production, import and commercial transport of foodstuffs and preventing food adulteration. Specifically, the Hellenic Food Authority determines and approves the regulations governing food hygiene in accordance with Greek and international laws and regulations and controls compliance with these, which is a prerequisite for establishing and operating all food enterprises. It maintains a registry of all food enterprises and determines the regulatory programmes carried out by its own and other regulatory bodies; it coordinates and regulates all controls in all stages of food production, processing, packaging, storing, transporting, distribution and supply for sale to the consumer; and it participates in relevant committees at the European level and at a wider international level for developing its regulatory and supervisory practices related to food.

During the Athens 2004 Olympic Games, the responsibilities of the Hellenic Food Authority included selecting the catering companies contracted by the Athens 2004 Olympic Games Organizing Committee, inspecting food and beverages within all Olympic venues (while the prefectural departments

of public health were responsible for food and beverage inspection in all facilities outside the Olympic venues) and participating in the electronic communication network linking several organizations to the Olympic Planning Unit created by the National School of Public Health to implement an environmental surveillance system to respond to public health emergencies (see above).

Greek Atomic Energy Commission

The Greek Atomic Energy Commission is under the Ministry of Development and is responsible for matters relating to nuclear power and technology as well as protecting the population, workers and the environment from ionizing and artificially produced non-ionizing radiation. The Greek Atomic Energy Commission is responsible for the emergency response in case of any radioactive accident or incident. In the period prior to and during the Games, the Greek Atomic Energy Commission 1) worked to identify all possible sources of radioactivity in Greece, 2) worked to install permanent and mobile radiation detectors in ports of entry to Greece, 3) participated in forming the Philoctetes security plan and 4) participated in multiple educational activities for first-responders as well as for health and public health professionals covering ionizing radiation and radioactive threats and recognizing and managing them.

General Chemical State Laboratory

This national laboratory under the Ministry of Economy and Finance is responsible for protecting public health, the environment and consumer interests and providing scientific support to judicial, police and other state authorities, including customs, tax and revenue authorities, by performing chemical analysis of products. The General Chemical State Laboratory, with laboratory facilities in 51 regions, conducts tests on numerous products and is the most important product quality control system in Greece.

Before and during the Athens 2004 Olympic Games, the General Chemical State Laboratory was responsible for identifying chemical agents in the event of threats involving biological and chemical agents or radionuclear material, provided support to the Hellenic Food Authority in matters of food safety and collaborated with all stakeholders in forming the security plan as well as training first-responder personnel.

Hellenic National Meteorological Service

The Hellenic National Meteorological Service is supervised by the Ministry of National Defence, provides meteorological support to the Ministry of National Defence and Ministry of Economy and Finance as well as the general public. In connection with the Athens 2004 Olympic Games, it participated in an intersectoral plan of action for preventing negative public health effects in the event of high temperatures and heat-waves.

Athens Water Supply and Sewerage Company

The Athens Water Supply and Sewerage Company (Ministry of the Environment, Physical Planning and Public Works) is responsible for providing water and sewerage services and for designing, constructing, installing, managing and maintaining water and sewerage systems in addition to desalinizing, treating, storing and distributing water in Greater Athens.

During the Olympic Games, the Athens Water Supply and Sewerage Company collaborated with the Olympic Planning Unit in the environmental surveillance system. Although it was not part of the electronic communication network of the Olympic Planning Unit, it participated through telephone communication and joint action with the Olympic Planning Unit in cases of suspected water contamination. As of 2005, the Directorate for Health Services was divided into the Directorate for Health, responsible for providing health services, and the Directorate for Public Health, responsible for public health activities.

PART 2

**Epidemiological surveillance and response
and public health preparedness
for the Athens 2004 Olympic Games**

Introduction

George Saroglou

The first Olympic Games of the modern era were held in Athens in 1896, and this most celebrated mass-gathering event was again organized in Athens in August 2004, followed by the Athens 2004 Paralympic Games in September 2004.

The Olympic Games is one of the largest international mass-gathering events in the world, thus also representing a major risk for communicable disease. Current reasons for this are:

- the potential for rapid dissemination of an imported or emerging infectious disease;
- significant pressure on civil infrastructure (such as hotels and food caterers), which can easily result in poor hygiene standards;
- difficulty in implementing public health control measures such as contact tracing, in case of an epidemic, due to the multitude of countries and visitors represented at the event;
- increased severity of air pollution and frequency of climate-related diseases;
- increased potential for trauma and injury incidents, which are also associated with alcohol consumption; and
- the potential deliberate use of biological and chemical agents or radionuclear material.

This last reason was added to this impressive list and made preparedness an even more difficult and complicated task for Greece's public health authorities. Intense and increased mass-media attention for all activities, including public health-related incidents during the Olympic Games, can also make the work of public health professionals very complicated. Response to the potential deliberate use of biological agents required the involvement of a new type of infectious diseases alert system and represented an international challenge for appropriate response with the use of an early warning system and epidemic intelligence.

To develop a successful public health response during the Athens 2004 Olympic Games, Greece's public health authorities decided not to develop a new infectious diseases surveillance system but to enhance the already functioning systems in place, emphasizing the notifiable disease reporting system, which underwent significant review and restructuring, sentinel systems, laboratory notification system and finally with the addition of an emergency room-based syndromic system. Information from risk monitoring, food inspections, air pollution data, weather data and heat indexes complemented the surveillance information system to present a full

picture of the potential public health threats to the decision-makers and to coordination centres.

Public health preparedness activities were intensified about two years before the Athens 2004 Olympic Games. The main policy was to lobby for funding for surveillance and response and to put forward as priority factors for the success of the Games all the public health issues to the Athens 2004 Olympic Games Organizing Committee. Public health preparedness relied heavily on a wide network of partners within the health system that shared the same objective. Partners needed to be sensitized, including clinicians, sport medicine specialists and emergency and intensive care specialists, through intensive training activity and exercises.

Greece's public health authorities also realized that preparedness should cover the whole country, as the whole territory could be affected, but special attention in all activities understandably was given to the designated Olympic athletic venues, with priority to Greater Athens.

In addition, sufficient attention was paid to classic public health issues such as foodborne diseases, legionellosis in tourist and hotel accommodations, recreational waters and cruise ships and other infections imported through travel.

When the deliberate use of biological agents is suspected, the health system must respond immediately. Covert incidents are identified based on the proper functioning of a national infectious diseases epidemiological system. Clinical syndromes caused by very virulent biological agents require differential diagnosis from common infections or other endemic diseases. In addition, such a properly prepared public health system would be able to handle the potential secondary spread of a naturally occurring contagious disease, although this could exhaust Greece's health resources. From the civilian perspective, preparedness plans for the potential deliberate use of

biological agents were regarded as the same as plans for a new emerging pathogen.

For the Athens 2004 Olympic Games, the Ministry of Health and Social Solidarity prepared a health care response plan called Philoctetes. The Hellenic Centre for Infectious Diseases Control was responsible for the surveillance of communicable diseases in Greece and intervention if necessary. The major response of the Hellenic Centre for Infectious Diseases Control to this challenge was to enhance the already functioning national infectious disease surveillance networks.

The Hellenic Centre for Infectious Diseases Control organized an epidemiological alert system including:

- the notifiable diseases reporting system;
- a laboratory network surveillance system for specific pathogens;
- a sentinel surveillance system for influenza and exanthematous diseases based on primary health care; and
- a rapid response system with 24-hour on-call epidemic response teams.

A new surveillance network was added for the Athens 2004 Olympic Games, syndromic surveillance, adapted from the Salt Lake City 2002 Winter Olympic Games system and capable of collecting data in real time based on emergency room data.

In addition, the Hellenic Centre for Infectious Diseases Control developed mobile health care units to respond to public health issues among mobile populations, immigrants and other refugees. During the Athens 2004 Olympic Games, the surveillance and response procedures were in place and well integrated, with smooth coordination with other functioning coordination and command centres.

This success was used to build further strength for surveillance and response in Greece, maintain the Health Coordination Command Centre under the

Ministry of Health and Social Solidarity as the focal point for the coordination of health issues and to maintain communication and coordination and to share data across all components of the public health sector in all of Greece's ministries.

General hospitals in the Olympic prefectures became the backbone of public health surveillance to assist in detecting and responding to potential communicable disease threats. The Hellenic Centre for Infectious Diseases Control strongly promoted, both through training and creating specific guidelines, the development of specific hospital preparedness plans covering all hazards, including a mass-casualty incident and the response to the potential deliberate use of biological and chemical agents or radionuclear material.

Hospital preparedness, which started for the Athens 2004 Olympic Games, benefits the health system in the response to any type of disaster, including the deliberate use of explosives, biological and chemical agents or radionuclear material, an earthquake or an influenza pandemic. The Hellenic Centre for Infectious Diseases Control recommended continuing the

updating of emergency preparedness plans and maintaining hospital planning committees beyond the Athens 2004 Olympic Games.

During the two years of the pre-Olympic period, the Hellenic Centre for Infectious Diseases Control embarked on a massive training programme for health care personnel in primary, secondary and tertiary care in public health issues as well as for all public health professionals. Maintaining training and awareness levels is a continuing effort needed in all of Greece. The threat of an influenza pandemic and the problem of avian influenza help to stimulate and maintain preparedness in hospitals as well as in the entire health system.

Standardizing hospital disaster planning and emergency preparedness is recommended by expanding the use of a standard template for all hospitals applying an all-hazards approach. Finally, continued cooperation and communication between agencies and ministries is necessary to implement and sustain emergency planning activities.

CHAPTER 3

Preparing epidemiological surveillance and response for communicable diseases

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Introduction

The summer Olympic Games are the largest multi-national athletic event in the world, characterized by spectators, athletes, team members, mass-media personnel and very important persons (VIPs) gathering in a limited geographical area over a short period of time. Organizing the Olympic Games applies considerable pressure to the infrastructure of the host country, extending beyond the organizational aspects relevant to public health.

Communicable diseases represented less than 1% of the total number of visits in health care settings both in the Atlanta 1996 and Sydney 2000 Olympic Games (1–3). Nevertheless, epidemiological surveillance and preparedness was enhanced for both these events, as it was for the Athens 2004 Olympic Games, since this event is characterized by conditions known to favour the occurrence and transmission of communicable diseases (4).

Further, the Olympic Games have a very high political, financial and symbolic profile, with excessive international mass-media attention and immediate publicity. In the context of the Athens 2004 Olympic Games, public health incidents related to communicable diseases might acquire unusual significance and have an unexpected impact.

The epidemiological surveillance and preparedness in response to public health emergencies during the

Athens 2004 Olympic Games was enhanced based on the experience of other countries that had hosted Olympic Games or other mass-gathering athletic events in the previous years and on the special characteristics of the Athens 2004 Olympic Games and of the health care and public health systems of Greece (1–3,5–8).

The main difference in the public health preparedness of the Athens 2004 Olympic Games from that of previous Olympic Games is that diseases potentially related to the deliberate use of biological or chemical agents were included in the spectrum of immediate priorities concerning surveillance and preparedness (Chapter 6).

The Hellenic Centre for Infectious Diseases Control was in charge of communicable disease surveillance and outbreak response and had an important role in public health crisis response during the Athens 2004 Olympic Games. The mandate of the Hellenic Centre for Infectious Diseases Control did not include non-communicable diseases of public health importance at that time, and such public health challenges as accidents or heat-related morbidity were therefore exempt.

The strategy focused on strengthening the capacity to identify communicable disease-related events of public health importance and ensure the respective management and overall response.

Preparation and initial planning

The Ministry of Health and Social Solidarity prepared a master health plan in 2002 (see Chapter 2), setting the main axes of activities for the Hellenic Centre for Infectious Diseases Control during the Athens 2004 Olympic Games. The plan outlined the following for public health:

- enhancing the epidemiological surveillance of communicable diseases;
- developing and enhancing laboratory-based capacity;
- managing unexpected public health events (epidemics and incidents potentially related to the deliberate use of biological and chemical agents or radionuclear material); and
- building and enhancing intersectoral collaboration with a broad spectrum of predefined partners.

The following priorities were set for preparedness and response, taking into account the incidence of these particular diseases in Greece and in participating countries, the probability of occurrence in the Athens 2004 Olympic Games, the potential for causing outbreaks, the incubation period (diseases with a short incubation period), the modes of transmission, the severity of the clinical picture and the necessity for investigating and/or implementing control measures even after an isolated case:

- 1) the diseases for which immediate notification is required, including cholera, plague, tularaemia, smallpox, anthrax, severe acute respiratory syndrome (SARS), botulism, melioidosis, viral haemorrhagic fevers, diphtheria and rabies;
- 2) meningitis and meningococcal disease;
- 3) legionellosis;
- 4) measles and pertussis; and

- 5) foodborne and waterborne diseases, particularly emphasizing clusters of gastroenteritis and brucellosis.

Training and awareness

Training constituted a major public health investment during the preparedness phase for the Athens 2004 Olympic Games for the purpose of building capacity for response. Training addressed mainly two target audiences: hospital-based health care professionals and prefectural public health professionals. Training also included an intersectoral collaboration component, with focused educational activities addressing professionals employed by other authorities, such as the Hellenic Police, Hellenic Coast Guard and Hellenic Fire Brigade.

Training the public health personnel working at the Hellenic Centre for Infectious Diseases Control was an absolute priority, as the human resources of the Centre expanded dramatically 18–24 months before the Games began, including mostly very motivated health professionals but inexperienced in public health and surveillance.

Training of health care and public health professionals

Training activities started intensively about 18 months before the Athens 2004 Olympic Games started. It was an extensive project of training and increasing the awareness of the health care professionals in 69

public and private general hospitals and health centres (Box 3.1) as well as of all public health professionals of the II Olympic prefectures.

In the hospitals, the training focused mainly on:

- raising awareness about and familiarizing health professionals with the role and the importance of epidemiological surveillance;
- familiarizing the personnel with the existing surveillance systems and with the enhanced surveillance scheme for the Olympic period;
- raising clinical suspicion and educating on clinical syndromes potentially related to the deliberate use of biological and chemical agents;
- managing communicable disease cases (including infection control measures and the use of personal protection equipment); and
- providing guidance for developing hospital disaster plans.

Specific target groups among the hospital staff were extensively trained as a means to educate, increase awareness, teach specific skills and establish optimal professional attitudes and behaviour among the different staff categories.

Interdisciplinary Hellenic Centre for Infectious Diseases Control teams visited all the participating hospitals of the enhanced epidemiological surveillance system of the Olympic prefectures two or three times. The purpose was to meet on site with designated groups of staff and to address each hospital's specific needs. Close and specific collaboration was established for a three-month continuous period with one of the major general hospitals in Greater Athens. This hospital participated in an intensive pilot preparedness-building procedure (see Chapter 13).

In the prefectural public health departments, the training focused on:

- managing cases of notifiable diseases;

- participating in outbreak investigation teams;
- managing cases of diseases potentially related to the deliberate use of biological and chemical agents or radionuclear material; and
- providing guidance on developing a public health crisis response plan for each prefecture.

The training included training meetings and seminars as well as on-site visits. Between January 2003 and June 2004, the Hellenic Centre for Infectious Diseases Control organized 32 training seminars. A similar approach was used for the visits at the II Olympic prefectures with the interdisciplinary Hellenic Centre for Infectious Diseases Control teams, covering contacts with prefectural public health departments, the Forensic Medical Services of the Olympic prefectures and the health services of the Athens International Airport and Thessaloniki International Airport.

The rationale behind this procedure was to introduce an individual and personalized approach to the already mentioned training axes and objectives. Further, the on-site visits were used to answer setting-specific questions.

The number of trainees exceeded 2000 key personnel in the hospital and public health community, extending from the administration to the clinicians, laboratory specialists and public health physicians, nurses and environmental health officers.

Training the Olympic Games volunteer health care professionals

Health professionals from the Hellenic Centre for Infectious Diseases Control participated in three training meetings for volunteer health care professionals for the Olympic Games. About 500 volunteers attended the training courses in three groups. The volunteers attending the courses were

Box 3.1**Health units participating in the enhanced surveillance system of the Athens 2004 Olympic Games****Prefecture of Attica**

1. Athinaiki Clinic
2. Iaso General Clinic
3. Amalia Fleming General Hospital
4. Alexandra General Hospital
5. Asklepieio Voulas General Hospital
6. G. Genimatas General Hospital
7. Ag. Varvara General Hospital
8. Hellenic Red Cross General Hospital
9. Thrasio General Hospital
10. Elpis General Hospital
11. Evangelismos General Hospital
12. Sotiria General Hospital
13. Ippokrateio General Hospital
14. KAT General Hospital
15. Laiko General Hospital
16. Ag. Olga General Hospital
17. Ag. Panteleimon General Hospital
18. A. Kyriakou Children's Hospital
19. Ag. Sofia Children's Hospital
20. Penteli Children's Hospital
21. Pammakaristos General Hospital
22. Tzaneio General Hospital
23. Sismanogleion General Hospital
24. Spiliopouleio General Hospital
25. Athens General Clinic
26. Evgenidio Therapeftirio
27. Evrokliniki
28. Evrokliniki Paidon
29. Athens General Clinic
30. Vari Health Centre
31. Koropi Health Centre
32. Lavrio Health Centre
33. Markopoulo Health Centre
34. Nea Makri Health Centre
35. Spata Health Centre
36. Athens Navy Hospital
37. A. Sygros Dermatological Hospital
38. E. Dunant General Hospital
39. Kyanous Stavros Hospital
40. Lefkos Stavros Hospital

41. Metropolitan Hospital
42. Ygeia Hospital
43. Iatriko Kentro group
44. Attikon University Hospital
45. Polykliniki Athinon
46. 1st IKA Hospital of Athens
47. 3rd IKA Hospital of Athens
48. 7th IKA Hospital of Athens
49. 401 Military General Hospital
50. 414 Infectious Disease Military Hospital
51. 417 NIMITS Military General Hospital

Prefecture of Achaia

52. Ag. Andreas General Hospital of Patras
53. University Hospital of Patras

Prefecture of Elia/Ilia

54. A. Papandreou General Hospital of Pyrgos
55. Krestena Health Centre

Prefecture of Heraklio

56. Venizeleio & Pananeio General Hospital
57. University Hospital of Crete

Prefecture of Thessaloniki

58. Ag. Dimitrios General Hospital
59. Ag. Pavlos General Hospital
60. AHEPA General Hospital
61. G. Genimatas General Hospital
62. Ippokrateio General Hospital
63. Papageorgiou General Hospital
64. Papanikolaou General Hospital
65. Iatriko Diavalkaniko of Thessaloniki
66. Ag. Loucas Clinic of Thessaloniki
67. Infectious Disease Hospital of Thessaloniki
68. 2nd IKA Hospital of Thessaloniki

Prefecture of Magnesia

69. Achilopouleio General Hospital of Volos

physicians and nurses who were already selected to provide their services to the 223 health care stations at the various Olympic venues. Further, attendees included the physicians and nurses seconded to the Athens 2004 Olympic and Paralympic Games by the three branches of the Armed Forces Medical Corps, which were also deployed during the Olympic Games at various health care stations.

The objectives of training volunteer health care personnel were:

- familiarizing them with the role of public health and surveillance for the Athens 2004 Olympic Games, emphasizing the Olympic surveillance system recording specific syndromes (see section below); and
- increasing their clinical awareness and suspicion for the priority diseases, including those potentially related to the potential deliberate use of biological and chemical agents or radionuclear material.

Further, this training emphasized the need to raise awareness and clinical suspicion of selected rare and severe diseases and focused on reporting clusters and unusual patterns of common diseases. The training of this specific target group was quite limited because of time and availability restrictions imposed by the Athens 2004 Olympic Games Organizing Committee as well as lack of familiarity with communicable disease surveillance and management issues.

Training of Hellenic Centre for Infectious Diseases Control staff

Most of the training for the health professionals of the Hellenic Centre for Infectious Diseases Control followed the learning-by-doing principle, with continuous task-based training during the 18-month intensive Olympic preparation period supported by

participating in scientific seminars and meetings. The main objective of this training was to increase the epidemic response capacity, emphasizing investigating outbreaks and managing incidents potentially related to the deliberate use of biological and chemical agents or radionuclear material.

An intensive one-week seminar was organized twice for the Centre's health professionals in collaboration with the European Programme for Intervention Epidemiology Training, focusing exclusively on the principles of investigating outbreaks, preceded by a short (three-day) module, using practical examples from the previous investigation experience of the Hellenic Centre for Infectious Diseases Control.

Another training seminar (two hours per week) on epidemiology and biostatistics was held between February and June 2004 in collaboration with the Department of Hygiene and Epidemiology of the Athens Medical School. Finally, in June 2004 a one-week training seminar was organized on Olympic syndromic surveillance in hospital emergency departments.

Medical associations and physicians working in the private sector

The privately practising physicians of the Olympic prefectures were also contacted via their respective professional associations with regard to the enhanced surveillance and response system. The aim was to raise their awareness on the specific preparedness for surveillance and response for the Athens 2004 Olympic Games and, further, to motivate their potential contribution in case of a major event.

The privately practising physicians in Greater Athens were contacted by mail through their association, and individual letters were addressed to all general practitioners, paediatricians and internists practising in

the other five Olympic cities, with the collaboration and contribution of their association. The communication emphasized the need to raise awareness and clinical suspicion of selected rare and severe diseases, focusing on reporting clusters and unusual patterns of common diseases.

Special care was attributed to the individual communication with defined groups of privately practising physicians such as the SOS physicians in Athens making home visits and the hotel physicians collaborating with the 161 hotels contracted by the Athens 2004 Olympic Games Organizing Committee.

Enhancing collaboration with the health care and public health sectors

During the pre-Olympic period, the Hellenic Centre for Infectious Diseases Control forged collaboration and enhanced its communication with the health care sector and with the regional and prefectural public health services to prepare their possible response to any public health crisis during the Athens 2004 Olympic Games.

Health care sector

Following the guidelines of the Hellenic Centre for Infectious Diseases Control, the 69 hospitals in the 11 Olympic prefectures participating in the enhanced epidemiological surveillance system proceeded with appointing at least one surveillance coordinator for each hospital. Depending on the hospital size and structure, additional coordinators were nominated in selected clinical departments such as infectious diseases or laboratories.

The selection and appointment of the coordinators relied on each hospital's arrangements and their assessment of needs based on the functioning of the enhanced epidemiological surveillance system.

The coordinators were expected:

- to coordinate the completion, collection and forwarding of the reports of the cases of notifiable diseases to the Hellenic Centre for Infectious Diseases Control;
- to inform immediately the Hellenic Centre for Infectious Diseases Control about cases of diseases requiring immediate notification;
- to actively participate in the planning and preparation for response in case of deliberate use of biological and chemical agents or radionuclear material; and
- to participate in training health professionals in collaboration with the Hellenic Centre for Infectious Diseases Control.

The role of the coordinators and the functioning of the enhanced epidemiological surveillance scheme, with daily and zero reporting, was tested during the August 2003 Olympic test events, in a pilot study with the participation of a number of hospitals in Greater Athens that were designated to cover the health care needs of the events.

Public health sector

Preparations for the Athens 2004 Olympic Games revealed the need to structure and enhance the links of collaboration, communication and information sharing within public health. As described in Chapter 1, Greece's public health system involves many bodies and agencies with often overlapping jurisdictions. Preparedness for this mass-gathering event was viewed as an excellent opportunity to shape these links, where absent, using a pragmatic problem-based approach.

The human resources as well as the technical equipment deficits in the infrastructure of the II Olympic prefectural departments of public health were recorded and reported, with relevant and realistic suggestions, to the administrative and political authorities.

Close collaboration with defined contact people from the Hellenic Centre for Infectious Diseases Control staff was established with the II Olympic prefectural departments of public health, focusing on their personnel participating in the outbreak investigation teams and in managing isolated cases of notifiable diseases.

The Hellenic Vessel Sanitation Programme comprised collaboration between the Hellenic Centre for Infectious Diseases Control (responsible for epidemiological surveillance) and the Ministry of Mercantile Marine, Ministry of Rural Development and Food, Public Health Department of Piraeus Port Authority S.A. and National School of Public Health, all responsible for different aspects of the environmental control.

Enhanced collaboration was established with the Hellenic Food Authority, leading to the systematic exchange of information. Daily person-to-person communication and sharing of information led to establishing coordinated, evidence-based action

planning and to implementing efficient control measures.

To formalize these relationships, a memorandum of understanding was signed between the II Olympic prefectural departments of public health, the Hellenic Food Authority and the Hellenic Centre for Infectious Diseases Control, referring to the terms of enhanced collaboration during the Olympic period.

Health Services Department of the Athens 2004 Olympic Games Organizing Committee

Collaboration with the Health Services Department of the Athens 2004 Olympic Games Organizing Committee was initiated in 2002. The primary concern of the Hellenic Centre for Infectious Diseases Control was integrating the public health dimension of communicable diseases epidemiological surveillance and response in the framework and daily operations of the Health Services Department of the Athens 2004 Olympic Games Organizing Committee, which was charged with health care in the Athens 2004 Olympic Games.

Specifically, this defined how the Health Services Department of the Athens 2004 Olympic Games Organizing Committee would contribute to the information flow as epidemiological data collection for the Olympic syndromic and notifiable diseases systems. The terms of collaboration in case of an outbreak or other unexpected public health event were established, and the infection control and communicable disease management capacity of the Health Services Department was designed and enhanced, emphasizing the Olympic Village Polyclinic, the main inside-the-fence health services provider.

The II syndromes of interest within the Olympic syndromic surveillance system were integrated in the

information requested on the Athens 2004 Olympic Games medical encounter forms in a user-friendly concept to facilitate syndrome reporting. Notification forms for notifiable diseases were distributed to the dispensaries and the Olympic Village Polyclinic.

Two health professionals from the Hellenic Centre for Infectious Diseases Control were present at the Coordination Centre of the Health Services Department, able to review the incoming individual medical encounter forms created when any person in a venue requested health care services, to ensure accurate epidemiological surveillance data collection and initial validation. Data entry was conducted on site as was initial verification of cases for defined diseases and syndromes, according to the formulated standard operating procedures.

One infectious diseases specialist from the Hellenic Centre for Infectious Diseases Control was present per shift (total two per day) at the Olympic Village Polyclinic to provide assistance and guidance upon request on clinically managing infectious disease cases, taking into consideration the considerable public health dimension of the setting. Further, the same infectious disease specialists enhanced the effectiveness of epidemiological surveillance by participating at the initial verification procedure and assisted in public health response by increasing the clinical awareness and clinical suspicion of the health care providers in the Olympic Village Polyclinic.

Developing good working relations and credibility proved to be crucial for building collaboration with the Health Services Department of the Athens 2004

Olympic Games Organizing Committee, in an environment in which the concept of communicable disease surveillance and control and of other public health issues seemed to be less important than other issues related to organizing the Games.

The impact of the surveillance-based public health measures on controlling communicable diseases and on the overall health security of the games had to be assessed and identified. Unlike the environmental control procedures, the principle of an effective and efficient response based on the surveillance information was less known and familiar. Further, the logistics required for implementing the enhanced surveillance inside the fence had to be introduced and the officials and volunteers had to accept it.

Training played an important role in developing the level of collaboration that eventually was achieved. This collaboration was further reinforced during the August 2003 test events, when all partners faced real problems and unexpected public health events, such as a gastroenteritis outbreak that affected the participation of Germany's delegation, necessitating concerted action for a public health response and inter-sectoral collaboration.

Finally, the international public health experience from similar mass-gathering events contributed constructively to defining the terms of collaboration with the Health Services Department of the Athens 2004 Olympic Games Organizing Committee, and these were included in a memorandum of understanding signed with the Hellenic Centre for Infectious Diseases Control.

Enhancing hospital infection control preparedness

Infection control procedures, guidance and protocols are a tradition in Greece's hospitals and have been a responsibility of each hospital's relevant infection control committee. The hospitals' infection control preparedness was a priority during the Olympic and pre-Olympic periods. Valuable experience and skills acquired during the SARS epidemic in spring 2003 were integrated in the enhanced hospital preparedness planning for the Athens 2004 Olympic Games.

The fields of major interest and investment were:

- the design and operation of emergency and crisis management plans (disaster plans) at the hospital level;
- the establishment of triage procedures focusing on communicable diseases;
- the establishment of standard operating procedures for managing patients and implementing isolation precautions at all levels of the hospital;
- the availability and indicated use of personal protective equipment;
- the establishment of isolation rooms and/or negative pressure rooms, as integrated in the overall planning for negative pressure chambers in Athens and the other Olympic cities;
- the functioning of the emergency departments, including their structural reorganization in many hospitals;
- the review and update of standard infection control procedures;
- the provision of decontamination facilities adapted to each hospital's capacity and geography and integrated in the overall planning for decontamination facilities' availability, in the framework of the health sector's participation in the Olympic security plan; and
- the planning and organization of a designated quarantine hospital in Athens.

The Hellenic Centre for Infectious Diseases Control provided scientific support and specific guidelines in these fields. More specifically, prototype emergency and crisis management plans were formulated and extensive training took place at various levels for the hospital staff to induce their development. The Olympic hospitals' plans were critically reviewed, upon request, and timely feedback was provided, along with standard operating procedures for the operation of emergency departments, which was formulated with emphasis on triage in the context of the overall management of communicable disease cases. Special attention and care were attributed to managing cases potentially related to the deliberate use of biological and chemical agents or radioactive material, including the need for decontamination.

Basic guidelines were issued for the building and functioning of the hospital decontamination facilities, isolation rooms and negative pressure chambers. Guidelines were also issued for the indicated use of personal protective equipment as well as relevant standards and quality requirements.

The existing and planned, hospital-based isolation facilities and negative pressure chambers were mapped at a national level. The data were collected through a semistructured questionnaire sent to the infection control committee in all hospitals in Greece.

The availability of hospital-based personal protective equipment was also recorded at a national level by

using the same questionnaire. Information on both topics was used for planning, in collaboration with the Ministry of Health and Social Solidarity, and appropriate feedback was given to the local hospital administrators.

Two 24-hour prevalence studies for nosocomial infections were implemented in Athens hospitals in 2002. The results were used as a preliminary indicator for the burden of the problem at the individual hospital level.

The hospital infection control committees were considered as important partners and stakeholders during the pre-Olympic period. The physicians and infection control nurses and members of the infection control committees in each hospital closely and actively collaborated with the Hellenic Centre for Infectious Diseases Control to review, update and implement various types of standard operating procedures and introduce novel aspects in the hospitals' structure and functioning. Emphasis was given to the

concept that every hospital in the Olympic cities should meet minimum requirements regarding infection control, including triage, decontamination and isolation capacity, patient management and use of personal protective equipment.

A horizontal approach for integrating infection control procedures in the overall response preparedness was prominent in the rationale and strategy. Further, the infection control and response capacity was underlined as being the expected partner or outcome of enhanced epidemiological surveillance and increased clinical awareness and suspicion. This concept proved to have a mutually supportive effect on both enhanced surveillance and infection control procedures and to have globally contributed to the hospitals' increased preparedness.

Collaboration was also enhanced with the hospital technical services and administrations. The spirit of intersectoral collaboration and teamwork was broadly promoted at all levels.

Enhancing laboratory capacity

Twenty-five pathogens of Olympic public health interest were chosen and designated within the framework of public health priorities. The national laboratory capacity for these pathogens, referring to capacity for laboratory confirmation, was registered in a survey using a semistructured questionnaire addressed to laboratories in all hospitals and reference institutions throughout Greece. One hundred and forty-eight questionnaires were mailed, with a response rate of 66%.

Sixteen reference and satellite laboratories were designated for diagnosing the 25 designated pathogens. The specialized laboratories were recognized as

possessing the required scientific background, experience and infrastructure to definitely identify and/or type the designated pathogens and effectively link with reference laboratories abroad, if necessary. The satellite laboratory system shared the same characteristics as the specialized laboratories, in the framework of a national geographical distribution, with the potential to increase national testing capacity in a large outbreak.

Mapping the national laboratory capacity enabled the Hellenic Centre for Infectious Diseases Control to efficiently plan the geographical distribution and the disease-specific mandate of the specialized and

satellite laboratories, following the identification of existing gaps in laboratory capacity and coverage after data analysis.

Finally, uniform guidance and protocols were formulat-

ed for collecting, transporting and laboratory processing clinical samples of the 25 pathogens of Olympic public health interest and were included in one of the manuals published before the Athens 2004 Olympic Games (see the section on publications).

Structuring and enhancing the capacity for epidemic response and intervention

The concept of increased sensitivity in implementing public health surveillance was complemented by increased sensitivity in the response planning. Further, known deficits in the response and intervention capacity were faced and managed to meet the challenges of the Athens 2004 Olympic Games. Isolated case management and outbreak investigation protocols were developed for diseases related to 30 microorganisms.

Standard operating procedures were also formulated for verifying and managing outbreaks, statistical signals and isolated cases of certain diseases. Four outbreak investigation teams were set up by using all Hellenic Centre for Infectious Diseases Control staff for response and intervention in case of an epidemic or other public health event, such as the potential deliberate use of a biological agent.

Procedures were also formulated for the participation of the Hellenic Centre for Infectious Diseases Control in managing events potentially related to the deliberate use of biological and chemical agents or radionuclear material within the framework of the security plan for the Athens 2004 Olympic Games and the Health Coordination Command Centre.

The Coordination Centre of the Hellenic Centre for Infectious Diseases Control was established with

appropriate equipment and relevant operating procedures. The Coordination Centre operated 24 hours per day and was horizontally linked to all Hellenic Centre for Infectious Diseases Control departments and offices. Its role was to support the in-house coordination of actions and to provide a functional link with the Health Coordination Command Centre and other partners. Contact details were recorded for key people in the hospitals, prefectural departments of public health, laboratories, forensic medical services, health authorities at ports of entry and, generally, for all the partners involved in the health and public health sector.

The Coordination Centre functioned on three shifts with two physicians and one administrative staff member in the morning and evening shifts and one physician on the night shift. Administrative support was on-call at night and could be called in if necessary. A coordinator from the pool of senior staff of the Hellenic Centre for Infectious Diseases Control was on 24-hour shift calls and had responsibility for initial crisis management. The overall operating procedures of the Hellenic Centre for Infectious Diseases Control would run for the two-month Olympic period of enhanced surveillance and response. This period was preceded by a two-week testing interval that ran according to the same principles. Surge capacity was also defined for both human

resources and logistical support. A pool of volunteers (health care professionals and students) had been formed and been preliminarily trained. Surge capacity was planned and foreseen in predefined sites with the potential to provide volunteers in case of an emergency.

Fact sheets for the public and mass media on specific diseases (either common and usual, or rare and

severe) that could potentially cause an unexpected event and/or attract mass-media attention during the Olympic period were produced (in both Greek and English versions) in a pre-agreed format.

The strategy focused on ensuring the appropriate response and intervention capacity, while preserving the continuity of the epidemiological surveillance activities in case of a public health emergency.

Publications and educational material

The publications issued in the context of the Athens 2004 Olympic Games preparedness complemented the training as a major investment of the preparation period. The manuals and guides issued were meant to address different needs in two main target populations: health and public health professionals and visitors to Greece, including members of foreign delegations:

- *A pocket guide: handbook on the clinical management of communicable diseases and deliberately released agents (9)* (in Greek and English);
- a hospital guide for the management of biological and chemical agents or radionuclear material (two volumes in Greek only); and
- a guide on the collection, transport and laboratory diagnosis of clinical samples for the

25 pathogens of Olympic public health interest.

Copies of this material were mailed and distributed to all hospitals in Greece, prefectural public health departments, laboratories, forensic medical services and all other partners of the health sector.

A health information guide for visitors to Greece (in English) was distributed to national missions, embassies and mass-media professionals. A short version of the guide (information leaflet) was distributed to visitors and spectators at numerous pre-defined sites of the Olympic cities.

A health information guide (in English) was distributed to passengers in cruise ships docked at Piraeus.

Intersectoral collaboration

Establishing and enhancing intersectoral collaboration with agencies and services outside the health care and public health sectors had been identified as a

necessity and was prominent as a major field of investment for the Hellenic Centre for Infectious Diseases Control during the two years before the

Olympics. Collaboration was established with various partners including law enforcement agencies (Ministry of Public Order), the Hellenic Coast Guard, the Armed Forces, the Forensic Medical Services (Ministry of Justice), the Civil Aviation Authority and the Ministry of Mercantile Marine. To build crisis management and response capacity, collaboration was developed with multiple agencies including the General Secretariat for Civil Protection, General Chemical State Laboratory, Hellenic Police, Hellenic Fire Brigade, Hellenic Coast Guard and Hellenic Army.

Further, the Hellenic Centre for Infectious Diseases Control was actively involved in designing the Olympic security plan on managing the potential deliberate use of biological and chemical agents or radionuclear material under the coordination of the Ministry of Public Order. The Hellenic Centre for Infectious Diseases Control had a defined role in

implementing this plan during the management of an event.

Mutual respect, consistent participation in the meetings and common activities and the involvement in the plan with clearly defined roles and mandates were the basis for developing a positive cooperation platform. In the framework of security preparedness, the Hellenic Centre for Infectious Diseases Control participated in designing, implementing and evaluating five exercises held between October 2003 and May 2004 focusing on the overall response coordination and communication after an incident with various public health impacts (see Chapter 6). The valuable experience acquired during the exercises was ultimately integrated in the operating procedures of the Coordination Centre and the overall operation of the Hellenic Centre for Infectious Diseases Control during the Olympic period.

International collaboration

The Hellenic Centre for Infectious Diseases Control promoted international collaboration specific to the Olympic Games with selected partners including international organizations, European public health institutions, EU programmes and highly specialized public health laboratories. The objectives varied largely and included enhancing epidemiological intelligence, tailoring assistance in building preparedness and expanding the laboratory capacity available. Collaboration was developed with WHO (WHO headquarters, the WHO Office for National Epidemic Preparedness and Response and the WHO Regional Office for Europe), the European Commission (Directorate-General for Health and Consumer Protection, Health Threats Unit), the United Kingdom Health Protection Agency, the

Robert Koch Institute and the European Programme for Intervention Epidemiology Training.

The Hellenic Centre for Infectious Diseases Control organized a workshop in May 2004 with the participation of international experts directly involved with public health surveillance and response during previously organized mass-gathering athletic events (the Atlanta 1996 Olympic Games, 1998 FIFA World Cup (France), the Sydney 2000 Olympic Games, the Salt Lake City 2002 Winter Olympic Games and the 2000 UEFA European Football Championship (Belgium and the Netherlands)). Participants also included experts from countries known to host similar events in the following two years, such as Italy (Torino 2006 Winter Olympic Games, 2006 FIFA

World Cup (Germany) and the 2004 UEFA European Football Championship (Portugal)).

Although organized late in the preparation period, the workshop had a considerable positive impact

on the finalization of decisions, on the credibility of choices and the acceleration of procedures while creating an international pool of resources and establishing a direct person-to-person collaboration.

Discussion

Preparations for public health surveillance and response for the Athens 2004 Olympic Games posed two serious challenges: the one the Games themselves presented and the post-Games era of integrating and capitalizing the Olympic experience in a medium- and long-term investment.

A two-principle strategy was adopted to meet the challenge of the Athens 2004 Olympic Games: increasing the sensitivity of both surveillance and response and enhancing the existing surveillance systems and creating new ones only where gaps were identified. Accordingly, surveillance in general had to be reorganized, new and enhanced collaborations with “natural” partners had to be established and new standard operating procedures had to be formulated.

The Athens 2004 Olympic Games provided the opportunity to address and meet longstanding needs and deficits that had already been identified in public health and communicable disease surveillance and response. Further, organizing this huge event enabled financial and human resources to be mobilized to effectively respond to agreed priorities while designing their integration in a long-term perspective.

As Part 3 clearly states, organizing the Athens 2004 Olympic Games was seen as an opportunity that could substantially and rapidly improve the public health system in Greece in the long term. However,

the sustainability of such investments and changes depends on such factors as the existence of a comprehensive public health strategy in a resourceful and stable public health environment.

Balancing increased sensitivity and efficiency also generated concern and interest with regard to both common and rare or severe diseases. The Athens 2004 Olympic Games were the first after the Salt Lake City 2002 Winter Olympic Games to explicitly incorporate the rare and severe diseases potentially related to deliberate use of biological and chemical agents or radionuclear material in their surveillance and response design. There was a clear conviction that the classical principles of good epidemiological public health practice were of utmost importance in this highly sensitive environment. Setting clearly defined action-oriented surveillance objectives, complemented by the relevant response design, can shift the balance, if not towards higher efficiency, at least towards a rational use of resources with a pre-defined outcome.

As stated previously, the mobilization of Greece's public health authorities for the SARS epidemic in spring 2003 raised considerably the preparedness level in both the health care and public health sector. Similarly, the Athens 2004 Olympic Games have contributed to preparedness and to developing relevant plans for managing an influenza pandemic.

Finally, integrating the public health perspective in the functioning and conception of the Health Services Department of the Athens 2004 Olympic Games Organizing Committee (inside the fence) represented an important concern. The public health surveillance and response dimension should have been conceived as an integral component of the overall security of the Athens 2004 Olympic Games and integrated in the planning at an early stage, enabling

the smooth development of the necessary collaboration with the local public health services and the establishment of specific preparedness. Building a sound partnership between the Athens 2004 Olympic Games Organizing Committee and the public health services was very important and required mutual acceptance and adequate time for common planning and training to jointly serve the public health security objective of the Olympic Games.

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CHAPTER 4

Experience of epidemiological surveillance and response for communicable diseases

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Introduction

Mass gatherings such as the Olympic Games represent a major challenge for surveillance and response systems, which have the task of recognizing promptly and intervening effectively in cases of outbreak or increased disease incidence in a complex setting with unusual numbers of people assembled in the same place and time.

The goals of surveillance and response during the Athens 2004 Olympic Games were:

- recognizing and responding to outbreaks in a timely manner;
- recognizing and responding in a timely manner to events potentially caused by the deliberate use of biological and chemical agents or radionuclear material;
- recognizing in a timely manner single cases of infectious diseases that require public health measures to prevent further spread; and
- evaluating primary prevention measures taken before and during the Athens 2004 Olympic Games, as described in detail in Chapter 3.

Surveillance and response in the Athens 2004 Olympic Games were organized building on the existing experience of previous Olympic Games (1–4). In contrast to other countries that recently hosted Olympic Games such as the United States of America and Australia, in Greece the pre-existing surveillance system could not serve as the basis of appropriate surveillance during the Athens 2004 Olympic Games because the notifiable disease list was outdated, reporting was on a monthly basis, many physicians disrespected surveillance, participation was low and other reasons. The major task of reorganizing the national surveillance system therefore had to be undertaken in parallel with the special preparation necessary for setting up surveillance for the Athens 2004 Olympic Games.

This chapter briefly describes the communicable disease surveillance and response system of the Athens 2004 Olympic Games and presents major findings and discusses the lessons learned from surveillance during August 2004 when the full-blown enhanced surveillance system was in operation in five prefectures of Greece (the Paralympic Games in September were held only in Greater Athens).

Communicable disease surveillance during the Athens 2004 Olympic Games

Main elements of enhanced surveillance

During the Athens 2004 Olympic Games, enhanced surveillance and response were implemented in the Olympic prefectures (Attica, Thessaloniki, Achaia, Heraklio and Magnesia), representing 51% of Greece's population. This consisted of:

- operating multiple surveillance systems (Table 4.1);
- reporting daily from selected Olympic hospitals and other health units (Box 3.1);
- requiring zero reporting from surveillance sources;

- supervising surveillance activities in Olympic hospitals and health units by a dedicated staff;
- reporting directly to the Hellenic Centre for Infectious Diseases Control during the Olympic period (1 August to 30 September 2004);
- analysing and reviewing daily surveillance data and preparing a daily surveillance report; and
- ensuring increased capacity for deploying outbreak investigation teams.

The following surveillance systems were enhanced during the Olympic Games:

- a mandatory notification system;
- a laboratory reporting system; and

Table 4.1

Participation of health units or physicians in enhanced surveillance systems in all Olympic prefectures, 1–31 August 2004

Surveillance system	Mean number of units reporting daily	Total number of units in enhanced surveillance	% ^a
Mandatory notification	54.5	69	79.0% ^b
Laboratory notification: stool cultures	29.5	69	NA ^c
Laboratory notification: serology	8.1	15	NA ^c
Primary care sentinel physicians	36.5	49	74.5%
Syndromic surveillance: hospital emergency departments	10–17 ^d	31	100%
Syndromic surveillance: Olympic venues	30–120 ^d	220	100%
Syndromic surveillance: cruise ships	8–10 ^e	10	100%

^a The mean number of units reporting daily as a percentage of the total number of units.

^b 88.5% on weekdays and 61.8% on weekends.

^c NA: not applicable (no zero reporting required).

^d Number of health units (hospitals or health centres) on duty every day.

^e Number of cruise ships serving Olympic Games needs.

- a primary care sentinel physician system.

In addition, the following systems were designed and implemented during the Olympic period:

- syndromic surveillance in hospital emergency departments;
- syndromic surveillance in Olympic clinics; and
- syndromic surveillance in cruise ships.

Surveillance systems

Daily reporting was organized within the framework of the mandatory notification (Table 4.2) and the laboratory surveillance systems (Tables 4.3 and 4.4); for the mandatory notification system, EU case definitions were used with minor modifications (5). Sixty-nine health units (hospitals and primary health care centres) participated, 51 of which were situated in Attica and 16 in the other Olympic prefectures (Box 3.1).

A primary care sentinel physician system was implemented during the Olympic period with the participation of 49 primary care physicians in Greater Athens. These physicians were daily contacted by

phone, reporting cases of selected diseases and syndromes seen on the previous day (Table 4.5) as well as total number of patients seen.

An ad hoc syndromic surveillance system was implemented before and during the Olympics to focus particularly on diseases that can be caused by the deliberate use of biological and chemical agents or radionuclear material (6). Data were collected from emergency departments of Olympic hospitals and health centres in Olympic prefectures (Table 4.6). The scientific team that ran syndromic surveillance during the Olympic Games was different from the team responsible for response and the other aspects of surveillance. Chapter 5 describes how this system functioned and the main results in more detail.

The Hellenic Centre for Infectious Diseases Control was notified daily for visits to clinics in Olympic venues (residence areas, stadiums and event sites) for specified clinical syndromes (Table 4.7). During the Olympic Games, 220 venue clinics were in operation, but 30–120 of them were functioning every day according to the schedule of events. Similar reports were sent daily from the 10 cruise ships in Piraeus serving as floating hotels for Olympic guests (Table 4.8).

Table 4.2

Cases of disease reported in Olympic prefectures through the enhanced system of mandatory notification, 1–31 August 2004

Disease	Attica	Thessaloniki	Achaia	Heraklio	Magnesia	Total	%
Haemorrhagic fever	1	0	0	0	0	1	0.2
Botulism	0	0	0	0	0	0	0
Varicella with complications	3	0	0	0	0	3	0.7
Anthrax	0	0	0	0	0	0	0
Brucellosis	4	0	0	0	0	4	0.9
Influenza (laboratory confirmed)	0	0	0	0	0	0	0
Diphtheria	0	0	0	0	0	0	0
Malaria	3	0	1	0	0	4	0.9

Table 4.2 (cont.)

Disease	Attica	Thessaloniki	Achaia	Heraklio	Magnesia	Total	%
Rubella	0	0	0	0	0	0	0
Smallpox	0	0	0	0	0	0	0
Echinococcosis	1	2	2	0	0	5	1.1
Hepatitis A	4	0	0	0	0	4	0.9
Hepatitis B	12	7	0	0	1	20	4.5
Hepatitis C	9	0	1	1	0	11	0.4
Measles	0	0	0	0	0	0	0
Pertussis	5	0	0	1	0	6	1.3
Legionellosis	7	0	0	0	0	7	1.6
Leishmaniasis	3	0	1	1	0	5	1.1
Leptospirosis	0	3	1	0	0	4	0.9
Arboviral infections	0	0	0	0	0	0	0
Enterohaemorrhagic <i>Escherichia coli</i> infection	0	0	0	0	0	0	0
Rage disorder	0	0	0	0	0	0	0
Melioidosis/glanders	0	0	0	0	0	0	0
Meningitis, aseptic	6	7	3	3	0	19	4.3
Meningitis, bacterial ^a	8	5	1	0	1	15	3.4
Meningococcal disease	1	1	0	0	0	2	0.4
Meningitis, unknown	0	1	0	0	0	1	0.2
Plague	0	0	0	0	0	0	0
Mumps	1	0	0	0	0	1	0.2
Q fever	1	0	0	0	0	1	0.2
SARS	0	0	0	0	0	0	0
Salmonellosis	163	47	1	4	22	237	53.5
Shigellosis	12	0	0	0	1	13	2.9
Tularaemia	0	0	0	0	0	0	0
Trichinosis	0	0	0	0	0	0	0
Typhoid or paratyphoid fever	2	1	0	0	0	3	0.7
Tuberculosis	50	20	6	1	0	77	17.4
Cholera	0	0	0	0	0	0	0
Total	296	94	17	11	25	443	100.1

^a Meningococcal meningitis not included.

Table 4.3

Reports of positive stool culture findings (laboratory reports) in enhanced surveillance in Olympic prefectures, 1–31 August 2004

Pathogen	Attica	Thessaloniki	Achaia	Heraklio	Magnesia	Total	%
Bacteria							
<i>Campylobacter</i> spp.	53	13	0	12	0	78	19.3
<i>Clostridium difficile</i>	11	0	0	1	0	12	3.0
<i>Escherichia coli</i> (enterohaemorrhagic and enterotoxigenic)	0	0	0	0	0	0	0
<i>Giardia lamblia</i>	15	2	0	0	0	17	4.2
<i>Salmonella</i> spp.	177	52	0	19	22	270	66.8
<i>Shigella</i> spp.	13	0	0	0	1	14	3.4
Parasites							
<i>Cryptosporidium parvum</i>	1	2	0	0	0	3	0.7
<i>Entamoeba histolytica</i>	4	3	0	0	0	7	1.7
<i>Taenia</i> spp.	1	0	0	0	0	1	0.2
<i>Yersinia</i> spp.	2	0	0	0	0	12	0.5
Total	277	74	0	32	23	404	100.0

Table 4.4

Reports of positive serology tests (laboratory reports) in enhanced surveillance in Olympic prefectures, 1–31 August 2004

Pathogen	Attica	Thessaloniki	Achaia	Heraklio	Magnesia	Total	%
Viruses							
Adenovirus	3	3	0	0	0	6	6.4
Coxsackie virus	2	2	0	0	0	4	4.3
Echo virus	4	0	0	0	0	4	4.3
Influenza virus	0	0	0	0	0	0	0
Parainfluenza virus	1	0	0	0	0	1	1.1
Norovirus	0	0	0	0	0	0	0
Rotavirus	1	1	0	0	0	2	2.1
Respiratory syncytial virus	0	0	0	0	0	0	0
Bacteria							
<i>Haemophilus influenzae</i>	0	0	0	0	0	0	0
<i>Mycoplasma pneumoniae</i>	18	0	0	0	0	18	19.1
<i>Streptococcus pneumoniae</i>	0	0	0	0	0	0	0
Other <i>Streptococcus</i> spp.	59	0	0	0	0	59	62.8
Total	88	6	0	0	0	94	100

Table 4.5

Reports for diseases and syndromes by the sentinel physician system in enhanced surveillance in Attica, 1–31 August 2004

Disease or syndrome	n	%
Respiratory infections	215	6.7
Influenza-like illness	15	0.5
Gastroenteritis	120	3.7
Chickenpox	6	0.2
Pertussis	0	0
Measles	0	0
Rubella	0	0
Mumps	0	0
Total cases of diseases or syndromes reported	356	11.0
Total visits (all causes)	3230	100

Table 4.6

Syndromes recorded by the emergency departments of hospitals and health centre through the syndromic surveillance system in the Olympic prefectures, 1–31 August 2004

Syndrome	Attica	Thessaloniki	Achaia	Heraklio	Magnesia	Total ^a	%
Respiratory infection	3 663	883	231	387	387	5 551	4.2
Diarrhoea with blood	86	18	22	5	8	139	0.1
Gastroenteritis	3 077	612	248	303	258	4 498	3.4
Fever with rash	461	59	45	35	32	632	0.5
Meningitis ^b	91	12	5	6	10	124	0.1
Hepatitis A ^c	44	22	0	2	0	68	0.1
Syndrome compatible with botulism	17	6	0	0	4	27	0
Lymphadenitis and fever	35	10	3	4	4	56	0
Septic or unexplained shock	24	0	0	1	1	26	0
Unexplained death	96	7	0	0	2	105	0.1
Total cases of syndromes reported	7 594	1 629	554	743	706	11 226	8.6
Total visits (all causes)	91 765	19 552	4 512	8 892	6 333	131 054	100

^a Cases reported from an unknown district are also included.

^b Syndrome compatible with meningitis, encephalitis or unexplained acute encephalopathy or delirium.

^c Syndrome compatible with acute hepatitis.

Table 4.7

Syndromes recorded from Olympic venues through the syndromic surveillance system in Olympic prefectures, 1–31 August 2004

Syndrome	Attica	Thessaloniki	Achaia	Heraklio	Magnesia	Total ^a	%
Respiratory infection	38	0	0	0	0	56	0.6
Diarrhoea with blood	0	0	0	0	0	0	0
Gastroenteritis	85	2	0	0	0	118	1.4
Fever with rash	6	0	0	0	0	7	0.1
Meningitis ^b	2	0	0	0	0	2	0
Hepatitis A ^c	2	0	0	0	0	1	0
Syndrome compatible with botulism	0	0	0	0	0	0	0
Lymphadenitis and fever	2	0	0	0	0	2	0
Septic or unexplained shock	0	0	0	0	0	1	0
Unexplained death	0	0	0	0	0	0	0
Total cases of syndromes reported	133	2	0	0	0	187	2.2
Total visits (all causes)	8013	24	6	30	7	8640	100

^a Cases reported from an unknown district are also included.

^b Syndrome compatible with meningitis, encephalitis or unexplained acute encephalopathy or delirium.

^c Syndrome compatible with acute hepatitis.

Table 4.8

Syndromes recorded through the syndromic surveillance system from cruise ships serving the Athens 2004 Olympic Games, 1–31 August 2004

Syndrome	n	%
Respiratory infection	1	0.0
Diarrhoea with blood	0	0
Gastroenteritis	0	0
Fever with rash	35	2.5
Meningitis ^b	0	0
Hepatitis A ^a	0	0
Syndrome compatible with botulism	0	0
Lymphadenitis and fever	0	0
Septic or unexplained shock	0	0
Unexplained death	0	0
Total cases of syndromes reported	36	2.6
Total visits (all causes)	1400	100

^a Syndrome compatible with meningitis, encephalitis or unexplained acute encephalopathy or delirium.

^b Syndrome compatible with acute hepatitis.

Analysis and interpretation of data

All data reported to the Hellenic Centre for Infectious Diseases Control were entered into databases designed using EpiData 3.02 (EpiData Association, Odense, Denmark). With the collaboration of the Department of Surveillance and Intervention of the Hellenic Centre for Infectious Diseases Control and the Epidemiological Strengthening Team of the WHO Office for National Epidemic Preparedness and Response in Lyon, France, a software application was prepared using R 1.9.1 (Centre for Computational Intelligence, Vienna, Austria) for the automated daily analysis of data and the production of daily surveillance reports. For every surveillance system, prefecture and disease, two tests were used to detect short-term aberrations: a Poisson test to compare the number of cases reported each day with the average number reported in the previous seven days and a binomial test to compare respective proportions (proportional morbidity): each day versus the previous seven days (7). These proportions were numbers of cases of specified diseases and syndromes reported daily over all cases reported on the same day (mandatory and laboratory systems) or the overall physician and outpatient visits recorded on that day (sentinel physician system and syndromic surveillance system). If $P < 0.05$ in either test, a signal was produced and data extracted for immediate review by epidemiologists.

Data were transferred daily by 13:30 to the Hellenic Centre for Infectious Diseases Control on diseases and syndromes reported for the previous day through the various surveillance systems. Automated analysis was performed, and a set of interactive tables, charts highlighting aberrations and a draft daily epidemiological bulletin were produced. At 15:00, the Hellenic Centre for Infectious Diseases Control surveillance coordinating team met, reviewed these data and decided the public health importance of the data, the interpretation of statistical signals and the appropriate action. Following this meeting, the chief epidemiologist of the Hellenic Centre for Infectious

Diseases Control inserted in the epidemiological bulletin a summary of the epidemiological situation and comments on specific events that had occurred.

The epidemiological bulletin was presented daily at the 17:00 meeting of the heads of sections involved in Olympic Games public health activities and was sent to the Ministry of Health and Social Solidarity and other parties involved. Daily surveillance data and the relevant report were not made available to the public or to health professionals during the Athens 2004 Olympic Games.

Response

Reports to the Hellenic Centre for Infectious Diseases Control for mandatory notification diseases (Table 4.2) triggered appropriate response in accordance with disease-specific surveillance guidelines, including identifying possible sources of infection or risk factors – depending on the disease – requiring special intervention to prevent further spread of the infection. Similar action and thorough outbreak investigation were undertaken when a cluster of cases of foodborne disease was reported. Action could also be triggered by statistical signals from surveillance systems. After a process of assessment and verification, statistical signals could be characterized as “alerts” for which further investigation and/or public health measures were undertaken (Annex I).

Outbreak investigation capacity was ensured by forming four teams of five staff members each from the Hellenic Centre for Infectious Diseases Control providing training in the previous months in collaboration with the European Programme in Intervention Epidemiology Training and by setting operating procedures. There was an open line of communication with the Global Outbreak Alert and Response Network (GOARN) for assistance in the event of situations presenting a potential for international spread.

Morbidity during the Athens 2004 Olympic Games

Participation in surveillance

Table 4.1 summarizes the participation of hospitals and other health units in the various systems of enhanced surveillance that operated during the Athens 2004 Olympic Games. Participation was 79% in the mandatory notification system, 75% in the sentinel physician system and 100% in the syndromic surveillance system in hospital emergency departments.

Cases notified through surveillance systems

Salmonellosis accounted for about half of the notifications in the mandatory notification system (Table 4.2), followed by tuberculosis (17% of notifications), hepatitis B (5%), aseptic meningitis (4%) and bacterial meningitis (3%). In addition, *Salmonella* was isolated in two thirds of positive stool cultures reported (Table 4.3), followed by *Campylobacter* (19%), *Lambli*a *giardia* (4%) and *Shigella* (3%).

The most common health problems – related to infectious diseases – for which people visited a primary care physician were respiratory infections (6.7% of visits) and gastroenteritis (3.7% of visits), as shown in Table 4.5. As expected, in the summer, the occurrence of

influenza-like syndrome was very low (Table 4.5). Morbidity from infectious diseases recorded in the clinics of Olympic venues and cruise ships was very low (2–3%), as shown in Tables 4.7 and 4.8.

Outbreaks of foodborne or waterborne disease

Fourteen clusters of cases of foodborne or waterborne disease were reported in August 2004, with a small number of cases each (two to five), usually in members of the same family. In addition, the Hellenic Centre for Infectious Diseases Control was notified of eight larger outbreaks of gastroenteritis during the same period affecting 6–38 people. For each of them, descriptive data and environmental information were collected, clinical and environmental samples tested and control measures implemented. None of these events justified analytical epidemiological studies because of the small numbers of cases involved, the known nature of the epidemiological source or, in one case, the inability to take meaningful history from psychiatric patients. None of these outbreaks was reported from within the fence: from Olympic venues, including residence areas, athletic stadiums and cruise ships related to the Athens 2004 Olympic Games.

Conclusions

The enhanced surveillance systems operating during the Athens 2004 Olympic Games, the extensive validation of data carried out by staff of the Hellenic Centre for Infectious Diseases Control, the automated daily analysis and report preparation and the standard procedures for interpreting data and deciding on necessary measures allowed a timely, valid and meaningful picture of morbidity trends oriented towards public health action.

The surveillance systems in operation had the sensitivity to capture a large number of minor events for which interventions, usually of small scale, were carried out to prevent further spread of infection.

The response capacity, mechanisms and operating procedures in place permitted prompt interventions

for verifying, assessing and controlling the events reported. Nevertheless, as no major public health event occurred, there was no opportunity to test these in stressful and demanding situations.

There was no major public health event during the Athens 2004 Olympic Games despite the risks posed by a large number of people congregating in the same place and time. This reflects, among other things, the effective primary prevention measures taken before and during the Olympic Games by the Athens 2004 Olympic Games Organizing Committee, the Hellenic Food Authority, the prefectural departments of public health with the coordination of the National School of Public Health and other bodies and individuals.

Lessons learned

Health care personnel can well accept daily reporting systems during mass gatherings for a short period of time during which mass-media visibility is high and the gathering is perceived to have special importance. The reporting systems provide an accurate picture of morbidity trends on which appropriate public health action can be based. Nevertheless, the increased sensitivity of enhanced surveillance requires increased specialist capacity for verification and minor interventions for all the events detected.

Enhancing communicable disease surveillance for large mass gatherings such as the Olympic Games

requires at least one to two years of planning and preparation as well as an appropriate budget. Working closely with the organizers of the Olympic Games is important to ensure smooth operations for surveillance and response.

Close contacts with international colleagues are very important in surveillance during international mass gatherings. The experience in exchanging information through the Early Warning and Response System of the EU and the WHO network of country representatives for interpreting the epidemiological situation in a broad international context and ensuring

international coordination of contact tracing (such as cases of meningococcal disease and tuberculosis) has been very positive.

Surveillance systems, particularly during mass gatherings, when multiple systems and daily reporting are in operation, can benefit from software applications that can help assimilate a large quantity of data by bringing together information from different sources and allowing flexible comparisons by disease, geographical area and/or other variables.

Statistical signals based on short-term comparisons (such as each day versus the previous seven days) can assist in reviewing surveillance data and focus on unexpected findings, but the limitations of these comparisons must be considered, such as a large number of comparisons, small numbers often involved, changes in health care and surveillance system and changes in the reference population.

Standard procedures for reviewing the day's picture of morbidity, critically appraising statistical signals, judging their public health significance and deciding on appropriate action are of paramount importance and should be built into the everyday operating procedure.

An appropriate software application to assist keeping track of and following up public health action considered necessary is of great value, particularly in the framework of mass gathering surveillance, when

many events requiring some intervention are expected.

The fact that the scientific team that ran syndromic surveillance during the Athens 2004 Olympic Games was different from the team responsible for response at times created diverging views that could have created problems in a crisis situation. Responsibility and criteria for surveillance should be well integrated with responsibility and criteria for response.

As mentioned, daily surveillance data – and the relevant report – were not made available to the public during the Athens 2004 Olympic Games. This prevented giving feedback information to the large number of health personnel involved in surveillance and could have created problems with the mass media had a major public health event occurred. Publishing surveillance findings in a timely manner is important to sustain the credibility of surveillance.

The Athens 2004 Olympic Games and possibly other major mass gatherings of high visibility can be an opportunity to reorganize and improve substantially the surveillance system in a country. Nevertheless, a clear long-term strategy for surveillance development should be explicitly set and agreed at the initial stage of the preparations of surveillance for the mass gathering, with clear goals for the future that should be explicitly pursued all the way through.

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CHAPTER 5

Syndromic surveillance system

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Introduction

The concept of syndromic surveillance is comparatively new in public health. It consists of collecting data for syndromes (for example, “respiratory illness with fever”) as opposed to collecting data for diagnosed cases of disease (for example, influenza). The main characteristic of syndromic data collection is that it collects real-time epidemiological information in a given population instead of waiting for a specific diagnosis of disease to be made and then reporting it to public health officials. In case of an epidemic outbreak or the deliberate use of biological agents, this more timely recognition of cases could significantly enhance the ability of public health to respond and minimize the impact of such events (1–3).

The Hellenic Centre for Infectious Diseases Control planned and implemented for the first time in Greece a syndromic surveillance system for the epidemiological surveillance of the Athens 2004 Olympic Games based on information gathered at the facilities providing emergency care. The major goal of the syndromic network was to establish a data set with historical syndromic background data to identify trends in syndromes potentially related to the deliberate use of biological agents or an outbreak of a communicable infectious disease. This database would facilitate comparison after appropriate adjustments with data collected during the Olympic period in Athens and other Olympic cities. This chapter briefly describes the methods and results of the implementation of the system.

Methods

Greece’s syndromic network was based on a similar system functioning at the Salt Lake City 2002 Olympic Winter Games (4). The list of syndromes under surveillance (Box 5.1) was developed based on communicable disease outbreaks of particular concern during the Athens 2004 Olympic Games (influenza, diarrhoeal illness, meningitis and measles) and on the likely clinical presentations of victims of the deliberate use of biological agents (such as anthrax) and was adopted after staff from the Hellenic Centre for Infectious Diseases Control visited Salt Lake City during the 2002 Olympic Winter Games (4).

Preparation, planning and pilot study

After an operational plan was prepared and presented to the Hellenic Centre for Infectious Diseases Control during spring 2002, the syndromic system was tested and refined across Greece via a pilot phase involving 18 sites. The Office of Travel Medicine and Olympic Games of the Hellenic Centre for Infectious Diseases Control conducted this pilot study during July and August 2002 to assess the feasibility of implementing a syndromic system in Greece’s health care environment. A team of epidemiologists, infectious diseases specialists, internists,

Box 5.1**Syndromes of public health interest recorded during the Athens 2004 Olympic Games**

Respiratory infection with fever
 Bloody diarrhoea
 Gastroenteritis (diarrhoea, vomiting), without blood
 Febrile illness with rash
 Meningitis, encephalitis or unexplained acute encephalopathy or delirium
 Suspected viral hepatitis (acute)
 Botulism-like syndrome
 Lymphadenitis with fever
 Sepsis or unexplained shock
 Unexplained death with a history of fever
 Other syndrome of possible interest to public health

paediatricians, nurses, public health experts and biostatisticians participated in setting up the system.

Staff of the Hellenic Centre for Infectious Diseases Control staff visited participating sites before the pilot study to review chief complaints and preliminary diagnoses recorded in emergency departments' daily log books. Since Greece's health care system lacks standard operating procedures for recording health information, it was deemed necessary to design a facility-customized procedure for collecting and transmitting data. For that purpose, an investigation was conducted in every facility selected for participation in the study to clarify how health information is recorded. The programme was implemented at 14 hospital emergency departments in Greater Athens and in three other Olympic cities. Twelve of the emergency departments included were part of a network of major hospitals designated as Olympic hospitals. One major primary health care facility geographically close to the Olympic athletic facilities and Athens International Airport was also included. The procedure included in addition a pre-Olympic test event (the 2002 Athens Regatta).

After the pilot study ended, a national network of

syndromic surveillance sites incorporating 33 sites was implemented that operated with a procedure identical to that of the pilot study. Data were collected weekly for most of the participating sites until 1 July 2003. Active daily collection was reinitiated on 1 July 2003 until 30 September 2003 and again in March 2004 through October 2004. The major goal of the syndromic network was to establish a data set with historical syndromic background data. This database would facilitate comparison after appropriate adjustments with data collected during the Olympic period in Athens and other Olympic cities.

Data collection

Data collection sites included the emergency departments and outpatient clinics of 33 carefully selected hospitals and health centres, a sample of primary health care facilities for the first two years of the operation of the system. During the Athens 2004 Olympic Games, data were additionally collected from the health care clinics for athletes and spectators at the Olympic venues and the Olympic Village Polyclinic.

Trained staff (mainly nurses) of the Hellenic Centre for Infectious Diseases Control certified for Olympic syndromic surveillance collected syndromic data daily. Infection control nurses contributed significantly to the emergency departments' health care staff accepting the staff certified for Olympic syndromic surveillance and to the collaboration with other hospital personnel.

The data were collected by completing a specially designed syndromic surveillance form. This form consisted of demographic fields (patient's name, age, gender, address, telephone number and nationality), fields concerning the patients' influx (hospital code, clinic, date of visit, examination time and total number of cases per clinic) and fields concerning primary syndrome category (symptoms and clinical picture of interest and further patient management). The basic aim was to obtain all the necessary information by 13:30 of the day after each participating hospital's on-call day.

Syndromes representing public health conditions of interest and potential relation to the deliberate use of biological and chemical agents or radionuclear

material were used (Box 5.1, see above). The case definitions of the syndromes were adapted from the ones used in the Salt Lake City 2002 Winter Olympics. If a case met the criteria of more than one syndrome category based on the information in the emergency departments' records, the case was classified as the preceding syndrome in the hierarchy list shown in Box 5.2. A team of public health experts located at the central offices of the Hellenic Centre for Infectious Diseases Control called the Olympic Syndromic Surveillance Coordinators coordinated the entire process.

Data management and analysis

Data were manually collected, coded to a standard Microsoft Excel form and e-mailed daily to the Hellenic Centre for Infectious Diseases Control, where they were converted into a format that would be recognizable by the statistical package used by the syndromic surveillance data management team. The Olympic Syndromic Surveillance Coordinators in collaboration with two clinical

Box 5.2

The hierarchy in recording syndromes in cases that presented with symptoms satisfying more than one "syndrome" definition

1. Unexplained death with history of fever
2. Meningitis, encephalitis or unexplained acute encephalopathy or delirium
3. Sepsis or unexplained shock
4. Botulism-like syndrome
5. Febrile illness with rash
6. Bloody diarrhoea
7. Respiratory infection with fever
8. Suspected viral hepatitis (acute)
9. Lymphadenitis with fever
10. Gastroenteritis (diarrhoea and vomiting) without blood
11. Other syndrome of possible interest to public health

infectious disease epidemiologists cleaned the data daily (correcting misclassification and editing data errors or omissions). A team of academic biostatisticians analysed the data. Statistically significant aberrations or signals were further explored, and single important cases were investigated for verification to determine their public health importance. There was continuous communication with a team of infectious disease experts. The programme coordinators prepared a summary report by 14:30 daily.

The statistical analysis was conducted daily using SAS Release 8.2. Analysis incorporated both descriptive statistics (tables by hospital, graphs showing day-to-day trends etc.) and time-series analysis, in which special signals were detected with various methods (CUSUM (cumulative sum approach to syndromic surveillance), Pulsar, temporal aberration detection and the Early Aberration Reporting System). These statistics were based on the daily count of each syndrome, their rate over the total daily number of syndromes, the proportion to the total number of daily visits to the sites and the proportion to the total daily number of syndromes. Data for August 2002 and 2003 were used as reference data and served for all statistical comparisons.

In the case of statistical signals (statistical alarms), an initial investigation was conducted that included a line listing review to check for possible outbreaks within families, the geographical distribution of the data and other relevant information. If this first step produced some concern, further investigation was triggered by following up patients who had been admitted to the clinics under surveillance.

The syndromic surveillance coordinators reviewed the results of the statistical analysis for the three most common syndromes (respiratory infection with fever, gastroenteritis and fever with rash), and the formal meeting of the epidemiological surveillance review committee discussed the results at 15:00. This committee was to recommend appropriate further action if necessary and included representatives from the notifiable diseases surveillance department supervising other sentinel surveillance systems, the department responding to the potential deliberate use of biological agents, the Olympic Games office and the syndromic surveillance programme.

Follow-up investigation

Evaluating the ability of the syndromes to capture successfully diseases and other situations of public health interest required having an alternative data source of high quality (the gold standard or true method) in contrast with the syndromic data (the test method). For this reason, for some of the cases identified as syndromes of interest admitted to a hospital, the staff certified for Olympic syndromic surveillance in collaboration with the infection control nurse conducted a follow-up investigation of the final outcome (discharge diagnosis). The investigation was conducted with the completion of a specially designed form. The staff certified for Olympic syndromic surveillance entered the follow-up investigation data into a Microsoft Excel database. The Olympic Syndromic Surveillance Coordinators managed the data similarly to the management of syndromic data.

Results

Pilot study

Data from nine major hospitals from September 2002 to September 2003 were reported. The system recorded 57 616 cases of syndromes of interest of 617 439 visits (9.3%), with 10 412 patients with syndromes (18.1%) being admitted. Respiratory infection with fever was the most frequently encountered syndrome (44.9%) followed by gastroenteritis (31.1%). The botulism-like syndrome was rare (0.06%). Cases suspected for deliberate use of biological and chemical agents or radionuclear material were followed prospectively. Fig. 5.1 shows the incidence rates for the two most common syndromes. Fig. 5.2 and 5.3

show the sample cumulative data from the first two years of operation for the syndrome of respiratory infection with fever and for the syndrome of gastroenteritis. Time series for the most common syndromes (Fig. 5.1) were examined using Pulsar models and compared with other time series methods (such as CUSUM (cumulative sum approach to syndromic surveillance) and temporal aberration detection) using simulated outbreak scenarios. Data from these analyses have been presented in detail elsewhere (5). Briefly, Pulsar fared well regarding sensitivity, specificity and timeliness compared with the other methods and for the specific simulation scenario used.

Fig. 5.1. The daily incidence rate of the most common syndromes (respiratory infection with fever and gastroenteritis) relative to the total visits for the summer 2002 pilot study time period

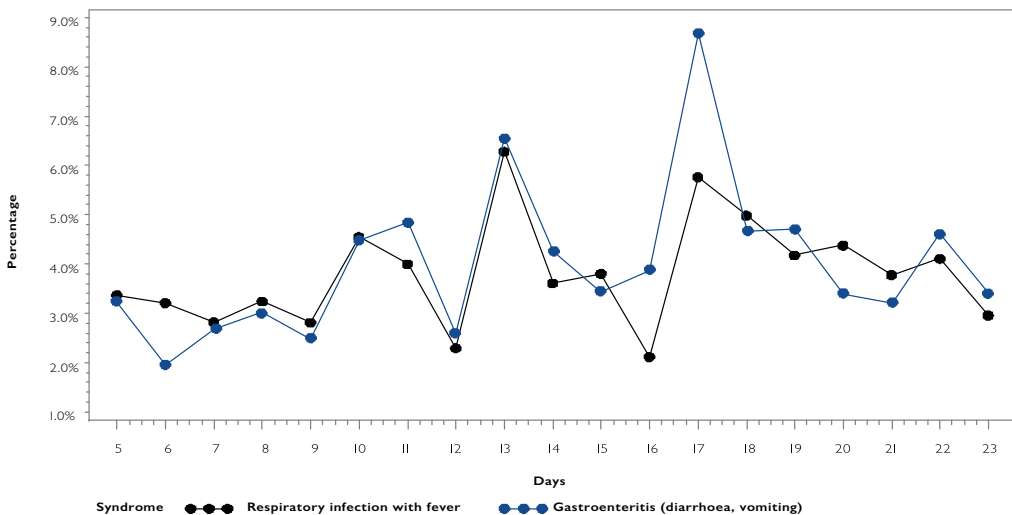


Fig. 5.2. Time series plot of gastroenteritis syndrome cases per day from August 2002 through September 2003

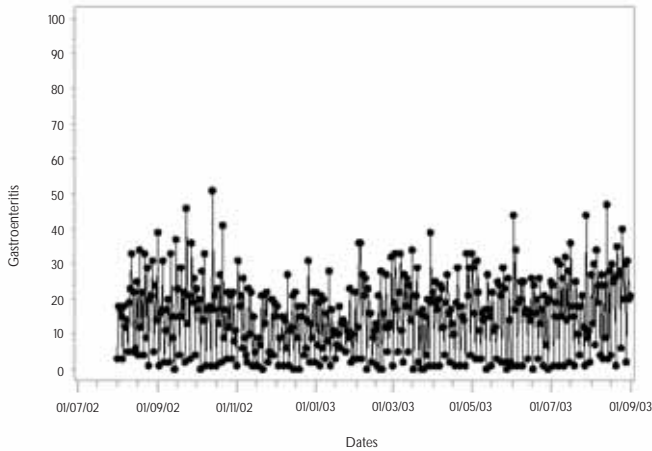
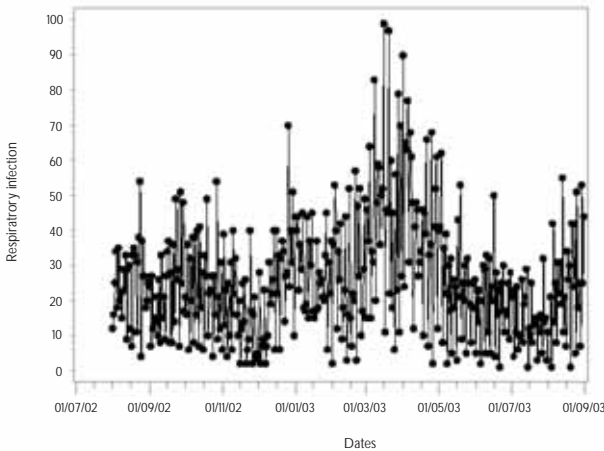


Fig. 5.3. Time series plot of respiratory infection with fever syndrome cases per day from August 2002 through September 2003



Infectious diseases epidemiologists validated data from the first two years of operation of the syndromic surveillance system (2002 and 2003) through extensive cross-checking; they correspond to data from other sentinel surveillance systems operating in Greece.

During the Olympic period, 11 226 syndromes were recorded from 131 054 emergency room visits from

1 to 31 August 2004. For the same period and for Olympic venues, 182 syndromes from 11 016 visits were recorded. Table 5.1 presents more detailed data about the syndromes recorded from 1 to 31 August 2004.

Both the total counts and syndromes as a proportion of total visits for the gastroenteritis syndrome increased statistically significantly for the Attica area

from 13 to 23 August 2004 (Fig. 5.4). The statistical alerts identified this outbreak earlier than any other surveillance system. The outbreak was cross-checked and verified for consistency across geographical areas and using other methods. No similar sustained alert was noted before or during the Olympics. Members of the syndromic surveillance team participated in the surveillance coordination team of the Hellenic Centre for Infectious Diseases Control. This team extensively discussed the alerts in common conferences in daily meetings. As verified by the exchange of information from other systems, such as the notifiable disease system and the laboratory notification system, the alert correlated highly with several community outbreaks or clusters of cases caused by

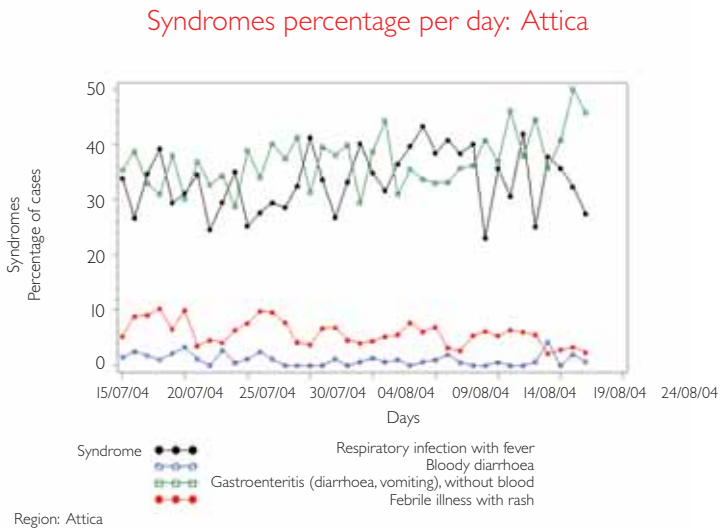
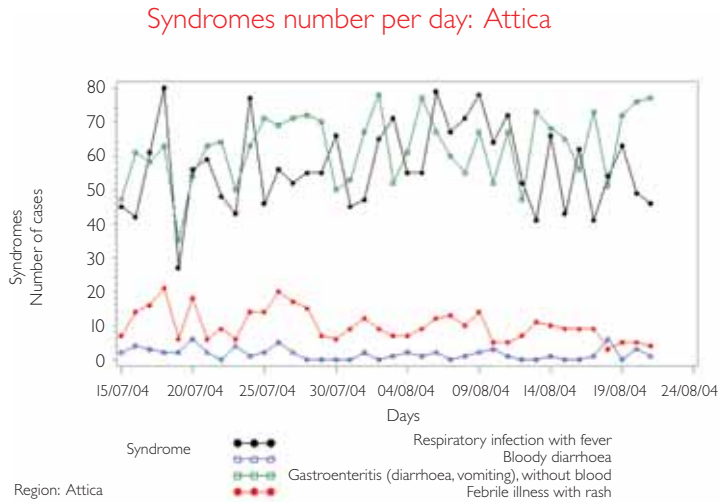
Salmonella spp. during the period of a major religious festival (15 August 2003 and 15 August 2004). When the traditional systems identified these clusters, the signals from the syndromic surveillance system were declining. Initial signal verification procedures initiated by the syndromic team disclosed no obvious epidemiological link between the cases. Moreover, an analysis from combined data from previous years and from other surveillance sources, such as sentinel provider data and laboratory notification data as well as syndromic data, showed a similar seasonal pattern during August. Thus, during the meetings, the surveillance coordination team decided that no immediate intervention or action should be taken.

Table 5.1 Recording of syndromes (numbers and percentages) by the syndromic surveillance system, 1–31 August 2004

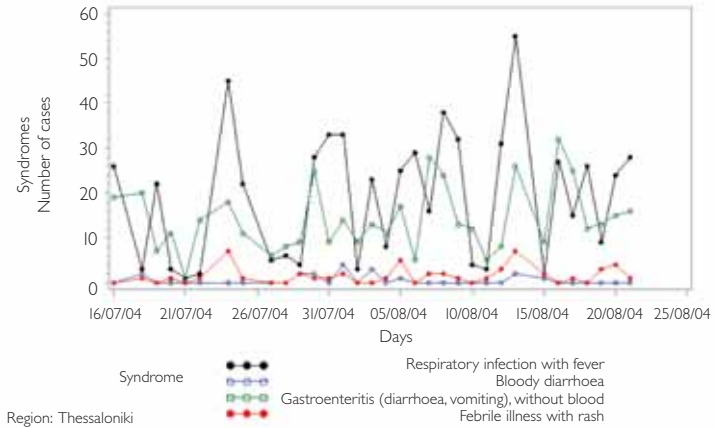
Syndrome	Total ^a	%
Respiratory infection with fever	5 551	4.2
Haemorrhagic diarrhoea	139	0.1
Non-haemorrhagic gastroenteritis	4 498	3.4
Fever with rash	632	0.5
Meningitis-like syndrome	124	0.1
Hepatitis-like syndrome	68	0.1
Botulism-like syndrome	27	0
Fever and lymphadenopathy	56	0
Septic or unexplained shock	26	0
Unexplained death	105	0.1
Total recorded cases with a syndrome	11 226	8.6
Total visits for any cause	131 054	100

^a Total counts include other syndromes of potential interest to public health.

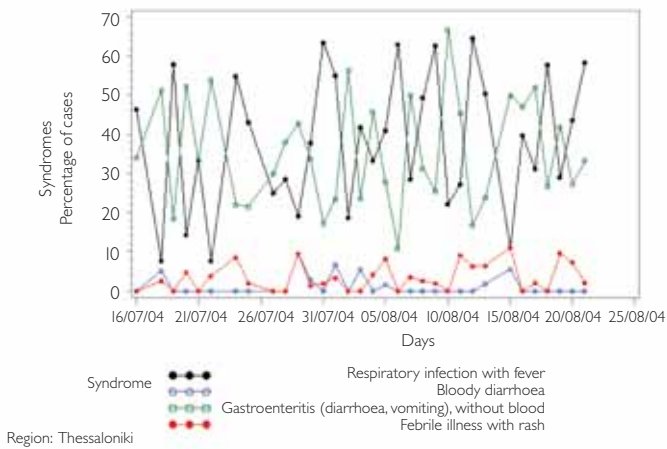
Fig. 5.4. Time series plots for four syndromes and for two different distant geographical areas (500 km apart) during July and August 2004, with a clear peak in gastroenteritis syndromes for 13–23 August



Syndromes number per day: Thessaloniki



Syndromes percentage per day: Thessaloniki



Discussion

One aspect of health care during mass-gathering sports events with international participation (6–8) is providing care for infectious diseases (9,10).

The main characteristic of syndromic data collection is that it is a means of collecting real-time epidemiological information in a given population instead of waiting for a specific disease to be diagnosed and then reported to public health officials. In case of an epidemic outbreak or the deliberate use of biological agents, this more timely recognition of cases would significantly enhance the ability of public health to respond and minimize the impact of such events.

Syndromic time-series are used in the surveillance of natural epidemics or the potential deliberate use of biological agents. Syndromic surveillance systems were initially developed in the United States by the United States Centers for Disease Control and Prevention and the New York Department of Health since 1998 and in the wake of the events of 11 September 2001 (11–13).

The Hellenic Centre for Infectious Diseases Control planned and implemented for the first time in Greece a syndromic surveillance system for epidemiological surveillance of the Athens 2004 Olympic Games based on information gathered at the emergency departments.

This was not the first Olympic Games with syndromic surveillance. During the Sydney 2000 Olympic Games, a similar network operated in 15 emergency departments across the New South Wales area (14).

The pilot phase proved that syndromic surveillance was a feasible system for Greece and further

enhanced the linked between the Hellenic Centre for Infectious Diseases Control and local hospital officials and personnel. Continuous training led to enhancing syndrome understanding and a statistically significant decline in recorded errors over time (15). Moreover, through extensive simulation testing, the statistical algorithms used were able to detect outbreaks with high sensitivity, specificity and timeliness with the usual limitations of simulations that they may not correspond to the actual sensitivity, specificity and timeliness of a system during a true biological alert. For the first time in the literature, the Pulsar algorithm that had previously been used for analysing episodic hormone secretion was used for analysing syndromic data (5,15).

The system of syndromic surveillance presented was fully implemented and operational and was evaluated further for its effectiveness inside and outside the Olympic venues during the recent pre-Olympic and Olympic period.

However, implementing the syndromic surveillance system was not an easy process. Necessary features for the proper function of the system included a facility-customized procedure for collecting and transmitting data and the continuous training of the participating personnel, which required significant time and money. There were several issues regarding the timely collection of data as well as acceptance of the role of staff of the Hellenic Centre for Infectious Diseases Control in emergency departments. In several instances this did not happen before considerable time was spent learning the structure and operation of each separate emergency department. In the future, electronic data processing at emergency departments using internationally accepted coding

systems as well as web-based secure communication might further facilitate the whole process of syndromic data collection in Greece. Nevertheless, collaboration with hospital staff working at the emergency departments was successful and helped to establish permanent ties with health care personnel as well as the hospital administrators. The presence there conveyed the message that communication and collaboration with the central Hellenic Centre for Infectious Diseases Control organization is necessary. Informing hospital personnel about the syndromes led to them becoming sensitized to epidemiological surveillance of infectious diseases in general. Ties were strengthened through joint educational efforts on communicable diseases, preparedness for the potential deliberate use of biological agents and syndromic surveillance.

Since syndromic surveillance is designed to catch only indications for diseases, the system incorporated important safety valves for action. First, the Hellenic Centre for Infectious Diseases Control asked staff to maintain good communication skills with the physicians and the nurses in the involved hospitals to act as intelligent observers and moreover to persuade them to report any mandatory notifiable disease that the system recognized (all personnel were specifically trained for this purpose), enhancing significantly the reporting of notifiable diseases in the participating hospitals. In addition, for significant isolated cases or clusters of cases and cases of statistical alerts, two-way communication between the central team and the local hospital members was paramount in implementing continuous follow-up for case verification. This ensued with no additional burden on resources and in close collaboration with the infectious diseases health care personnel in the participating hospitals.

Thus, the statistical thresholds were not used for detecting epidemics but rather to trigger verification of cases and necessary further investigation. This

action together with real-time feedback to the central offices of the Hellenic Centre for Infectious Diseases Control was helpful in ensuring rapid communication with the appropriate departments within the Centre in case of an alert, such as those for notifiable diseases intervention and for responding to the potential deliberate use of biological agents. Moreover, it served as a quality control measure for the procedure, making the system more specific, while providing additional information for decision-making during the meeting of the surveillance coordination team.

Syndromic surveillance may not be the best system for detecting small epidemics spread over a large geographical area, as was the case of inhalational anthrax in the attacks in the United States of America in 2001 (16); however, the system is continuously evolving and new methods of data analysis are presented. Although syndromic surveillance networks are still under evaluation and their results are questioned (1,2,17), they may provide significant information not only for the early detection of epidemics but for the potential deliberate use of biological agents, thus enhancing earlier public health response. Moreover, they can be used and expanded to include monitoring of events other than illness, such as medication purchases, forensic data or data from the emergency medical services (11).

Nevertheless, persuading public health policy-makers about the value of a system is difficult without validating it through an actual incident involving the deliberate use of biological agents, although this is certainly not wished for. This was a continual difficulty in pursuing funding and persuading appropriate people to support the programme.

In conclusion, similarly to other reported efforts, a new syndromic surveillance network significantly enhanced the surveillance system (4,18,19).

Lessons learned

The implementation of syndromic surveillance in a non-computerized environment at the data sources was feasible but difficult. Disadvantages included a more labour-intensive system leading to higher cost and lower security, but the advantages included a more personalized approach with specialized public health personnel deciding on syndrome categorization on the scene, higher awareness of emergency department personnel due to daily interaction with public health professionals and the existence of intelligent observers on the scene.

The immediacy of syndromic data added significantly to the confidence regarding the effectiveness of the surveillance system during the Athens 2004 Olympic Games, both in detecting natural epidemics and the potential deliberate use of biological agents as well as in the response timing.

Of paramount importance during the Olympic period was immediate reassurance that none of the syndromic cases was associated with the deliberate use of biological agents by verifying and/or following up suspected syndromic cases.

Using multiple measures and methods helped in understanding the aberration signals. The simple synthesis of multiple alerts was very useful for real-time decision-making and successful in detecting the outbreak observed. Syndromic surveillance was successful in detecting the outbreak 3–4 days before the other active surveillance systems.

The collaborative procedure with the surveillance coordination team based on synthesizing signal information from the various surveillance sources was very effective and useful.

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CHAPTER 6

Public health preparedness for incidents involving the potential deliberate use of biological and chemical agents or radionuclear material

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Introduction

The organization of a mass gathering involving many spectators and participants, such as for sports, political or religious gatherings, presents important security challenges for a state, especially since 11 September 2001. The deliberate use of biological and chemical agents or radionuclear material at major public events could result in severe consequences, depending on the nature and quantity of the agents or material, the location used and the population impacted.

For years, these considerations have led several states involved in hosting major events such as the Olympic Games to implement arrangements to prevent the deliberate use of explosives. Conversely, since the Olympic Games and other major public events are planned long in advance, people who may want to deliberately use explosives or biological and chemical agents or radionuclear material have time to prepare their own action for such events.

The deliberate use of explosives is a historically known risk for the Olympic Games (Munich in 1976 and Atlanta in 1996) (1,2). The events of 11 September 2001 and the subsequent deliberate use of anthrax in the United States of America imparted high priority on preparedness for incidents that could threaten public health in a large scale, such as the deliberate use of explosives or biological and chemical agents or radionuclear material, although explosives remained as the most probable agent of deliberate use as they are easy to obtain or develop.

The 22 000 athletes, 60 000 volunteers, 25 000 journalists, 33 Olympic venues, about 1.5 to 2.0 million visitors expected and more than 4 billion potential television viewers for the Athens 2004 Olympic

Games posed significant challenges to Greece's health care and public health communities, especially regarding the preparedness for the response to potential deliberate use of explosives or biological and chemical agents or radionuclear material. In the new environment created after the events of 11 September 2001, the Government of Greece invested almost three times as much money as was spent for security at the Sydney 2000 Olympic Games to stage an unprecedented security operation.

The Salt Lake City 2002 Olympic Winter Games comprised the first mass-gathering athletic event to take place after 11 September 2001 but as such could not compare with the Athens 2004 Olympic Games in symbolic significance, number of expected visitors and participating delegations or geographical accessibility. Nevertheless, important contacts and scientific exchanges were first formed during the Salt Lake City 2002 Olympic Winter Games, which were used for developing several educational activities and a syndromic surveillance system (see Chapter 5). The actual games took part as follows: the Games of the XXVIII Olympiad from 13 to 29 August 2004 and the Games of the 12th Paralympiad from 17 to 28 September 2004. The Olympic period refers to the period between 19 July 2004 and 4 October 2004, when all authorities involved including law enforcement were on high alert for responding to any type of incident, either natural or caused by humans.

Public and international pressure rose exponentially as the Athens 2004 Olympic Games approached, requiring Greece's authorities to display national preparedness plans available to cover various scenarios and all relevant equipment needed.

Extensive preparations were undertaken in Greater Athens to respond to the health sector needs anticipated during the Athens 2004 Olympic Games. Significant health sector planning for the health needs of the Games presented an important challenge for Greece's health authorities, as national disaster plans needed to be revisited for the first time after the 1970s or 1980s, and specific plans for responding to the potential deliberate use of biological and chemical agents or radionuclear material needed to be developed, for which multisectoral collaboration was also needed. Greece has three different agencies involved in the different types of asymmetrical threats, and these were therefore asked to participate in the planning response to such an incident during the Olympic period.

- The General Chemical State Laboratory was responsible for scientific advice on and the detection of chemical agents; it is an authority under the Ministry of Economy and Finance and serves as the national authority for the Chemical Weapons Convention under the Organisation for the Prohibition of Chemical Weapons.
- The Hellenic Centre for Infectious Diseases

Control under the Ministry of Health and Social Solidarity was responsible for biological agents, since they are able to cause epidemics, and was the authority responsible for epidemiological surveillance and response in Greece.

- The Greek Atomic Energy Commission, under the Ministry of Development, was responsible for any activity involving radionuclear material.

The health sector would nevertheless be responsible for managing people exposed to any type of agent and human casualties as well as the public health effects, and the Hellenic Centre for Infectious Diseases Control was asked to provide information and advice on all three types of agents for the health care personnel and the public, although its expertise was recognized as being in biological agents.

This chapter describes the main planning and preparedness activities in Greece's health sector in relation to the potential deliberate use of biological and chemical agents or radionuclear material for the Athens 2004 Olympic Games and discusses some of the challenges, the resulting actions and the lessons learned.

Elements of threat and risk assessment

Greece in general is assessed a low-priority target for the potential deliberate use of explosives, biological and chemical agents or radionuclear material, except for relatively small local groups (Revolutionary Organization "17 November" and Revolutionary Popular Struggle (ELA)) that have a history of long existence and local activity targeting individuals mostly in a symbol-oriented pattern as their method of operation. The founders and members of

Revolutionary Organization "17 November" were arrested during the summer of 2002 (3–6).

The risk of the deliberate use of explosives or biological and chemical agents or radionuclear material leading to a mass-casualty incident during the Athens 2004 Olympic Games was assessed as being high. Many publicized scenarios referred to the aerosol release of a biological agent into a closed stadium,

resulting in simultaneous widespread infections. Small-scale attacks were also of great concern for the public health authorities in Greece, as the potential to organize and carry them out would be greater.

After the events of 11 September 2001 and the subsequent conflicts in Afghanistan and Iraq, numerous security analyses, mass-media articles and some scientific reports were published referring to the high-risk situation that could possibly develop during the Athens 2004 Olympic Games. The Olympic Games are considered a symbolic mass gathering and the largest gathering of its kind in the world. The participating delegations include important and valuable athletes from countries that may be engaged in serious conflicts. Further, many members of the Olympic Family also attend this high-profile event, and they could be considered a potential target for the deliberate use of explosives, biological and chemical agents or radionuclear material solely because of their visibility and status.

In the perspective of the Olympic Games, Athens posed some challenges. As a city it is geographically accessible compared with the previous two host cities (Sydney in 2000 and Atlanta in 1996). As part of the EU under the Schengen Agreement, free movement of people is allowed through multiple national borders. Finally, Greece has its own symbols related to Orthodox Christianity and democracy, which could also become targets.

Based on security analysis and lessons learned from the Sydney 2000 Olympic Games (7), certain delegations (especially those from Israel, the United Kingdom and the United States of America) were considered potential targets, in addition to specific symbolic events such as the opening and closing ceremonies and the last day of the track and field events, when most spectators would be accumulated in the main Olympic Stadium. The list of high-profile targets was amended also with the addition of Olympic Family hotels in downtown Athens and the cruise

ships in Piraeus. One point the exercises during the preparedness phase addressed was the strategic importance of the immediate pre-Olympic period, when the deliberate use of explosives, biological and chemical agents or radionuclear material would have deterred many countries from sending their delegations to Athens and would therefore cause the Olympic Games to be cancelled.

Since the official threat assessment for the Athens 2004 Olympic Games was confidential and because of security clearance considerations, such knowledge was not made available to the planners in all partner agencies outside law enforcement and security agencies. In retrospect, this factor represented a significant weakness of the planning process and relevant lesson learned for future host countries.

For the purposes of the planning process and all the resulting training activities, one of the first initiatives was nevertheless to agree on a priority list of biological agents of concern. The Hellenic Centre for Infectious Diseases Control had the primary role in this process, and this involved massive literature research and consultation with the European Commission. A threat list created by the European Commission Task Force on Bio-terrorism was adopted, which included very-high-threat and high-threat agents based on work with a matrix for biological agents containing substantial information on each agent and enabling final priorities to be set based on existing knowledge, expertise and needs in the EU (8). Table 6.1 shows the list of agents adopted. Agents belonging in the very-high-threat list were considered of first priority for the planning process.

The efficacy of the risk assessment process and the consequent public health preparedness were also hampered by the absence of specific models both for the development of epidemics in an athletic mass gathering and the development of a mass-casualty incident in the specific circumstances, such as a stadium.

Table 6.1

List of pathogens and agents in alphabetical order in each group resulting from the evaluation of biological agents using the matrix developed by the EU Task Force on Bioterrorism (13)

List of diseases	Agents of very high threat
Anthrax	<i>Bacillus anthracis</i>
Botulism	<i>Clostridium botulinum</i> toxin
Glanders	<i>Burkholderia mallei</i>
Haemorrhagic fever	Congo-Crimean virus, Ebola virus, Guanarito, Junin virus, Lassa virus, Machupo virus, Marburg virus, Omsk fever, Sabia fever
Plague	<i>Yersinia pestis</i>
Smallpox	Variola major
Toxic syndromes	Ricin, tetrodotoxin
Tularaemia	<i>Francisella tularensis</i>
List of diseases	Agents of high threat
Brucellosis	<i>Brucella abortus</i> , <i>Brucella melitensis</i> , <i>Brucella</i> spp., <i>Brucella suis</i>
Chikungunya fever	Chikungunya virus
Cholera	<i>Vibrio cholerae</i>
Coccidioidomycosis	<i>Coccidioides immitis</i>
Dysentery	<i>Shigella dysenteriae</i>
Hantavirus pulmonary syndrome	Hantaan virus
Haemorrhagic fever	Nipah, Rift Valley fever virus
Histoplasmosis	<i>Histoplasma capsulatum</i>
Haemolytic uremic syndrome	<i>Escherichia coli</i> O157:H7
Influenza	Influenza virus (new strain)
Legionellosis	<i>Legionella pneumophila</i>
Melioidosis	<i>Burkholderia pseudomallei</i>
Meningitis	<i>Neisseria meningitidis</i>
Monkey pox fever	Monkey pox
Nervous system syndrome	Palytoxin
Paratyphoid fever	<i>Salmonella paratyphi</i>
Psittacosis	<i>Chlamydia psittaci</i>
Q fever	<i>Coxiella burnetii</i>
Rocky mountain spotted fever	<i>Rickettsia rickettsii</i>
Scrub typhus	<i>Orientia tsutsugamushi</i>
Toxic syndrome	Conotoxin, Microcystin, Saxitoxin
Tuberculosis	<i>Mycobacterium tuberculosis</i>
Typhoid fever	<i>Salmonella typhi</i>
Typhus fever	<i>Rickettsia prowazekii</i>

Planning partners

Security plan for the response to the potential deliberate use of biological and chemical agents or radionuclear material

Planning activities against the potential deliberate use of biological and chemical agents or radionuclear material, through the perspective of the security of the Athens 2004 Olympic Games, started already since autumn 2001, when public health services had to face the “white powder” or anthrax hoax incidents that were very common at the time after the anthrax attacks in the United States of America (9).

To face the complex multisectoral issues created by the response to this type of threat, coordinated efforts were made to develop a national plan to respond to the potential deliberate use of explosives, biological and chemical agents or radionuclear material under the Hellenic Police and, more specifically, its Olympic Games Security Division. The Olympic security plan was developed via a relevant planning committee with representatives of the participating ministries and agencies. The committee remained active for 3.5 years before the Athens 2004 Olympic Games. More than 30 ministries, agencies and departments were involved in creating the Olympic security plan for the response to the potential deliberate use of biological and chemical agents or radionuclear material during the Athens 2004 Olympic Games. This plan was changed further in the post-Olympic period to become part of the national contingency planning and national legislation.

Fig. 6.1 outlines the Olympic security plan, the four

levels of responsibility and the coordinating centres functioning at each level described in the plan, specifically for the security of the Athens 2004 Olympic Games.

The tactical level refers to the teams acting at the scene of suspected incidents of deliberate use of biological and chemical agents or radionuclear material, where a Hellenic Fire Brigade officer is in command and multiple players are operating according to risk assessment and planning.

The operational level refers to the major coordinating centres and their supporting structures such as the Expert Crisis Management Team.

The strategic level refers to structures responsible for strategic decisions, represented mainly by the hierarchy of law enforcement and national security structures.

The political level refers to the representatives of the Government of Greece, which is initially represented by a small number of ministers heavily involved in preparing the Athens 2004 Olympic Games and, in case of a more severe crisis, by the full Council of Ministers.

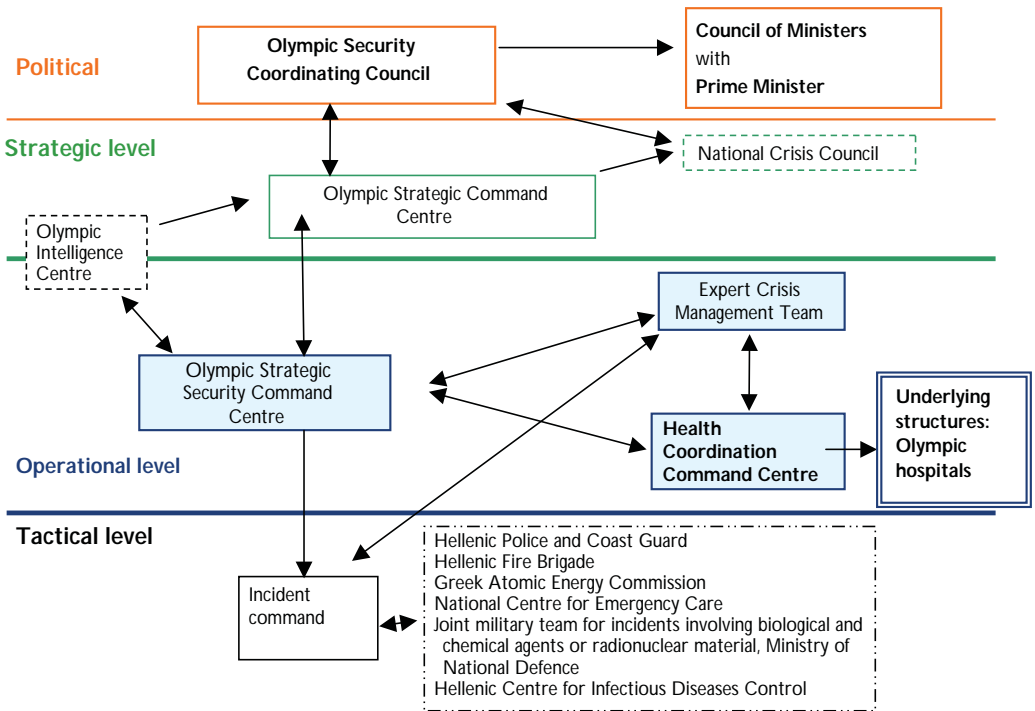
Working groups under the committee responsible for creating the plan were delegated the responsibility to create standards for the necessary detection, protective and decontamination equipment. This process was mostly influenced by the needs of law enforcement and the military, however, thereby creating some discrepancy between the actual needs of civilian health care and the actual equipment obtained.

Health sector partners in planning

Finally, in late 2003 Greece officially requested assistance from the North Atlantic Treaty Organization (NATO) for responding to the potential deliberate use of explosives or biological and chemical agents or radionuclear material during the Athens 2004 Olympic Games. Close collaboration was taking place well before the official request, including exchanging knowledge and shaping the official response of NATO countries in relation to all the sectors involved in Greece (10).

The Hellenic Centre for Infectious Diseases Control mostly represented the health sector in the planning process for responding to the potential deliberate use of biological and chemical agents or radionuclear material due to its scientific expertise. The health sector actors involved in the plan for responding to the potential deliberate use of biological and chemical agents or radionuclear material were as follows.

Fig. 6.1. Outline of the different levels of the security planning of the Olympic Games Security Division for incidents involving the deliberate use of biological and chemical agents or radionuclear material for the Athens 2004 Olympic Games



Note: The Olympic Security Command Centre was a joint operations centre in which most agencies and ministries involved in the security planning were represented. The Health Coordination Command Centre was the coordination centre of the Ministry of Health and Social Solidarity coordinating all activities in the health sector. The Expert Crisis Management Team included experts on incidents involving the deliberate use of biological and chemical agents or radionuclear material from the Olympic Intelligence Centre (joint law enforcement and military intelligence team); the Olympic Strategic Security Command Centre (high-level representatives of the Hellenic Police, Hellenic Coast Guard, Hellenic Fire Brigade and Hellenic Armed Forces; the National Crisis Council (the heads of the law enforcement agencies and the Greek Military); the Olympic Security Coordinating Council (chaired by the Minister of Public Order with the participants being the Ministers of Justice; Culture and Sports; Foreign Affairs; Interior, Public Administration and Decentralization; and, as needed, the Minister of Health and Social Solidarity).

- The Ministry of Health and Social Solidarity was responsible for the legislative framework and distribution of funding to participating hospitals and other supervised structures as outlined below. The Ministry of Health and Social Solidarity created the Health Coordination Command Centre for coordinating the response to health crises and improving crisis management and crisis communication. The Ministry of Health and Social Solidarity also directly supervised the National School of Public Health, which participated actively in organizing the environmental testing for Greater Athens and the cruise ships serving as VIP accommodation facilities.
- The Hellenic Centre for Infectious Diseases Control was the public health institute responsible for surveillance of human infectious diseases and for providing scientific advice to the Ministry of Health and Social Solidarity on plans and equipment and response capacity for epidemiological intervention.
- The National Centre for Emergency Care represented the emergency medical services in Greece and the first-responders of the health sector, responsible for delivering emergency and prehospital care at the scene of an incident.

The health sector planners were responsible both for defining their activities in the Olympic security plan and for developing their individual plan for managing the health effects of the potential deliberate use of explosives or biological and chemical agents or radionuclear material or a disaster during the 2004 Olympic period (code name: Philoctetes).

The responsibilities of public health services under the national security plan for the response to the potential deliberate use of biological and chemical agents or radionuclear material were as follows:

- prevention activities;
- assessing the risk at the scene of a suspicious

incident for the teams involved and the people possibly exposed;

- determining the need for chemoprophylaxis for people exposed to a biological agent and maintaining a registry for follow-up; and
- transporting samples for biological agent testing to the national reference laboratory and the European collaborating laboratories by an appropriate method.

As described in Part 4, Greece's national health services (both emergency medical services and hospitals) would be responsible for:

- implementing triage, first aid and the stabilization of any victims evacuated or rescued from the scene of the deliberate use of biological and chemical agents or radionuclear material or another mass-casualty incident, together with administering antidotes;
- decontaminating injured, non-ambulatory patients;
- providing prehospital care and transport for victims from the scene;
- providing hospital care for the victims; and
- providing care for the mental effects on victims, their families, the first-responders and the public in general.

In case of the deliberate use of biological and chemical agents or radionuclear material, public health and emergency medical services would have been responsible for managing the scene inside and outside the Olympic fence at all Olympic venues, which otherwise is the full responsibility of the Health Services Department of the Athens 2004 Olympic Games Organizing Committee. This process assumed close collaboration with the Health Services Department and joint training for their health volunteers (to avoid contact and evacuate themselves in case of deliberate use), which was quite limited in the preparedness phase (see Chapter 3).

Public health preparedness

Greece's public health sector gained valuable experience for the daunting task of preparedness for the Athens 2004 Olympic Games from facing various public health crises in the years before the Games. These included the "white powder" incidents or anthrax hoaxes in autumn 2001, a minor epidemic of Coxsackie virus linked with myocarditis in spring 2002 (11) and, most significantly, the SARS epidemic in spring 2003. All former experience established and reinforced the basic principle for future work: to strengthen the existing public health system, including surveillance practices and health care structures, to be able to respond to any natural or technological disaster.

During the planning and preparedness period, the public health services cultivated relations with various experts: national, European and other international (United States Centers for Disease Control and Prevention and WHO (WHO headquarters, the WHO Regional Office for Europe and the WHO Office for National Epidemic Preparedness and Response in Lyon, France)). The Government of Greece and various Greek authorities, such as the Hellenic Police, the Greek Atomic Energy Commission, the National School of Public Health (responsible for environmental testing) and the Hellenic Centre for Infectious Diseases Control, also developed bilateral collaboration with other countries and international organizations for exchanging expertise, organizing training activities and providing assistance on site at the Athens 2004 Olympic Games.

This process by itself produced significant experience for Greece's services. EU guidance is lacking for many issues related to public health response to the potential deliberate use of biological agents. This was

realized early in 2001, and the European Commission formed a Task Force on Bioterrorism to look into implementing a health security programme (12,13). While this work was ongoing, Greece's authorities had to consider other existing guidance from third countries or the military, which required adapting to the EU and sometimes the civilian framework. This international cooperation at the expert level was quite productive for the planning process, placing many difficult issues in a public health perspective. It also resulted in creating high-quality educational activities for law enforcement, first-responders and the health care and public health personnel.

Following agreement on the threat list of agents (biological and chemical) for the purposes of public health services as mentioned above (see Table 6.1), the preparedness followed four distinct and interconnected axes that provide the basis for a public health response to the potential deliberate use of biological agents:

- recognizing the deliberate use of biological and chemical agents or radionuclear material, which involves clinical recognition and epidemiological surveillance;
- enhancing laboratory capacity;
- epidemiological intervention; and
- taking appropriate public health measures.

Recognizing incidents

To enhance recognition of the deliberate use of biological and chemical agents or radionuclear material, multiple activities were undertaken aiming at:

- raising the awareness of clinicians about the possible syndromes connected to the deliberate use of biological and chemical agents or radionuclear material;
- enhancing reporting frequency by clinicians to public health authorities;
- enhancing the existing national surveillance systems for notifiable diseases; and
- creating a specific syndromic surveillance system with the aim of early detection of epidemic trends.

More specifically, the Hellenic Centre for Infectious Diseases Control worked to enhance both clinical and epidemiological recognition of the potential covert deliberate use of biological agents.

Clinical recognition

As mentioned in Chapter 3, the Hellenic Centre for Infectious Diseases Control devoted significant resources to increase clinicians' awareness about the potential deliberate use of biological agents, the syndromes produced by exposure to biological and chemical agents or radionuclear material and the need to report any suspicious cases to the Centre. Concurrently, disaster plans needed to be created in all hospitals, with special focus in the designated Olympic hospitals, for facing all types of natural and technological disasters, including managing the health effects of the potential deliberate use of biological agents.

The Hellenic Centre for Infectious Diseases Control organized several seminars for health care workers focusing on local public health officers, emergency department staff, infection control nurses and internal medicine specialties and subspecialties. Health care workers from the Olympic cities (Athens, Thessaloniki, Patras, Volos, Heraklio and Ancient Olympia) were given priority, although personnel

from all of Greece were also invited. The Hellenic Centre for Infectious Diseases Control held 29 training seminars related to the Athens 2004 Olympic Games from early 2003 until July 2004, of which six were devoted to the potential deliberate use of biological and chemical agents or radionuclear material and managing relevant issues. More than 500 health care workers were trained in these seminars for a total of almost 100 hours and were also given material to replicate the training in their region or hospital. All seminars organized by the Hellenic Centre for Infectious Diseases Control at the time referred to the potential deliberate use of biological and chemical agents or radionuclear material and their management as well as disaster planning. Thus, all 2000 staff members trained were sensitized to the specific issues (see Chapter 3).

Staff of the Hellenic Centre for Infectious Diseases Control also participated actively in training first-responders (Hellenic Police, Hellenic Coast Guard, Hellenic Fire Brigade and National Centre for Emergency Care). Multiple seminars were organized for first-responders under the responsibility of law enforcement. Training for first-responders always included basic knowledge of the very-high-threat biological agents, training on the use of personal protective equipment, managing patients at the scene of the deliberate use of biological and chemical agents or radionuclear material and training on the processes of decontaminating the people exposed. These activities involved more than 200 work hours for staff of the Hellenic Centre for Infectious Diseases Control.

Complementary to these training seminars, staff of the Hellenic Centre for Infectious Diseases Control consulted international literature and various Internet and other sources and created written educational material with extensive information on biological and chemical agents and radionuclear material together with a guide for hospital disaster planning, which were included in:

- a hospital guide for the management of biological and chemical agents or radionuclear material (two volumes in Greek only); and
- a handbook in Greek and English: *A pocket guide: handbook on the clinical management of communicable diseases and deliberately released agents (14)*.

Both guidebooks were distributed as widely as possible for free to health care staff in hospitals and public health personnel all over Greece, to emergency medical services personnel and to law enforcement personnel. The material included for biological and chemical agents and radionuclear material in the first guide appeared for the first time in Greek for the particular target audience of health care workers, and the material was also downloadable free from the Hellenic Centre for Infectious Diseases Control web site.

Epidemiological surveillance

A special separate reporting form was created for 12 diseases to be immediately reported, which included the diseases caused by very-high-threat biological agents (see Table 6.1: anthrax, botulism, plague, smallpox, tularaemia, viral haemorrhagic fevers, glanders and melioidosis), together with SARS, rabies, arboviral encephalitides and cholera. Following the example of other countries, after 2003 the clinical suspicion of these diseases in Greece requires immediate notification to public health authorities (both at the local level and the Hellenic Centre for Infectious Diseases Control) without need for confirmatory laboratory results (see Chapter 4).

Chapters 4 and 5 describe the surveillance systems functioning in Greece together with the syndromic surveillance system developed for the Olympic period and the relevant daily analysis methods used for the daily report.

An additional ad hoc syndromic system functioning during the Olympic period was the responsibility of the Department of the Prevention of Biological and Toxic Hazards of the Hellenic Centre for Infectious Diseases Control, and this involved the surveillance of certain pathological findings by the forensic medicine services covering the Olympic cities (Athens, Piraeus, Thessaloniki, Patras and Volos). Forensic medical services in Greece either belong to the medical schools or represent a department of the Ministry of Justice and are responsible for undertaking autopsies and participating in investigating suspicious deaths. The Hellenic Centre for Infectious Diseases Control worked with the forensic services staff in creating educational material describing the autopsy and pathology findings in human cases that might have died due to the agents included in the immediate reporting form of the Hellenic Centre for Infectious Diseases Control (the 12 diseases mentioned above) by reference to similar material produced by the United States Centers for Disease Control and Prevention (15). Forensic medical staff members are required to report the officially notifiable diseases as described in Chapter 4 in the same manner as all other physicians in Greece. After two training meetings with the forensic staff, it was agreed that staff of the Hellenic Centre for Infectious Diseases Control would contact the forensic services twice a week during the Olympic period inquiring about possible cases of the above diseases and about cases of unexplained deaths detected by the Olympic syndromic system.

All training activities described above for clinicians and public health officers included specific lectures on the surveillance systems, the necessary reporting forms and description of the process to be followed during the Olympic period. The capability of these systems to detect was emphasized, especially in case of the deliberate use of biological agents. During the last weeks before the Athens 2004 Olympic Games, special meetings were convened with infection control and microbiology laboratory personnel of the

Olympic hospitals to further stress the need for daily reporting to the Hellenic Centre for Infectious Diseases Control.

Enhancing laboratory capacity

The Hellenic Centre for Infectious Diseases Control realized early in the planning process the need for accurately identifying biological agents. Laboratory issues had already been considered since 2001, when the Centre was involved in managing anthrax hoaxes. At the beginning of the Olympic planning process, no laboratory facility working with Biosafety Level 4 standards existed in Greece. After consultation with experts, both national and European, the decision was made not to create a new one but rather to form partnerships with relevant European laboratories. Instead, the political decision favoured the enhancement of several laboratories to Biosafety Level 3, specialized in bacterial detection, in addition to the Biosafety Level 3 Virology Laboratory already existing since 1996 in Thessaloniki, which is a WHO Collaborating Centre for Viral Haemorrhagic Fevers.

For the purpose of full geographical coverage of Greece, especially since four more cities than Athens were involved in the Olympic Games, the Hellenic Centre for Infectious Diseases Control created a national laboratory network for the response to the potential deliberate use of biological agents (ARES network), including seven laboratories. This network aimed at enhancing laboratory capacity in Greece for very-high-threat biological agents by:

- promoting training of laboratory personnel;
- promoting expertise and strain exchange with international partner laboratories; and
- creating a framework of collaboration with international partner laboratories.

To fulfil these aims, the Hellenic Centre for

Infectious Diseases Control signed official collaboration agreements with two highly specialized laboratories in Europe:

- the Health Protection Agency Centre for Emergency Preparedness and Response in Porton Down, United Kingdom; and
- the Virology Laboratory in the Bernard Nocht Institute for Tropical Medicine in Hamburg, Germany.

Staff from each of the seven laboratories of the national network were trained in modern (reverse transcriptase–polymerase chain reaction and electron microscopy) and classic diagnostic techniques for the very-high-threat agents, in addition to working in high biosafety level conditions. The laboratory staff members were immunized against anthrax with anthrax vaccine (Centre for Applied Microbiology and Research, Porton Down, United Kingdom) following the currently recommended five-dose schedule (16). This same laboratory staff was designated to work with all “suspect” samples, clinical or environmental, and was placed on a 24-hour call schedule during the Olympic period covering all very-high-threat biological agents, except botulism toxin, for which samples would be sent directly to the Health Protection Agency Centre for Infections in London.

Besides the training provided by laboratories in Europe to Greek microbiologists before the Athens 2004 Olympic Games, the most important part of the collaboration agreements included the process of confirming potentially positive results and confirmatory isolation of any biological threat identified first by the Greek laboratories, implying that both the other European laboratories would also be on call for the Olympic period. After agreeing on the process of splitting samples and the type of material to be sent abroad, a memorandum of understanding was created for this specific purpose and a quality control exercise was undertaken for all laboratories during spring 2004.

In response to the official request of the Government of Greece for collaboration and assistance in case of the deliberate use of biological and chemical agents or radionuclear material, NATO posted a 150-member multinational task force that is part of its Multinational Chemical, Biological, Radiological and Nuclear Defence Battalion to Greece for the Olympic period. This included a mobile high-biosafety laboratory capable of diagnosing all very-high-threat biological agents. Further, specific memoranda of understanding were needed at the time to clarify the process for transporting samples, testing and notifying results between Greece's health services and the NATO task force.

The Hellenic Centre for Infectious Diseases Control took responsibility for transporting specimens for biological testing to the appropriate laboratory of the national laboratory network. The Centre also attempted to organize the transport of suspected specimens to the other European collaborating laboratories but, despite appropriate biohazard packaging, no commercial carrier could guarantee 24-hour, 7-day service especially if the deliberate use of biological agents was suspected. This led us to approach the Hellenic Air Force and create another memorandum of understanding describing the process of transporting samples during the Olympic period under escort by public health staff, and after its finalization, to undertake a relevant exercise with the collaboration of the Hellenic Air Force in spring 2004. During the Olympic period, the Hellenic Centre for Infectious Diseases Control, in collaboration with international expert teams from WHO, the United States of America and the United Kingdom), developed a draft standard operating procedure on collection and splitting authentic samples on site aimed at the formal handling of specimens on and off site. The document was shared and discussed with all interested parties.

Finally, in order to complete the enhancement of the laboratory diagnostic capability in Greece and place

this on a correct scientific and crime-scene conscious basis, the Hellenic Centre for Infectious Diseases Control took responsibility in assisting in training Hellenic Fire Brigade personnel in the international standards for this process. The Fire Brigade personnel were assigned to two detection and sampling teams covering Greater Athens 24 hours per day during the Olympic period, while limited personnel were also available in the periphery. Staff of the Hellenic Centre for Infectious Diseases Control wrote all necessary guidance, training the Hellenic Fire Brigade teams in four successive groups together with providing them exercise sessions. These mini-exercises included using appropriate personal protective equipment and applying the sampling guidance taught. Finally, the Hellenic Centre for Infectious Diseases Control provided the first 15 sampling kits to the Fire Brigade.

The process for organizing the international laboratory cooperation, the negotiations for the agreements and the structure of the memoranda of understanding provided very useful experience for the staff of the Hellenic Centre for Infectious Diseases Control. The agreements are provided via the European Commission (Directorate-General for Health and Consumer Protection, Health Threats Unit) to other EU countries, which would also need to form similar partnerships.

Epidemiological intervention

The Hellenic Centre for Infectious Diseases Control invested resources in enhancing its capacity for epidemiological intervention and field epidemiology in general by:

- organizing training seminars for its staff;
- training staff abroad in relevant epidemiological courses; and
- training staff by systematic participation in joint

missions with senior staff for the period before the Athens 2004 Olympic Games.

Special attention was given in training to differentiating between natural and human-made epidemics. Staff of the Hellenic Centre for Infectious Diseases Control also participated for the first time together with Hellenic Police officers in joint seminars on forensic epidemiology organized by the European Commission in spring 2004.

Case investigation protocols were revised and specifically rewritten for the very-high-threat biological agents (Table 6.1). Details and necessary evidence and questionnaires were added to assist in differentiating between natural events and deliberate use, almost all following the single-case investigation imperative.

Each of the four response teams of the Hellenic Centre for Infectious Diseases Control organized for the Olympic period was complemented by the addition of one staff member familiar with the issues of the response to the potential deliberate use of biological and chemical agents or radionuclear material (see Chapters 3 and 4).

Public health measures

This axis of activities refers to the measures needed for protecting public health in case of an epidemic, which for the purposes of this chapter would be the deliberate use of biological and chemical agents or radionuclear material.

The Hellenic Centre for Infectious Diseases Control functioned as the main scientific adviser to the Ministry of Health and Social Solidarity on issues of public health policy, preparedness planning and proposed measures for protecting public health. In this

capacity, its staff worked on creating updated public health legislation regarding quarantine incorporating lessons learned from the SARS epidemic, and this was adopted in late 2003.

The Hellenic Centre for Infectious Diseases Control submitted a proposal for a national plan for the management of the deliberate use of smallpox virus to the Ministry of Health and Social Solidarity. This plan adopted the ring vaccination policy for managing potential smallpox cases in Greece and establishing smallpox vaccination clinics if smallpox vaccination were to be needed, together with a number of pre-identified physicians specialized in diagnosing smallpox after relevant training.

The Hellenic Centre for Infectious Diseases Control also defined the minimum standards and requirements for personal protective equipment to be used by health care workers for decontamination procedures and for providing health care to people with infectious diseases, together with determining minimum requirements for decontamination facilities for hospitals. In this particular aspect of preparedness, assistance from experts from elsewhere in Europe and from the United States of America was invaluable in creating sensible and scientifically accepted guidance and minimum requirements. Technical knowledge and advice, often from different disciplines such as engineering, was sought for creating the relevant standards.

The Hellenic Centre for Infectious Diseases Control supported scientifically the Ministry of Health and Social Solidarity in setting up the National Pharmaceutical Stockpile for medicines and created a proposal for the possible amounts needed based on existing bibliography and consultations with other experts. The staff of the Ministry of Health and Social Solidarity finally decided the medicines and amount procured and was also responsible for procurement, storage and possible deployment.

Interagency cooperation

During the Athens 2004 Olympic Games, the number of visitors and participants coupled with the responsibilities of the host city posed a significant challenge to health care and public health authorities, as pointed out by the health services involved in past Olympics (17–21). To face this challenge for the Athens 2004 Olympic Games in the event of a multiple-casualty incident or the deliberate use of biological and chemical agents or radionuclear material, Greece's authorities collaborated closely to create a national security plan for the response to biological and chemical agents or radionuclear material during the Olympic period. Fig. 6.1 presents an outline of the national security plan, giving an initial hint about the need for close collaboration, cooperation and finally coordination between significant numbers of Greece's authorities.

The development of the Olympic security plan together with the preparedness exercises for the implementation of the Olympic security plan assisted in creating a close collaborative relationship between all agencies and their representatives. The Hellenic Centre for Infectious Diseases Control took active part in the planning and coordination phase of the Olympic security plan in addition to its specific activities in public health.

This whole process depended heavily on a parallel process of development of trust between all the participating agencies and ministries and respect for the work and responsibilities of each. Consistent representation, participating in all activities and willingness to find solutions for the existing gaps of preparedness all played an important role in forging closer working relationships. It also became obvious early on that authorities working at the scene of an

incident commanded more respect, and a certain camaraderie developed between these specific agencies and departments, enabling them to work smoothly together.

Preparedness for the Athens 2004 Olympic Games required public health authorities in Greece to collaborate closely for the first time with law enforcement, the military and civil protection authorities. Besides the training activities, for which staff of the Hellenic Centre for Infectious Diseases Control devoted more than 250 work hours to teaching as mentioned above, common exercises provided everyone with significant insight on the areas and issues needing improvement and closer scrutiny.

Referring back to Fig. 6.1, several coordination centres needed to collaborate closely, especially during a crisis, in the Olympic period. All joint operating centres and committees (boxes with red shading in Fig. 6.1) needed to be staffed by liaison people from the agencies involved. Of note is the lack of participation of health sector personnel in the joint Olympic Intelligence Centre. Despite attempts on behalf of public health and even common activities, the participation of non-law enforcement personnel was always met with extreme scepticism. The staffing of joint operating centres included the health sector and presented another significant challenge for the human resources of all participating agencies. After the Hellenic Centre for Infectious Diseases Control participated in the exercises, however, it concluded that using more junior staff as liaison people was preferable to keep more experienced staff in the Centre to handle any crisis from the health coordinating centres.

Greece sought and received assistance in the form of collaboration with experts outside Greece at an even higher level of international interagency cooperation in view of organizing a mass-gathering event of the magnitude of the Athens 2004 Olympic Games. In this aspect, the Hellenic Centre for Infectious Diseases Control collaborated closely with experts from the United Kingdom Health Protection Agency and the Bernard Nocht Institute for Tropical Medicine in Hamburg, Germany for organizing training for health care workers in Olympic hospitals and for Greek microbiologists on very-high-threat agents.

Several WHO experts participated in the planning process for public health purposes, taking part in some of the Olympic exercises before the Athens 2004 Olympic Games. The Hellenic Centre for Infectious Diseases Control and the Ministry of Health and Social Solidarity also collaborated closely with experts from the United States Department of Health and Human Services and the United States Centers for Disease Control and Prevention in developing the plans covering the potential deliberate use of biological and chemical agents or radionuclear material and mass-casualty incidents (Annex 4).

Finally, several experts from WHO and the United States Department of Health and Human Services were present during the Athens 2004 Olympic Games and participated regularly in the meetings of the coordination teams in the Hellenic Centre for Infectious Diseases Control and the Ministry of Health and Social Solidarity. The participating experts covered a wide area of expertise, such as surveillance and data analysis, epidemiological intervention, chemical weapons, use and deployment of stockpile of countermeasures, crisis communication and management of psychological effects.

The Hellenic Centre for Infectious Diseases Control had also seconded a member of its staff as an expert to the European Commission for 18 months to work for the EU programme on health security (11). At the same time, the Hellenic Centre for Infectious Diseases Control was able to take advantage of the activities at the European level and participate actively in exchanging information and experiences regarding planning, equipment and training at this level on the specific issues involved in managing the potential deliberate use of biological and chemical agents or radionuclear material.

Exercises during the preparedness phase

The Hellenic Police, who were coordinating the development of the Olympic security plan, quite appropriately devoted significant resources in personnel and funds for organizing multiple exercises with the assistance of experts from outside Greece. The Olympic Games Security Division of the Hellenic Police created a special exercise planning group that worked intensively in preparing five multisectoral exercises for the Athens 2004 Olympic Games.

The health sector and the Hellenic Centre for Infectious Diseases Control in particular participated actively in all exercises and assisted in creating scenarios related to the deliberate use of biological agents and to epidemics. The exercises mainly focused on managing the potential deliberate use of explosives, biological and chemical agents or radionuclear material aimed at creating mass casualties and significantly disrupting the state and the upcoming Olympic



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Training of first-responders in dealing with the potential deliberate use of biological and chemical agents or radionuclear material in preparation for the Athens 2004 Olympic Games



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The Health Coordination Command Centre team at work during the Hercules Shield exercise

Games. Most exercises included scenarios that escalated gradually to involvement and/or attacks on multiple sectors of the government, causing large numbers of victims and disruption of society.

The main multisectoral preparedness exercises included the following.

- Flaming Glaive in September 2003 was a table-top exercise focused mainly on a twofold deliberate use attack: attack with a blister (vesicant) agent in the Athens Metro and a hostage situation in the port of Piraeus. This first multisectoral exercise brought out a multitude of communication issues between the stakeholders, the need to specify more clearly each sector's responsibilities in the hot zone for the purposes of the Olympic security plan and the need for a health sector coordination centre.
- Olympic Guardian I in November 2003 was a table-top exercise with the participation of ministers and the hierarchy of all agencies involved in the Olympic security plan, together with NATO. This exercise involved for the first time the hierarchy of Greece's authorities and outlined the issues of international collaboration. It became clear that Greece's services needed to definitively and accurately outline their own capacity and resources and the possible assets in international assistance that would be needed in case of the deliberate use of explosives, biological and chemical agents or radionuclear material during the Olympic period, accompanied by a plan for assimilating all international assistance offered.
- Blue Odyssey in February 2004 was a large-scale field exercise with a scenario involving the potential deliberate use of explosives, biological and chemical agents or radionuclear material. This exercise allowed for an almost real-time exercise of the coordination centres and intervention teams at the hot zone, where the participants used all available detection and protective equipment. Communication issues were again prominent during the exercise, together with timeliness of the intervention teams and effective command of the scene.
- Hercules Shield in March 2004 was a combination field and table-top exercise lasting 10 days



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Training of first-responders in dealing with the potential deliberate use of biological and chemical agents or radionuclear material in preparation for the Athens 2004 Olympic Games

and involved mainly the coordination centres at all levels (Fig. 6.1). The second half of this exercise involved the health sector and presented the health services with a variety of scenarios including the deliberate use of explosives resulting in multiple casualties, a legionellosis outbreak in an Athens hotel, the deliberate use of a biological agent and the initiation of an influenza pandemic. Communication issues were again identified as a major problem, especially between coordination centres. International observers from the United States Department of Health and Human Services and WHO (WHO Regional Office for Europe and WHO headquarters) contributed to the exercise analysis and lessons learned. Finally, all participants realized that each sector involved in the Olympic security plan needed a concrete overview of the national resources that would be dedicated for the response to the potential deliberate use of biological and chemical agents or radionuclear material.

- Olympic Guardian II in May 2004 was a large table-top exercise with the participation of many ministers and the hierarchy of all agencies

involved in managing the potential deliberate use of explosives or biological and chemical agents or radionuclear material. Participants included also representatives from NATO and the Olympic Advisory Group of countries (Australia, France, Israel, Russian Federation, Spain, United Kingdom and United States of America). This exercise involved multiple escalating scenarios involving the potential deliberate use of explosives, biological and chemical agents or radionuclear material during the Olympic Games and exposed the participants to issues related to extreme situations of social disruption and the type of crisis management decisions that would be needed after multiple incidents of deliberate use of explosives, biological and chemical agents or radionuclear material.

All these exercises were important in obtaining experience for the public health personnel involved, especially since the health sector did not manage to organize a health-focused exercise of similar magnitude before the Olympic Games. The Hellenic Centre for Infectious Diseases Control planned and organized its Coordination Centre in view of participating in Hercules Shield, and after a few modifications resulting from this exercise, the Coordination Centre structure and processes remained and functioned successfully throughout the Olympic period.

The preparation exercises assisted in revealing the weaknesses of the proposed plans and the procedures needed for the communication and the coordination of the participating centres involved in managing all types of crises, especially ones caused by the potential deliberate use of biological and chemical agents or radionuclear material. Problems in communication between agencies arose in each exercise. This is also the most common finding in international literature reviewing disasters and major incidents in general, but communication failure mostly results from organizational errors rather than failure of equipment (21).

Other important lessons from these exercises included the need for a process for clearly activating the plan for managing the potential deliberate use of biological and chemical agents or radionuclear material and more effective and strict scene management.

Clear and rapid decision-making was needed at the scene of a suspicious incident, especially regarding the perimeter of the incident and the need to rapidly decontaminate people at the scene who may have been exposed.

Results

The Hellenic Centre for Infectious Diseases Control created a database (using Microsoft Access) to monitor all activities involving any response from its Co-ordination Centre. Three members of the staff of the Co-ordination Centre were trained to input during their shifts all required information regarding all incidents and requests handled by the Centre (time and route of notification, type of incident and request, scanned related documents such as laboratory results etc.). An incident was defined for the Olympic period as any notification, question or enquiry to the staff of the Co-ordination Centre of the Hellenic Centre for Infectious Diseases Control that resulted in a report, documented phone call or other action in response. The Co-ordination Centre used this database for monitoring as well as for quality assurance purposes during the Olympic Period.

According to this database, the Hellenic Centre for Infectious Diseases Control handled 79 incidents (Fig. 6.2), of which the vast majority (68 (86%)) involved incidents related to communicable diseases, as expected, due to the Centre's mandate and expertise. Each incident or request involved between one and more than five reports to the hierarchy of the Centre, the Ministry of Health and Social Solidarity or other ministries, the hospitals and local public health authorities or other involved agencies and authorities.

The Hellenic Centre for Infectious Diseases Control was notified of six incidents (8%) due to the suspicion of the presence of a biological agent. Five incidents were notified in Olympic cities (four in Athens and one in Patras) and resulted in the activation of the Olympic security plan for responding to the potential deliberate use of biological and chemical agents or radionuclear material. Four of the five incidents involved some kind of powder found in a Hellenic Post facility, which notified all four to the Hellenic Police. Five of the six incidents occurred in the days immediately before the opening of the Olympic Games. Due to the traffic rules enforced in the Olympic period, three of the five incidents activating the Olympic security plan were notified outside work hours or at night. The Co-ordination Centre of the Hellenic Centre for Infectious Diseases Control discussed the development of each incident at its next daily meeting, and reports were prepared as the event developed and the results became available.

Fig. 6.2 shows the incidents the Co-ordination Centre of the Hellenic Centre for Infectious Diseases Control handled according to type, and Fig. 6.3 shows the frequency of incidents and requests to the Co-ordination Centre per day during the Olympic period, with the potential biological incidents marked in red.

All samples from the six potential biological incidents tested negative for very-high-threat bacterial and viral agents. Chemical testing revealed one substance to be sand, one corn flour, one a diet supplement in powder form and one sugar, and another incident involved various pharmaceutical substances (unidentified medicines discovered in the scanned luggage of a participant country delegation).

Another three incidents involving the suspicion or presence of a chemical agent were reported to the Olympic Security Command Centre and the

Coordination Centre of the Hellenic Centre for Infectious Diseases Control in a delayed fashion, and the Olympic security plan was never activated for them. The Hellenic Centre for Infectious Diseases Control staff was required nevertheless to disseminate information to the Ministry of Health and Social Solidarity and other involved operations centres regarding the effects of the agents involved and participated in investigating one of them.

Finally, during the Olympic period, the ad hoc system of forensic services surveillance notified the Hellenic

Fig. 6.2. Type and number of incidents handled by the Coordination Centre of the Hellenic Centre for Infectious Diseases Control

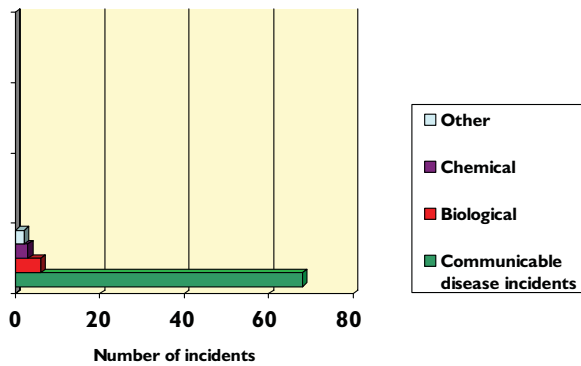
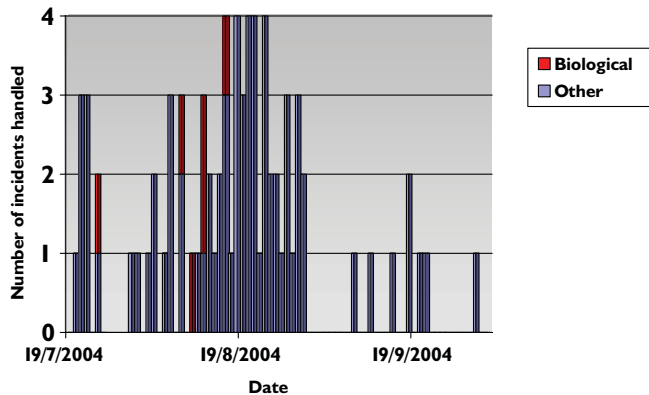


Fig. 6.3. Number of incidents handled by the Coordination Centre of the Hellenic Centre for Infectious Diseases Control per day of the Olympic period in 2004, showing in red the incidents with the potential deliberate use of biological agents



Centre for Infectious Diseases Control of the unexplained death of a middle-aged person following a brief illness involving symptoms of multiorgan failure and disseminated intravascular coagulation. Autopsy findings were consistent with disseminated intravascular coagulation and multiorgan failure, without more specific findings. Since both culture and toxicological tests were ultimately negative, the case was not investigated further.

Incident description

To give the reader an idea about the timeline of the development and management of an incident during the Olympic period in Athens, Box 6.1 describes one of the incidents notified to the Coordination Centre of the Hellenic Centre for Infectious Diseases Control due to suspicion of a biological agent, for which the Olympic security plan was activated and all the necessary procedures were followed.

This incident was deemed suspicious and high risk enough to activate the national security plan, and Box 6.1 outlines some of the significant issues that were recognized in such incidents during the Olympic period in Athens.

- Initial risk assessment is very hard for a team of experts without directly overseeing the scene of the incident. The initial reports coming from first-responders at the scene are often fragmented and inaccurate, as people tend to report only the obvious. Information might change and evolve as more experienced people arrive at the scene. In the particular incident described, a significant piece of information was missing: the working area where the leaking box was discovered was actually one large storage space where 72 people were working at the time of the incident although only 5 employees actually touched the particular leaking box.
- Public health officers at the scene are considered the official experts regarding potential exposure to a biological agent, need for decontamination and need for chemoprophylaxis administration, which might put them in a position fraught with stress. They need to be attentive, cooperative and resourceful. The physician on the scene in the particular case readily enlisted the assistance of police officers to register everyone's name and contact details for follow-up and instructions.
- The decontamination process in the particular incident needed to be immediately expanded to cover all potentially exposed people as mentioned above. The capacity required at the scene may need to be significantly expanded as additional information is collected.
- Although the sampling process was unified, biological and chemical samples were collected in different ways, due to differences in the agency responsible for their testing. Other countries collect samples that are divided officially in a high-biosafety laboratory. The processes and protocols need to be created well ahead of time and exercised according to the national system.
- Although risk assessment changed as more information was collected as the incident evolved, the process of activating the Olympic security plan could not be reversed despite the new evidence available. Everyone was reluctant to take responsibility. Processes for this reversal need to be considered and included in a relevant Olympic security plan to conserve resources.
- Nevertheless, the information about a decreased risk always trickled down to the teams operating at the scene, creating a minimal-threat sense of security. If this situation happens repeatedly, it reinforces for the first-responders the false conviction that all incidents are actually hoaxes and it therefore causes procedures to relax, which would be extremely dangerous in actual exposure to a very-high-threat biological agent.
- Operations involving multiple teams from different agencies operating at the same scene tend

Box 6.1**Description of an incident that resulted in the activation of the national security plan for the response to biological and chemical agents or radionuclear material during the Athens 2004 Olympic Games**

01:40 – powder leaking from a cardboard box while unloading cargo from a European flight to Athens at the postal facility of Athens International Airport

Notification to Airport Police

01:50 –

Notification to joint Olympic Security Command Centre

02:10 – notification of Expert Crisis Management Team

Initial risk assessment as suspicious incident

- Olympic period
- Olympic city
- Airport facility
- Postal facility
- Package mailed from the United States of America
- Leak of unknown substance
- Powder substance, not white, nongranular

02:15 – activation of the national security plan and notification of all participating agencies to be present at the scene

03:00 – arrival of a Hellenic Centre for Infectious Diseases Control team at the scene for assessing the need for chemoprophylaxis and subsequent sample transport for biological testing

03:30 – discovery of five people directly exposed to the substance and 72 people working in the same area with common ventilation

Elements for secondary risk assessment

- Package originally mailed to Albania
- Package accurately marked with sender and recipient data
- Weight significant (17 kg, about 50 cm by 50 cm)
- Leak due to rough manipulation by postal employee

04:00–05:00 – operation continues according to the national security plan

- Evacuation of all employees from the airport postal facility site
- Names and contact details of possibly exposed people registered for follow-up
- Fire Brigade sampling team operation for sampling
- Fire Brigade decontamination operation of possibly exposed people
- Public health assessment with Hellenic Centre for Infectious Diseases Control coordinator: low risk for anthrax spores exposure
 - No chemoprophylaxis to be administered awaiting for results
 - Instructions to close postal site until laboratory results available
- Samples delivered to Hellenic Centre for Infectious Diseases Control team

06:00 – delivery of first sample to Bacteriology Laboratory in Athens

07:00 – return to the Coordination Centre of the Hellenic Centre for Infectious Diseases Control and report

12:30 – delivery of second sample to Virology Laboratory in Thessaloniki

to last long, which is not very relevant to biological agent exposure but would be crucial in case of a chemical agent, in which all efforts are needed to minimize response times.

- The original incident site, in this case the postal facility at Athens International Airport, is always anxious for the operation to terminate and, after the initial shock wears off, would invariably try to

shorten the time during which activity is limited. To avoid such pressure and possible misunderstandings for communication purposes, all involved partners in the plan need to know the time needed for dependable laboratory results on which to base decisions for public health measures.

Discussion

As indicated by the above incident description, risk assessment is a vital part for the triggering of the Olympic security plan, but it represents an extremely difficult task that should combine science and intelligence information. In the Athens 2004 Olympic Games, all law enforcement agencies were on high alert due to the generic forewarning about the potential deliberate use of explosives, biological and chemical agents or radionuclear material. Subsequently, all events were considered extremely suspicious and the Olympic security plan was activated, probably for far more incidents than absolutely necessary. As Fig. 6.3 shows, most incidents occurred in the days immediately before the Olympic Games, indicating the strategic importance of those days. As Fig. 6.3 implies, the Paralympic Games represent a lower-profile, quieter event, although the alert level remained high.

The Olympic security plan could not be deactivated despite new evidence from the scene. This is certainly debatable, but the argument from the public health perspective is that it becomes dangerous to repeatedly respond to hoaxes because a false feeling of security develops, especially among first-responders.

Despite many exercises, managing the scene of such an incident always proves difficult, and there were

delays in decision-making and difficulty in handling the decontamination of possibly exposed people. Communication issues between various joint operating centres and agencies still figured prominently in the problems noticed, which implies deeper organizational problems in the processes.

Although field detection was available to the responding teams, it was never considered adequate for public health decision-making. Delays in obtaining dependable results by accredited microbiological, virological and chemical laboratories need to be clear ahead of time. At the time of the Olympic Games, at least 12 hours was needed for the first dependable results by RT-PCR and electron microscopy. At least 24 and up to 48 hours was needed for the microbiological laboratories to produce the final culture results.

Despite all training and exercises, mishaps with the sampling procedures still occurred and the samples received in one incident were dangerously large for the laboratories of the national laboratory network for the response to the potential deliberate use of biological agents (ARES network). Collaboration with law enforcement was extremely useful, but continued training, development of trust and respect for the work on both sides are needed.

The Coordination Centre of the Hellenic Centre for Infectious Diseases Control was considered quite helpful for the public health response in each incident together with the presence of a more senior scientist on call as coordinator. The daily meetings of the epidemiological and the coordination teams of the Hellenic Centre for Infectious Diseases Control were also very helpful in managing all events and the response of the health sector. In general, personal contact with the health care workers in hospitals was quite valuable in producing sustained response and positive acceptance of the principles for dealing with incidents involving the potential deliberate use of biological and chemical agents or radionuclear material and/or mass casualties. In the post-Olympic era, processes in both public health and health care degenerated. Continual training is needed to maintain capacity and capability in the health sector.

In general, as reported in the Atlanta 1996 and Sydney 2000 Olympic Games (16–19), the Athens

2004 Olympic Games had only a small actual impact on public health. The cost of the planning process, equipment procured and deployment of personnel (national and international) is hard to estimate and most likely actual figures will never be available, although it can safely be said to be quite high. The total cost of the Athens 2004 Olympic Games was initially projected at €4.6 billion but was reported to be up to €7 billion. Of this cost, the estimated total cost for security was at least €1 billion (4,22).

National interagency and international collaboration is an extremely useful and interesting process. One of the most complicated subjects was the need to predict the assistance needed in the event of a disaster or mass-casualty incident. Having no simulation models available, public health services in Greece were called upon to make impossible predictions based on worst-case scenarios created by law enforcement.

Conclusions and lessons learned

This report and discussion of the public health activities preparing for the response to the potential deliberate use of biological and chemical agents or radionuclear material at the Athens 2004 Olympic Games show that a valuable process took place, strengthening the public health services in Greece. Capacity and needs were thoroughly assessed initially, which was and still remains valuable for reference purposes.

In the current era of rapid information dissemination and known international implications of incidents and of international scrutiny and high expectations, sound public health structures are absolutely needed in the

host country of a mass-gathering event. Public health structures need to be able to face and respond to natural and human-made events and all emerging health threats. The most important lesson and argument used to raise awareness and cooperation was the dual use of public health structures. Taking into account the time that has passed since the Athens 2004 Olympic Games and international reports, dual use for any structure needs to be incorporated when it is created (23–25). Processes, systems or structures need to be developed with their future use in mind, together with built-in quality assessment mechanisms.

Despite the obvious focus on public health services

in this chapter, one more point needs to be clarified and stressed. A strong public health system required to respond to the potential deliberate use of biological agents needs to be connected to an equally prepared and effective health care system to diagnose, treat and care for the people exposed. Health sector preparedness needs to be considered as a jigsaw puzzle where all parts need to fit together to create a smooth but bold and unified picture (26).

Early involvement of the hierarchy of the health sector is vital for implementing planned systems and educational activities and for developing international collaboration, which frequently are considered very political moves. Scientific organizations in public health need to be able to translate the scientific needs into policy-making needs and the projected budget involved for the politicians to make decisions. The politicians involved need to be frequently updated and kept involved to appreciate the magnitude of the preparedness needed. Finally, enough time needs to be devoted to planning and training activities at full speed early on so that, closer to the event, some personnel can be diverted to plan for the future activities of the people and the systems deployed for the particular event.

The staff of the Hellenic Centre for Infectious Diseases Control was heavily involved in creating standards for equipment and structures (such as decontamination systems in hospitals). This activity proved a great challenge for the health care personnel and obviously required close collaboration with experts from engineering or occupational health. This activity involves another significant aspect of preparedness: the need to be a rational consumer of scientific innovations to augment public health response, such as stationary detection systems, field detectors, portable decontamination equipment, personal protective equipment and portable laboratories. As an informed consumer, public health services should identify what their realistic needs are, always keeping in mind national budget issues and postevent use. Public

health staff should be continuously updated scientifically, maintain integrity throughout the process and always be realistic in the proposed standards.

Cross-training of the public health staff was extremely useful for planning the response mechanism, especially as it enabled using staff members in training the trainers for the rest of the health care workers in the Olympic hospitals. This was generally well received by junior staff, especially when it involved on-the-job training with more senior staff members. As in the case of processes mentioned above, however, cross-training requires continuing education and updating.

Practice makes perfect. After participating in the law enforcement exercises, the health care and public health services realized the need for health-focused exercises. Despite their obvious usefulness, the exercises under law enforcement have a different focus, and health remained peripheral to the issues to be managed. Public health services in countries preparing for a mass-gathering event should seriously consider devoting resources to realizing their own exercises professionally, addressing their own needs. Health sector exercises are valuable investments both in expertise for staff involved and in their return of much-needed feedback on preparedness gaps and the effectiveness of the existing response plans.

In this era of emerging public health threats with an emphasis on the potential deliberate use of biological and chemical agents or radionuclear material, close collaboration is urgently needed with other services outside the health sector. This collaboration mentality needs to be reinforced at every level in the health sector, as all recent and older crises indicate. The Athens 2004 Olympic Games required strong collaboration with law enforcement for security reasons even at the most confidential levels such as intelligence, SARS indicated the need to collaborate at the ports of entry with various stakeholders (such as customs, airlines and airport authorities) and the potential avian influenza epidemic stresses yet again

the need to work closely with veterinary public health services (26–29).

One of the most interesting aspects of the preparedness for organizing a mass event today is the exchange of expertise and ideas with counterparts at the European level and more broadly. Public health experts with the experience of organizing past, present or future mass-gathering events need to be able to speak with each other and to collaborate to cover any gaps identified. Public health has a long tradition of free exchange of knowledge and guidance, and all efforts need to be undertaken so that this tradition is maintained. For Greece's public health experts, collaboration with international experts increased expertise and provided insight into international negotiations and agreements. This publication represents the first attempt to document experience from various levels and to create a strong reference for public health services attempting to manage a mass gathering in the future.

Last but not least, there is a lesson regarding the mental needs of the staff involved in the preparedness process and the actual event. During the immediate pre-event phase and the actual event, some staff members might experience burnout and significant stress. All staff needs to be prepared for the "postevent blues", a feeling of letdown after the ceremonies are over and all the lights are out. The post-Olympic era has created a strong feeling of purposelessness and work without a major objective, which is generally reinforced by the restriction of budgets and activities to the levels prevailing before the Olympic Games. Human resources management also faces significant challenges in the period after a mass-gathering event, such as mass requests for vacation time and sabbaticals postponed before the event. A suggestion is to preplan staggered vacation for everyone, to use staff in a regulated process to implement the necessary changes and assimilation into postevent use and to plan early for new activities that will give staff new incentives for work.

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PART 3

**Addressing the environmental health challenges
of the Athens 2004 Olympic Games**

Introduction

Christos Hadjichristodoulou and Jenny Kourea-Kremastinou

Addressing the environmental health aspects of the Athens 2004 Olympic Games was a complex and challenging undertaking. Many athletes from different countries and a multiplicative number of visitors were expected to gather in a relatively small geographical area. The experience from the previous Olympic Games in Atlanta (1996) and Sydney (2000) (1–3) and other mass gatherings (3–5) was a valuable source of experience for planners in Greece.

In 2001, the National School of Public Health in Athens, in cooperation with the Ministry of Health and Social Solidarity, formed a multidisciplinary team of public health professionals, the Olympic Planning Unit, to document the needs and deficiencies of the local public health agencies and to identify the potential public health risks during the Olympic Games. Chapter 7 presents the findings of the needs assessment.

From 2002 to July 2004, an active integrated environmental health surveillance and response system was developed for the Athens 2004 Olympic Games to monitor and prevent exposure to environmental hazards, which included standardizing, computerizing and electronically transmitting data on environmental inspections of 17 site categories of public health interest, water quality monitoring and suggested corrective actions. Chapter 7 describes the methods

used for developing the environmental health surveillance system and the lessons learned. The Olympic Planning Unit integrated and centrally managed data from 13 prefectural departments of public health and recommended, supervised and coordinated prompt corrective action.

The prefectural departments of public health had the primary jurisdiction for environmental health safety controls inside and outside the Olympic venues and the food safety controls outside the Olympic venues. In parallel, the Hellenic Food Authority was responsible for ensuring food safety within all Olympic venues and coordinating a laboratory network in all Olympic cities for food sampling and analysis.

The Central Public Health Laboratory and the Department of Microbiology of the National School of Public Health provided testing services to support the environmental inspections of targets of public health importance, including potable and recreational water safety. In addition, the Department of Microbiology of the National School of Public Health developed the laboratory capacity to respond to incidents involving the deliberate use of biological agents.

The Department of Sanitary Engineering and Environmental Health of the National School of Public Health was responsible for ensuring the safety of

drinking-water in holding tanks at the Olympic venues against the risk of contamination resulting from an accidental or deliberate act. The Department of Parasitology, Entomology and Tropical Diseases of the National School of Public Health implemented a project aimed at recording in detail all the types of potential mosquito breeding sites in the Prefecture of Attica, studying all species that breed in each site, observing population fluctuation throughout the year, evaluating the risks posed by the presence of several

species and contributing to planning and implementing a successful programme for managing the mosquito population to reduce their presence and maintain it at acceptable levels using environmentally sound methods.

This part covers the planning process, activities and outcomes in environmental health surveillance and management, water quality control, microbiological laboratory testing and mosquito control.

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CHAPTER 7

Environmental health surveillance and management of food and water safety

**Christos Hadjichristodoulou, Varvara Mouchtouri
and Jenny Kourea-Kremastinou**

Introduction

A public health sector that enforces and ensures prevention, control and management of environmental health issues is essential during a mass gathering such as the Olympic Games. At the Athens 2004 Olympic Games, many people were potentially exposed to possible environmental health hazards given the massive food service operations, common and excessively used drinking-water and recreational water supplies, crowded accommodation and shared sanitary facilities in hotels, Olympic venues and cruise ships. All these provided conditions favourable to the spread of infectious diseases. Environmental health issues as part of public health surveillance were effectively managed in previous Olympic Games (1–5), while enhancements initiated for the Games were used to yield long-term benefits for the local public health systems (6).

The international mass media had expressed doubts about the success of the Athens 2004 Olympic Games, and there were worrying signs that Athens might fail to be ready on time. Careful planning and

intensive preparations were therefore required to successfully respond to the major challenge of the Athens 2004 Olympic Games.

The Ministry of Health and Social Solidarity initiated comprehensive planning for the Olympic and Paralympic Games 18 September 2001 with the formation of the Olympic Planning Unit at the National School of Public Health to assess the capacity and deficiencies of public health agencies (this section) and to design and implement the environmental health surveillance system for the Athens 2004 Olympic and Paralympic Games (later in this chapter).

This section presents the methods used to implement a comprehensive needs assessment process for the public health infrastructure and to set priorities among the potential public health risks during the Olympic period. Finally, the section presents the actual results observed during the Athens 2004 Olympic and Paralympic Games.

Methods

Needs assessment process

Initially, the existing environmental health legislation was identified, and a needs assessment process was organized based on the knowledge of each agency's obligations determined by law. Seventeen specific questionnaires were administered during on-site visits to collect information on the personnel, resources

and training of each public health agency. The needs assessment process started in September 2001 and continued until 31 March 2002.

Prefectural departments of public health were expected to play the most important role during the Olympic period. The challenges for each prefectural department of public health depended on the

presence of Olympic venues within its boundaries, the size of its population, the number of hotels and the number of tourists expected. Thus, the prefectural departments of public health were ranked according to the priority of their needs (7,8).

Number of visitors expected

Knowing the number of people attending the Games was a prerequisite for planning and implementing an environmental health surveillance system. The Athens 2004 Olympic Games Organizing Committee provided information on the number of delegations, athletes, officials and mass-media representatives. The number of visitors, however, was not known. An estimate was attempted based on the attendance at previous Olympic Games (Table 7.1). The countries included within a circle with a radius of four hours by air from Athens were considered the most probable sources of visitors during the Athens 2004

Olympic Games. Moreover, data from previous years' most popular portals of entry during the month of August were obtained from the Greek National Tourism Organization (7).

Public health risks

International travel involves risks to travellers, and mass gatherings are associated with increased numbers of accidents and higher population morbidity (9,10). For example, several communicable diseases that are not endemic in Greece could possibly be imported. Based on the review of medical literature related to mass gatherings in general and Olympic Games in particular, the potential public health risks for the Athens 2004 Olympic and Paralympic Games were identified (Table 7.2). These risks were divided according to cause (infectious and noninfectious) and priorities were set in terms of likelihood of occurrence: high and low priority (7).

Implementation and outcomes

Needs assessment

More than 100 on-site visits were conducted in Athens and the other Olympic cities (Thessaloniki,

Patras, Volos and Heraklio), and 170 questionnaires were completed. As a result, many deficiencies in personnel, resources, training and coordination were identified in most prefectural departments of public

Table 7.1

Alternative scenarios for the number of visitors expected during the Athens 2004 Olympic Games

		Highest expectation scenario	Most probable scenario	Lowest expectation scenario
Pre-Olympic period	June–July	450 000	200 000	100 000
Olympic period	August	3 570 000	1 500 000	850 000
	September	460 000	250 000	50 000
Total (summer 2004)		4 480 000	1 950 000	1 000 000

Table 7.2
Potential public health risks identified for the Athens 2004 Olympic Games

	High risk	Low risk
Infectious diseases	Travellers' diarrhoea	Hepatitis A
	Foodborne and waterborne diseases	Brucellosis
	Airborne diseases	Non-endemic diseases
	Sexually transmitted infections	Severe acute respiratory syndrome (SARS)
		Deliberate use of biological agents
Non-infectious causes	Heat-related illness	Deliberate use of chemical agents, radionuclear material or explosives
	Road crashes	
	Drowning – other injuries	

health. Environmental health inspections performed at the time of the assessment were deemed inadequate, and no effective penalty system was identified.

A series of proposals was therefore incorporated into the Olympic environmental health plan. The proposals referred to developing and implementing special regulations specifically prepared prior to the Olympic Games and enhancing the capacity of the prefectural departments of public health. A total of 196 public health inspectors, 86 working outside and 110 accredited to work inside the Olympic venues, were considered necessary for executing the environmental health inspection during the pre-Olympic and Olympic periods, and special efforts were made to assign them accordingly. Specific training programmes for the public health inspectors were proposed to be implemented. A programme of intense inspections during the Olympic period was also considered, modified accordingly for inside and outside the Olympic venues. The safety and sanitation of food (preparation and service), drinking-water, pest control, waste management (solid and liquid), toilet sanitation, cooling towers, swimming pools and other water-sport venues were determined to be the main inspection challenges. In addition, a communication network was recommended between the prefectural

departments of public health, the Ministry of Health and Social Solidarity and the Olympic venues that would facilitate their coordination in responding to public health emergencies. All findings and proposals were entered onto a multimedia compact disk. Many hyperlinks were created throughout the text so that readers would be able automatically to refer to relevant legislation. The compact disks were submitted to the Ministry of Health and Social Solidarity for further consideration and dissemination.

Most of the Olympic venues were in the four counties of Athens and Eastern Attica (Fig. 7.1). Thus, the five prefectural departments of public health in Athens received the highest priority followed by the prefectural departments of public health of Piraeus, due to the ten cruise ships that were expected to be harboured and used as floating hotels during the Olympic Games, and then the prefectural departments of public health of the other Olympic cities (7).

Number of visitors expected

About 18 000 athletes and escorts from 201 countries were expected to participate in the Olympic

Fig. 7.1. Map of Greece with Olympic cities and all the counties involved



Source: Olympic Planning Unit, National School of Public Health, Greece

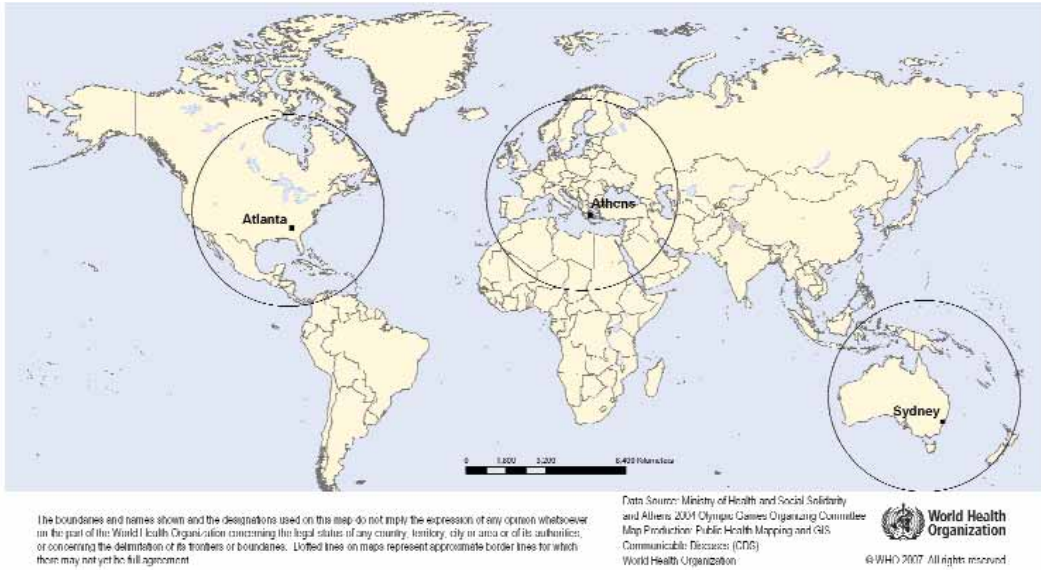
Games and 7000 in the Paralympic Games. Most of the athletes were expected to come from Europe and North America. Specifically, 9000 were expected from Europe, 5300 from the Americas, 2500 from Asia, 1400 from Africa and 900 from Oceania. In the Paralympic Games, 95% of the athletes were expected to arrive from Europe, North America and Oceania. An estimated 23 000 mass-media representatives were expected to visit Athens to broadcast the games. According to the Organizing Committee's plan, all athletes would be accommodated in the specifically constructed Olympic Village and reporters in the Media Village.

Based on the assumption model described in the methods section, the circle of expected visitors around Athens included most of Europe and parts of Africa and western Asia (Fig. 7.2). Excluding most of the population of the former USSR, countries in eastern Europe, Africa and Asia due to their lack of financial resources, the population of the Athens

four-hour air circle included about 390 million people, whereas Atlanta's circle included 250 million people and Sydney's 30 million people. Atlanta had about 2 million visitors during the Olympic Games and Sydney about 300 000, which translates into 0.8% of the potential population for Atlanta and 1.0% for Sydney. Using Atlanta's percentage (0.8%), the expected number of visitors for the Athens 2004 Olympic Games was calculated (3 120 000) and the usual number of tourists in August added (450 000). This total of 3 570 000 visitors therefore constituted the maximum expectation scenario, assuming that the international political situation would be ideal during the pre-Olympic period. Table 7.1 presents the three different scenarios, which were developed by considering factors that might affect attendance at the Games.

According to data from 2000 and 2001 obtained from the Greek National Tourism Organization, 83.6% of the tourists arrived in Athens by air,

Fig. 7.2. Geographical area from which the majority of visitors for the Athens 2004 Olympic and Paralympic Games were expected with comparisons for the Atlanta 1996 and Sydney 2000 Olympic Games (information provided by the Ministry of Health and Social Solidarity and the Athens 2004 Olympic Games Organizing Committee)



9.8% by car, 7.4% by sea and only 0.2% by train. Athens International Airport and Piraeus Harbour were therefore expected to be the most loaded ports of entry followed by the airports of Thessaloniki, Rhodes and Heraklio and the ports of Crete and the Cyclades islands (7).

Public health risks

Based on the public health risks classified and priorities set (Table 7.2), foodborne and waterborne diseases, during the pre-Olympic and Olympic period, were considered to have the highest risk because of the enhanced production and rushed transport of large quantities of food and bottled water to meet the increased demand from Olympic venues, hotels, restaurants and food stores. For example, the Organizing Committee reported that three restaurants would operate in the Olympic Village where

250 chefs and 250 assistants would be preparing 50 000 meals per day to cover the needs of the Village's residents. In addition, many canteens and outdoor vendors were expected to offer food around the venues, presenting a serious challenge to the inspecting agencies and a greater risk to public health.

Second, other illnesses may cause outbreaks by airborne transmission, especially within the confines of indoor venues and/or cruise ships, such as influenza (considering that some of the athletes and spectators will be coming from the Southern Hemisphere), tuberculosis, meningitis, pertussis, measles and Legionnaires' disease (2,11). Infectious diseases of lower risk were considered to be several non-endemic diseases, such as malaria, cholera, yellow fever and haemorrhagic fevers. Hepatitis A and brucellosis, although endemic, were also considered of lower risk. Environmental health inspections, especially inside the Olympic venues, were expected to be

effective in preventing the distribution of contaminated foods, since transmission occurs by consuming specific items (seafood for hepatitis A and unpasteurized milk products for brucellosis). Finally, the 2002–2003 epidemic of SARS remained on the list of potential challenges for the public health infrastructure during the Olympic Games.

Moreover, potential risks with noninfectious causes such as heat-related illnesses, which constituted a real problem in the Atlanta 1996 Olympic Games (12), were a high priority in Athens due to the high temperature and humidity in August (Table 7.3). In

addition, motor vehicle accidents, drowning and other injuries outside the home were expected to increase during the Athens 2004 Olympic and Paralympic Games (11,13). Nevertheless, since Greece was not implicated in situations that could make the Olympic Games a target of groups interested in the deliberate use of explosives, biological and chemical agents or radionuclear material, such attacks and incidents were considered of lower risk. However, high preparedness levels were required and strict security measures were taken, especially around Olympic venues, because of the major public health implications of such incidents (14,15).

Lessons learned

The Athens 2004 Olympic and Paralympic Games had certain individual characteristics that placed complex demands on environmental health planning. The large number of expected athletes and visitors concentrated in a small geographical area that was

already densely populated and the long duration of the games comprised some of the challenges for the public health infrastructure of Greece. The key public health issues of concern included food safety (16) and the other environmental health issues mentioned

Table 7.3

Important information for the period of the Athens 2004 Olympic Games

Number of participating delegations ^a	201
Number of accredited athletes ^a	18 000
Attica population	3.5 million
Greater Athens population	3.1 million
Highest number of expected visitors in Athens	4.48 million
Average historical temperature for Athens during August	27.9°C
Average historical high temperature for Athens during August	31.4°C
Highest expected temperature in Athens during August 2004	44.2°C
Rainfall in August 2004	4 mm
Air humidity average in August 2004	46%

^a Information provided by the Athens 2004 Olympic Games Organizing Committee.

above, plus heat-related illnesses (11,17) Legionnaires' disease (18), sanitation on cruise ships (18) and emergency management (potential deliberate use of explosives, biological and chemical agents or radionu-clear material) (19). Thus, early planning and effective cooperation among the prefectural departments of public health and the Olympic Planning Unit aimed to secure a comprehensive environmental health inspection programme during the Athens 2004 Olympic and Paralympic Games.

Increased public health surveillance was first described for the Los Angeles 1984 Olympic Games (5). Since then, the host cities that followed have implemented many modifications and improvements. Information from the Atlanta 1996 Olympic Games (1) described a systematic, coordinated process in planning for public health response. More than 10 000 athletes from 197 countries and about 2 million visitors gathered to watch the games. Atlanta's state health agency therefore established a central Public Health Command Center and response teams for environmental health emergencies (9,13,19). Likewise, the Sydney 2000 Olympic Games attracted more than 10 000 athletes, 5100 officials, 15 000 mass-media people and 300 000 domestic and international visitors. The New South Wales Health Department established an Olympic Planning Unit in 1996 for the Olympic environmental health surveillance system (2,20,21).

In Greece, a similar approach was followed to enhance the human resources and overall preparedness of the prefectural departments of public health involved. Due to lack of standards and adequate

funding, the agencies were not uniformly prepared and had a broad range of different capabilities in terms of personnel, resources and training. Efforts to increase the capacity of and coordination between the different prefectural departments of public health were therefore a particular challenge and continued to be an ongoing task until the beginning of the Olympic period. Such efforts remain central in every occasion for planning for public health agencies' preparedness for mass gatherings. Additional budgeting for personnel, equipment and training for every agency involved in the environmental health surveillance system during the Athens 2004 Olympic and Paralympic Games was one of the most important parameters (22).

A postevent assessment of the effectiveness of the proposed environmental health surveillance system, showed that, overall, the recommendations made by the Olympic Planning Unit and implemented in cooperation with the prefectural departments of public health and the Ministry of Health and Social Solidarity were successful. Information from the Organizing Committee on attendance revealed that, in the end, 11 099 athletes from 202 countries attended the Athens 2004 Olympic Games, and 3960 athletes from 136 countries attended the Paralympic Games. The number of official mass-media representatives was estimated at 5500 during the Athens 2004 Olympic Games and 1400 during the Paralympic Games. Athens had about 500 000 visitors in August 2004. This number approaches the lowest expected number. The international political situation explains in part the relatively few visitors (7).

Environmental health surveillance system

Introduction

Based on the capacity assessment findings presented in the previous section and data obtained from previous Olympic Games, an environmental health surveillance system was developed. This section describes how the environmental health surveillance programme for the Athens 2004 Olympic Games was implemented and evaluated, presenting and discussing the results and lessons learned. The section explores the potential for using enhanced environmental health surveillance not only during mass gatherings but also routinely within the national public health system.

Methods

The integrated environmental health surveillance programme included a computerized standardized inspection system of all environmental health aspects

and monitoring the microbial quality of water. The main objectives were the early detection of emergencies that might require rapid intervention and the coordination of corrective actions. Environmental health targets included hotels, restaurants, other food premises, canteens, water supply systems of buildings, swimming pools, decorative fountains, cooling towers, passenger ships, camps, seacoasts, airports, marinas, bottled-water plants, ice-producing plants, waste management facilities, sewage treatment units, public toilets, areas requiring pest control and the Olympic cruise ships. The personnel of 13 prefectural departments of public health performed the inspections in the five Olympic cities of Greece (Athens, Thessaloniki, Volos, Heraklio and Patras). The prefectural departments of public health did not have jurisdiction over food safety issues within Olympic venues, and food premises within the Olympic venues were therefore excluded from the environmental health surveillance programme. Personnel of the Hellenic Food Authority inspected food premises inside the Olympic venues (see Chapter 8).

Standardized inspection

Registration and inspection were standardized to ensure uniformity and consistency of procedures as well as efficient electronic management of data. A total of 19 forms were developed to register information regarding premises of environmental health interest (23). The data requested by each registry form included the name and the unique registration

code of the establishment, the address including county of jurisdiction and standardized questions to identify typical and representative characteristics of each premise according to the type of the premise. For example, the swimming pool registry form included questions on the capacity of the pool, the method of disinfection and the type of filtration.

Table 7.4

Standardized inspection forms (checklists) with the number of items and critical items included in each

Standardized inspection forms	Number of items	Number of critical items
Areas requiring pest control	21	10
Waste management facilities	21	7
Public toilets	20	5
Sewage treatment units	26	7
Bottled-water plants	46	13
Seacoast	34	6
Camps	44	13
Marines	12	3
Hotels	23	6
Swimming pools	48	9
Water supply systems	42	11
Cooling towers	39	6
Decorative fountains	17	3
Food premises	39	16
Canteens	24	11
Ships	42	17
Ice-production plants	21	8

Seventeen standardized scored inspection forms were developed (Table 7.4) including establishment name, unique code, inspection identification code, county, date of inspection, overall score, specific violations cited, manually tested measurements during

inspection (free chlorine, pH and temperature), inspectors and time spent on inspection. The results of the inspections were graded as: A: satisfactory; B: relatively satisfactory; or C: unsatisfactory (23).

Water quality surveillance programme

The main objective of the water quality surveillance programme was to assess the quality of the water at the point of use. The following seven standardized sample collection forms were developed to standardize sampling procedures: sample collection forms for swimming pools, water distribution systems,

bottled-water plants, seacoasts, water distribution systems (*Legionella* spp. detection), cooling towers (*Legionella* spp. detection) and decorative fountains (*Legionella* spp. detection).

Samples collected from water supply systems of

Olympic venues, hotels and floating hotels were tested for the presence of coliform bacteria, *Escherichia coli*, intestinal enterococci and *Clostridium perfringens* (including spores). These microbiological parameters are obligatory for routine monitoring of water quality according to Greek and EU legislation (24). In addition, special sampling was conducted in distribution systems to detect and enumerate *Legionella* spp. in water samples.

Swimming pool water samples were tested for the

presence of coliform bacteria, *Escherichia coli*, *Staphylococcus aureus*, *Pseudomonas aeruginosa* and heterotrophic plate count at 37°C (25). Water samples from swimming pools and water supply systems of Olympic venues and floating hotels were also tested for *Cryptosporidium* spp., *Giardia* spp. and norovirus.

Water collected from cooling towers and decorative fountains was tested for the presence of *Legionella* spp. and for aerobic counts at 37°C at a minimum of 48 hours of incubation.

Standardized corrective actions

For each deficiency cited during inspection, a standardized corrective action was suggested in the corrective action form. In addition, the Olympic Planning Unit created standardized guidelines for disinfecting

water distribution systems, cooling towers, swimming pools and decorative fountains and delivered them to the prefectural departments of public health as a response to every positive laboratory result received.

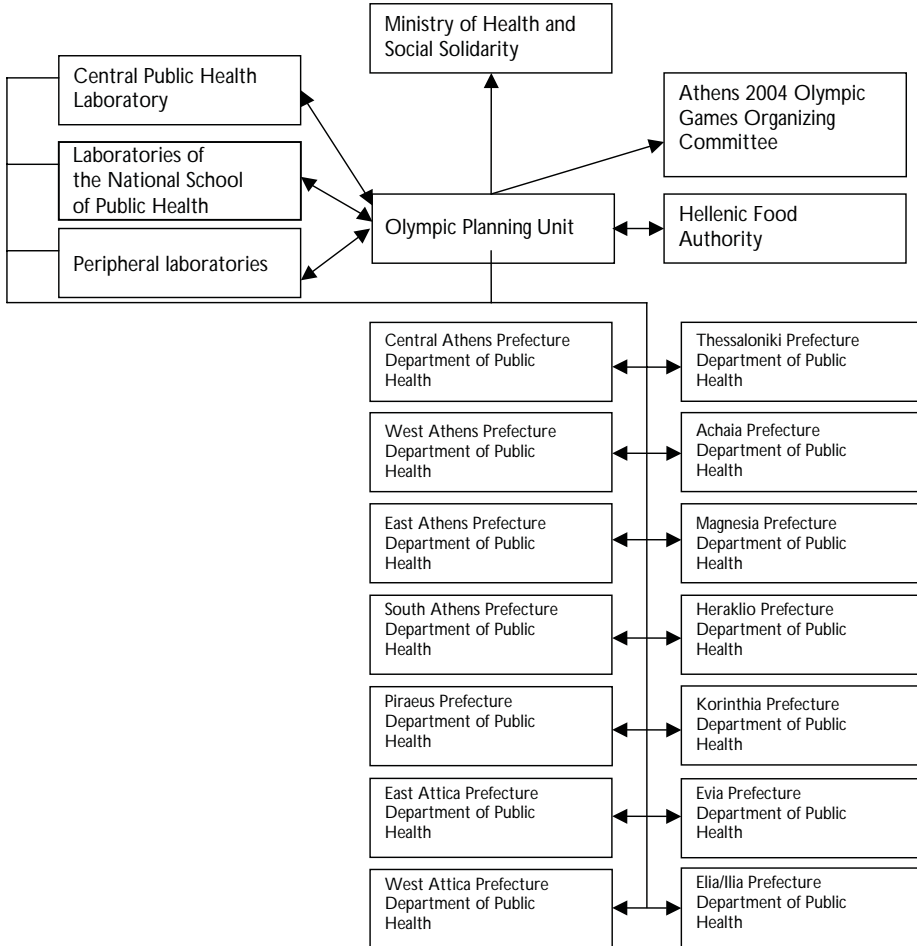
Computerized electronic network

Using Epi-Info 2000 software (United States Centers for Disease Control and Prevention), 19 geographical information system databases were developed to record the establishments (registry database), 17 databases to record the standardized inspection forms used including the documented results and 6 databases to record the microbiological sample test results. A unique code was given to each establishment to relate the registration, inspection and microbiological results by using this code. Further, the geographical information system was used to

implement an integrated environmental health surveillance programme (23).

A virtual private communication network connecting the 13 prefectural departments of public health, the Central Public Health Laboratory, the Olympic Planning Unit and the Ministry of Health and Social Solidarity provided the opportunity to collect, collate, analyse, review and share the results of the environmental health inspections and microbiological tests in real time (Fig. 7.3).

Fig. 7.3. Flow of information in the environmental surveillance system: the National School of Public Health managed the information hub



Training and guidelines for professionals and owners

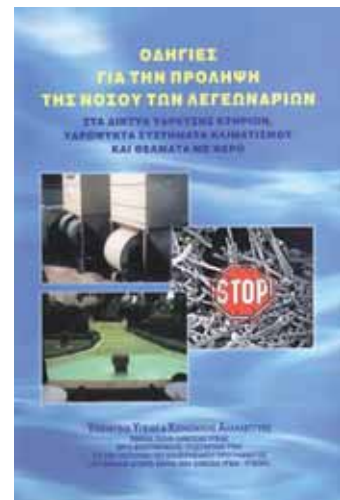
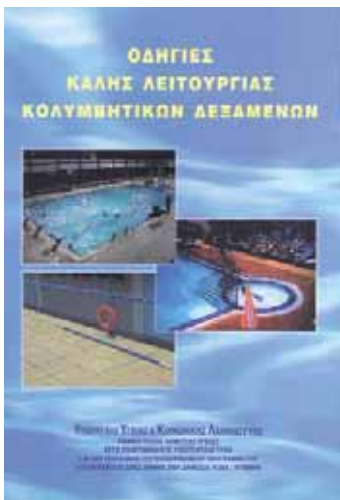
Up-to-date training material on food safety, water quality (potable and recreational), Legionnaires' disease prevention, vessel sanitation, waste management, and vector control was prepared to be used in practical and theoretical training programmes for officers of the prefectural departments of public health. Standardized inspection training gave special attention to avoiding subjective interpretation during inspections. Training material was also prepared and distributed to facility owners and the public (Fig. 7.4).

The Athens 2004 Olympic Games Organizing Committee contracted 10 cruise ships to be used as floating hotels in the Piraeus Harbour. The Ministry of Health and Social Solidarity identified a lack of a standardized or coordinated response to a potential public health threat for passengers and crew members. Many different authorities were involved with similar but not clearly assigned responsibilities. Thus,

a coordinated approach was required for ship sanitation and communicable disease surveillance.

For the Sydney 2000 Olympic Games, a Vessel Inspection Program was introduced to inspect the 10 cruise ships moored in the Sydney Harbour that served as floating hotels (18). The National School of Public Health in collaboration with the Vessel Sanitation Program of the United States Centers for Disease Control and Prevention developed the Hellenic Vessel Sanitation Programme to ensure the health and safety of passengers and crew members. The Hellenic Vessel Sanitation Programme was closely modelled on the Vessel Sanitation Program of the United States Centers for Disease Control and Prevention (26), which has been successful in reducing diarrhoeal illness on board cruise ships since it was introduced in 1975 (27). Based on EU and Greek legislation and WHO guidelines, the Hellenic Vessel

Fig. 7.4. Guidelines for safe swimming-pool operation and for *Legionella* prevention in cooling towers, water systems and decorative fountains



Sanitation Programme defined and enforced requirements regarding potable water safety, swimming pool operation, food safety, sanitation, Legionnaires' disease prevention, waste management and vector control. Special regulations were created for implementing the Hellenic Vessel Sanitation Programme

and applied during the Olympic Games. Moreover, environmental inspections and microbiological laboratory testing of water were conducted in 25 passenger ships used to transfer passengers from the port of Piraeus to the Greek islands (8).

Performance

Statistical analysis of the standardized inspection results and water quality tests results together with the communicable disease surveillance findings were used to evaluate the performance of the environmental health surveillance programme.

Time-series analysis was performed to detect association between time and inspection or microbiological test results. The inspection and test results were categorized into four periods: January–December 2003, January–May 2004, June–July 2004 and the Olympic period (August–September 2004). Linear regression and the chi-square test for trend were also used. All statistical analysis used the software package Epi-Info 2000 and SPSS for Windows Release 11.01.

Workload assessment

The exact address and postal code of each premise of environmental health interest and each archaeological and tourist-oriented area were used to develop geographical information system maps for each county. All registered addresses were geocoded into specific databases using ArcView 3.2 software. The longitude and latitude coordinates for every geocoded address were assigned automatically from the digital map (called a street reference map),

so that the location of each specific place could be visualized. These maps were used to estimate the total distance along with the mean inspection time required to inspect each registered premise by taking into account the inspection time itself and the one-way transport time to each premise. The transport time was calculated using a geographical information system to simulate travel time on a particular street network. Pedestrian streets, one-way roads and specifically designated Olympic lanes and other restrictions imposed during the Athens 2004 Olympic Games were considered in calculating the transport time. The following criteria were considered as constant parameters used to estimate the workload of each county.

- All inspections were performed by two inspectors (a pair).
- The daily working time was estimated at six hours including transport and inspection time.
- The inspectors' transport speed was estimated using the inspection data. Driving was estimated at about 10 km/h and walking in a pedestrian zone at about 4 km/h and on stairways at about 2 km/h.
- The starting-point of every daily route was considered to be each office of a prefectural department of public health.

Using these criteria, the total number of inspection hours needed for each prefectural department of public health was calculated. The number of working days for each inspector was estimated by dividing the total number of estimated inspection hours by six hours, the daily working time. In addition, the required person-time (in months) for the total number of inspections was estimated (each month was considered 22 working days) (23).

A total of 44 741 premises of environmental health interest were obtained. As a result, 44 741 addresses were geocoded into geographical information system databases and developed appropriate working maps. Table 7.5 presents the total number of registered premises in each of the 11 prefectural departments of public health. Fig. 7.5 provides an example of a geographical information system map produced, representing all premises of environmental health interest of the central section of Athens, which was the most

important Olympic county since most of the Olympic events were scheduled to take place within its boundaries.

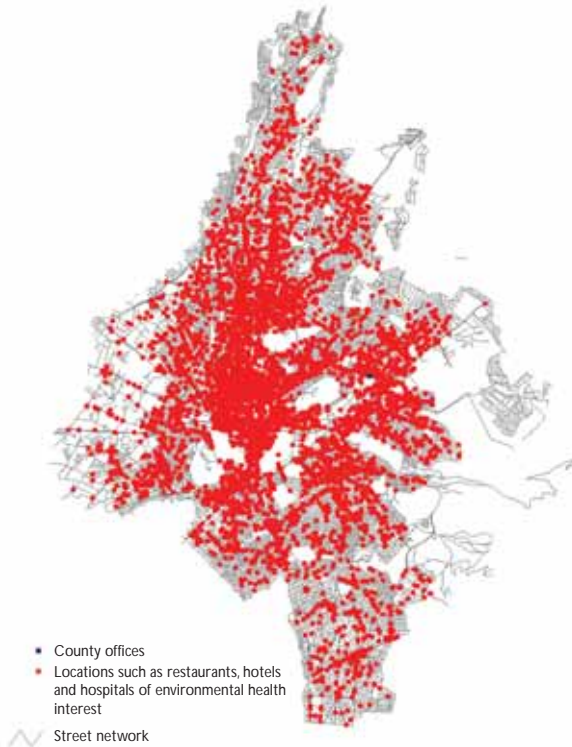
To cope with the enormous number of existing food premises (restaurants, bars and canteens) in Greater Athens and devise the most realistic and cost-effective environmental health inspection programme for the Olympic Games, a series of scenarios was developed, including a different number of food premises in each scenario, which depended on the available number of inspectors, cars and fiscal resources of each prefectural department of public health. The first scenario included all 11 prefectural departments of public health inspecting all premises. In this scenario, a large number of inspectors would be required to work for a long time to cover the total number of inspections. For example, in the central section of Athens, inspecting all 8358 premises would require five pairs of inspectors working for

Table 7.5

Comparison of scenario 1 (inspection of all county premises) to scenario 6 (inspection of a selected number of premises) in each Olympic prefectural department of public health in Greece

Prefectural department of public health	Scenario 1		Scenario 6	
	Number of premises for inspection	Required time (in months)	Number of premises for inspection	Required time (in months)
Central Athens	8358	24.9	1010	4.7
East Athens	2277	9.1	578	2.8
South Athens	2648	9.4	929	3.8
West Athens	2684	9.6	640	2.9
East Attica	2147	8.8	386	2.6
West Attica	1536	5.7	171	2.4
Piraeus	5841	17.9	1532	6
Thessaloniki	10096	29.7	599	3.5
Patras	3262	11.4	344	3.6
Volos	2838	10.4	429	4.3
Heraklio	3054	11.9	704	4.9
Total	44741	148.8	7322	41.5

Fig. 7.5. Map of Attica showing the spread of Olympic venues in Greater Athens



Source: Olympic Planning Unit, National School of Public Health, Greece

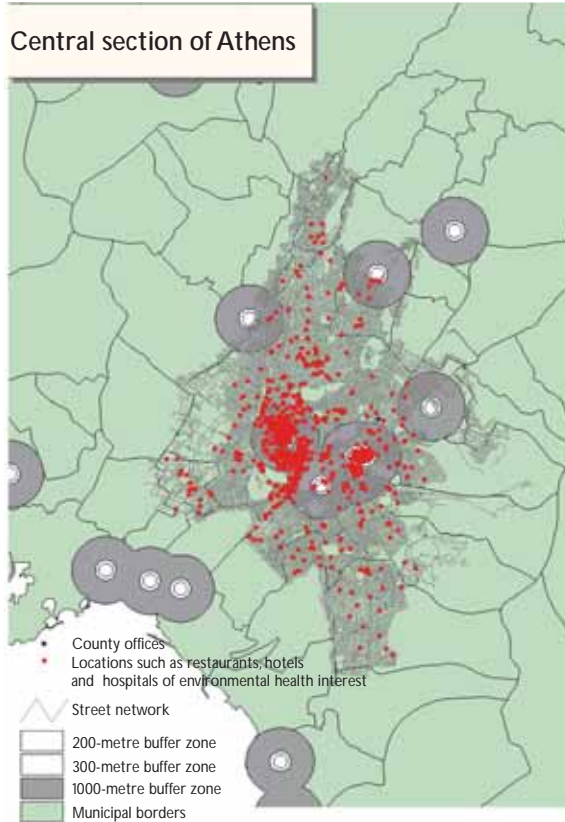
24.9 months. Apparently this scenario was not realistic because it would impede counterchecks of several locations whenever needed. The second scenario estimated the time and personnel required for inspecting hotels and Olympic venues only.

However, this would not be sufficient for protecting public health during the Athens 2004 Olympic and Paralympic Games. The third, fourth and fifth scenarios included inspecting all premises in each Olympic county and inspecting all food premises around Olympic venues and Olympic hotels in buffer zones of 1000, 500 and 300 metres, respectively. The above scenarios enabled a sufficient number of inspections to be conducted, but many food premises were not included. Finally, the sixth scenario, which was recommended and selected for implementation,

included the following: (1) each prefectural department of public health inspects all premises except for food premises; (2) inspection of all food premises around Olympic venues and Olympic hotels in a buffer zone of 200 metres; (3) inspection of all food premises around tourist-oriented and archaeological areas in a buffer zone of 200 metres; and (4) inspection of 2% of the food premises, randomly selected, from the rest of each county.

Based on the sixth scenario described in the above section, the exact number and type of premises each prefectural department of public health was to inspect during the pre-Olympic and Olympic period were determined. For instance, the workload of the central section of Athens was estimated at 1250 hours or 420 person-days for inspecting

Fig. 7.6. Map of Attica showing the distribution of Olympic venues in Greater Athens according to the recommended scenario



Source: Olympic Planning Unit, National School of Public Health, Greece

1010 environmental health items. The total inspection time for five pairs of inspectors was therefore estimated at 4.7 months (23). Table 7.5 compares the implementation of two different scenarios, the first and the sixth scenario, for all prefectural departments of public health. Fig. 7.6 presents a geographical information system image of the recommended scenario in the central section of Athens.

An algorithm was developed and used based on geographical information system technology to partition each prefectural department of public health in as many equal parts as the number of available pairs of inspectors. The term *equal* did not refer to the

geographical area or the number of premises eligible for inspection. Rather the partitioning was based on the workload of each prefectural department of public health (the time required for inspecting all locations identified as being of environmental health interest). The daily inspection programme was therefore organized such that the available inspectors in each county would perform the maximal possible number of inspections during the pre-Olympic and Olympic period.

The partitioning of every Olympic county was based on the available number of inspectors (pairs) employed in each county (23).

Electronic network

A communication network between the prefecture departments of public health, the Central Public Health Laboratory, the Olympic Planning Unit and the Ministry of Health and Social Solidarity was completed and tested during January 2004. The network provided the opportunity to share, review and analyse the results of the environmental health inspections and microbiological tests in real time.

All data from the inspection results were entered into the electronic databases in the prefectural departments of public health and were sent to the Olympic Planning Unit. Data from the microbiological test results were entered into the electronic databases in the Central Public Health Laboratory and were sent to the Olympic Planning Unit and the prefectural departments of public health. The

Olympic Planning Unit was responsible for relating all data and for producing daily reports (Annex 2) that were sent to the Ministry of Health and Social Solidarity and the Athens 2004 Olympic Games Organizing Committee (Fig. 7.3).

Training and guidelines distributed

Olympic Planning Unit personnel uniformly trained and certified most of the inspectors in standardized inspections before the inspection programme was implemented. Moreover, the staff of the prefectural departments of public health attended a series of six-day training programmes concerning other aspects of public health (Table 7.6).

Table 7.6

Training programmes conducted at the National School of Public Health and attended by the public health officers in the Olympic cities

Title	Number of trainees
1. Standardized sanitation inspection – epidemiological surveillance	73
2. Response to emergencies and disasters	39
3. Epi-Info software	65
4. Entomological surveillance	43
5. Control of parasitic and tropical diseases	50
6. Standardized water microbiological testing	27
7. Standardized food microbiological testing	30
8. Food safety	43
9. Standardized sanitation inspection on cruise ships	50
10. Standardized control of meningitis	60
11. Outbreak identification – response to and management of infectious diseases	50
12. Standardized environmental inspection for Legionnaires' disease prevention	50
Total	580

A series of guidelines was published (in Greek) and distributed to environmental health officers and facility owners:

- guidelines for safe swimming-pool operation;
- guidelines for *Legionella* prevention in cooling towers, water systems and decorative fountains; and

- guidelines for water sampling.

In addition, standardized disinfection guidelines for cooling towers, decorative fountains, swimming and spa pools and water supply systems were prepared and applied when positive microbiological test results were produced. Instructions to the public for healthy swimming were distributed to facility owners (8).

Implementation and outcomes

Standardized inspections

A total of 44 741 premises of environmental health interest were identified as potential inspection sites. From January 2003 to July 2004, 196 environmental health inspectors registered via on-site visits 5724 premises using standardized registration forms.

During 2002, 2003 and 2004, 46 test events were held to evaluate venues and logistics. From January 2003 to July 2004, 5956 inspections were carried out (Table 7.7) and 2606 inspections during the Olympic Games (August–September 2004), 1739 of which were performed within the Olympic venues and 867 outside the Olympic venues (Table 7.7). Of 8562 inspections, 5673 (66.2%) were satisfactory, 1922 (22.4%) were relatively satisfactory and 967 (11.3%) were unsatisfactory (8).

Water quality surveillance programme

Of 4242 water samples collected from January 2003 to July 2004, 995 were collected within and 3247 outside the Olympic venues (Table 7.8). During the Olympic period, of 782 water samples, 571 were collected within the Olympic venues and 211 outside the Olympic venues (Table 7.8). Of 2497 samples tested for *Legionella* spp., 415 (16.6%) were positive. Of 1909 samples collected from water supply systems and bottled water plants and tested, 227 (11.8%) were positive. Of 618 samples collected from swimming pools and coastal waters, 76 (12.2%) tested positive. None of the 105 samples collected from swimming pools and water supply systems tested positive for *Cryptosporidium* spp., *Giardia* spp. or norovirus (8).

Table 7.7 Inspection results in four periods before and during the Athens 2004 Olympic Games

Standardized inspection forms	Inspections	Inspection results							
		January–December 2003		January–May 2004		June–July 2004		Olympic Games	
		A ^a or B ^b	C ^c (%)	A or B	C (%)	A or B	C (%)	A or B	C (%)
Food premises	1648	243	45 (15.6)	376	93 (19.8)	545	53 (8.9)	251	42 (14.3)
Canteens	20	2	12 (85.7)	2	3 (60.0)	0	0 (0.0)	0	1 (100.0)
Hotels	883	169	7 (4.0)	229	86 (27.3)	268	28 (9.5)	92	4 (4.2)
Ships	48	0	0 (0.0)	0	12 (100.0)	8	2 (20.0)	26	0 (0.0)
Swimming pools	374	79	15 (16.0)	62	7 (10.1)	128	7 (5.2)	76	0 (0.0)
Water supply systems	1214	189	13 (6.4)	354	33 (8.5)	314	35 (10.0)	275	1 (0.4)
Cooling towers	136	18	23 (56.1)	7	8 (53.3)	37	11 (22.9)	32	0 (0.0)
Decorative fountains	336	74	156 (67.8)	26	14 (35.0)	38	7 (15.6)	21	0 (0.0)
Ice-production plants	3	0	3 (100.0)	0	0 (0.0)	0	0 (0.0)	0	0 (0.0)
Areas requiring pest control	171	22	19 (46.3)	21	11 (34.4)	30	3 (9.1)	64	1 (1.5)
Waste management facilities	571	146	18 (11.0)	89	8 (8.2)	91	2 (2.2)	215	2 (0.9)
Public toilets	3051	185	24 (11.5)	603	52 (7.9)	661	44 (6.2)	1437	45 (3.0)
Sewage treatment units	20	7	1 (12.5)	3	0 (0.0)	6	1 (14.3)	2	0 (0.0)
Bottled-water plants	21	3	3 (50.0)	7	0 (0.0)	6	2 (25.0)	0	0 (0.0)
Camps	4	2	0 (0.0)	0	0 (0.0)	1	0 (0.0)	1	0 (0.0)
Seacoast	44	6	0 (0.0)	6	10 (62.5)	20	0 (0.0)	2	0 (0.0)
Marinas	18	0	0 (0.0)	1	0 (0.0)	1	0 (0.0)	16	0 (0.0)
Total	8562	1145	339 (22.8)	1786	337 (15.9)	2154	195 (8.3)	2510	96 (3.7)

^a Satisfactory inspection result.
^b Relatively satisfactory inspection result.
^c Unsatisfactory inspection result.

Table 7.8

Water microbiological test results in four periods before and during the Athens 2004 Olympic Games

Premises	Samples	Microbiological test results							
		January–December 2003		January–May 2004		June–July 2004		Olympic Games	
		Total	Positive (%)	Total	Positive (%)	Total	Positive (%)	Total	Positive (%)
Water supply systems ^a	1657	256	30 (11.7)	491	81 (16.4)	610	78 (12.7)	300	38 (12.6)
Water supply systems ^b	2142	292	32 (10.9)	767	101 (13.1)	870	178 (20.4)	213	36 (16.9)
Swimming pools	560	123	16 (13.0)	66	6 (9.0)	170	31 (18.2)	201	21 (10.4)
Cooling towers	204	81	37 (45.6)	15	0 (0.0)	64	22 (34.0)	44	7 (15.9)
Decorative fountains	151	78	0 (0.0)	32	2 (2.5)	36	0 (0.0)	5	0 (0.0)
Bottled-water plants	252	98	0 (0.0)	105	0 (0.0)	34	0 (0.0)	15	0 (0.0)
Seacoast	58	11	2 (18.1)	27	0 (0.0)	16	0 (0.0)	4	0 (0.0)
Total	5024	939	117 (12.4)	1503	190 (12.6)	1800	309 (17.1)	782	102 (13.0)

^a Samples tested for the presence of coliform bacteria, *Escherichia coli*, intestinal enterococci, *Pseudomonas aeruginosa* and *Clostridium perfringens* (including spores).

^b Samples tested for *Legionella* spp.

Standardized corrective actions

From January 2003 to July 2004, 14 714 corrective actions were put into effect, and 2313 corrective actions were undertaken during the Olympic period.

Computerized electronic network

All data from the registration and the inspection results were entered into the electronic databases in the prefectural departments of public health and were delivered to the Olympic Planning Unit. Data from the microbiological test results were entered into the electronic databases in the Central Public Health Laboratory and were delivered to the

Olympic Planning Unit and the prefectural departments of public health. The Olympic Planning Unit was responsible for compiling all data and producing reports daily, which were sent to the Ministry of Health and Social Solidarity and the Athens 2004 Olympic Games Organizing Committee (Fig. 7.3). The private virtual electronic communication network operated 18 hours daily and allowed rapid distribution of information. No network failure occurred after it was installed. A total of 28 daily reports were sent during the Athens 2004 Olympic Games and 12 during the Paralympic Games. The daily reports included the total number of A, B and C grading inspection results, the number of positive or negative microbiological test results and the

Fig. 7.7. Booklet with instructions for healthy swimming handed out to the public



number of suggested corrective actions for each prefectural department of public health. An additional highly detailed daily report was created including all unsatisfactory (C grading) or positive microbiological test results. The compliance deadline for the facility owners was no more than 24 hours. The follow-up inspection results were sent to the Olympic Planning Unit through the electronic network immediately after the inspections (8).

Training and guidelines

From January 2003 to February 2004, 196 environmental health inspectors underwent uniform training and certification to carry out consistent standardized inspections. Moreover, officers of the prefectural departments of public health of the Olympic cities attended a series of short training courses including 865 hours of training on epidemiological investigation, vector control, ship sanitation, response to emergencies and disasters and Epi-Info software.

Guidelines were published and distributed to the environmental health inspectors and facility owners: 5000 copies of guidelines for safely operating swimming pools, 5000 copies of guidelines for preventing *Legionella* in cooling towers, water systems and decorative fountains, 5000 copies of guidelines for water-sampling procedures and 5000 copies of manuals for managing shipboard pests. About 1 million copies of instructions on safe swimming in Greek and English were distributed to the public (Fig. 7.7).

Floating hotels: the 10 Olympic cruise ships

On arrival, the 10 cruise ships used as floating hotels underwent a full vessel inspection under the Hellenic Vessel Sanitation Programme by a group of inspectors comprising officials and experts from the Ministry of the Mercantile Marine, the Veterinary Directorate of the Prefecture of Piraeus, the National School of Public Health and the Vessel

Sanitation Program of the United States Centers for Disease Control and Prevention. After the inspection, the vessels were given an inspection score according to the Hellenic Vessel Sanitation Programme. Two received unsatisfactory scores and were reinspected after corrective action. A total of 27 follow-up inspections were carried out every three to four days concentrating on food buffet services (especially food temperatures), water supply and swimming pool and spa maintenance.

At the same time, microbiological testing was conducted in 45 samples collected from drinking-water tanks, ice-making machines and kitchen water taps and 30 samples originating from swimming and spa pools. During inspections, spoiled or expired food items were found and destroyed on three cruise ships; water-related problems were associated with four cruise ships. *Pseudomonas aeruginosa* was detected in samples collected from the swimming pools of four vessels (8).

Performance

An outbreak of salmonellosis among the German junior rowing team occurred in August 2003 that prevented them from participating at the respective rowing championship test event. The restaurant of the hotel accommodating the team, which was linked to the outbreak, had received one of the lowest unsatisfactory inspection results seven days before the out-

break occurred. No other disease outbreak was recorded by the enhanced communicable disease surveillance system before or during the Athens 2004 Olympic Games within the Olympic cities.

Unsatisfactory inspection results (Fig. 7.8, $r = 0.44$, $P < 0.0001$; Fig. 7.9, $r = 0.16$, $P < 0.005$) as well

Fig. 7.8. Distribution and regression of the percentage of unsatisfactory inspection results of premises inspected outside the Olympic venues 160 days before the end of the Athens 2004 Olympic Games, $r = 0.44$, $P < 0.0001$

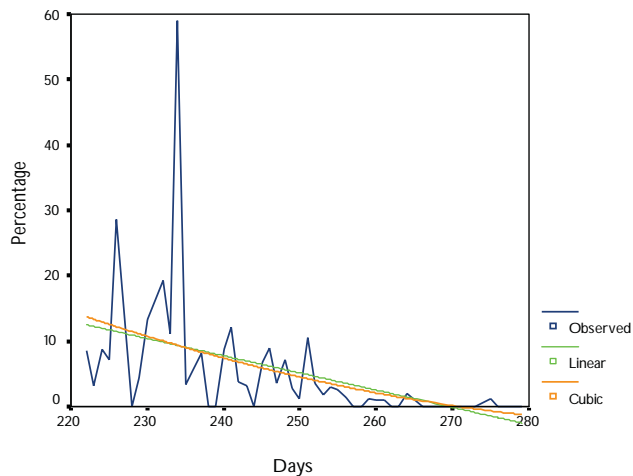
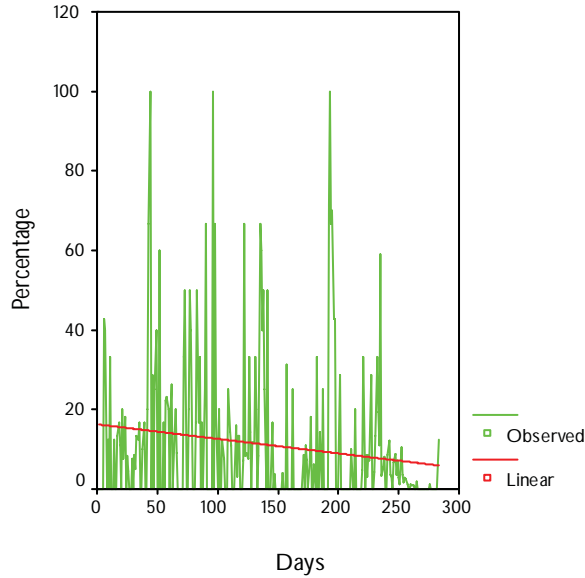


Fig. 7.9. Distribution and regression of the percentage of unsatisfactory inspection results of premises inspected within the Olympic venues 300 days before the end of the Athens 2004 Olympic Games, $r = 0.16$, $P < 0.005$



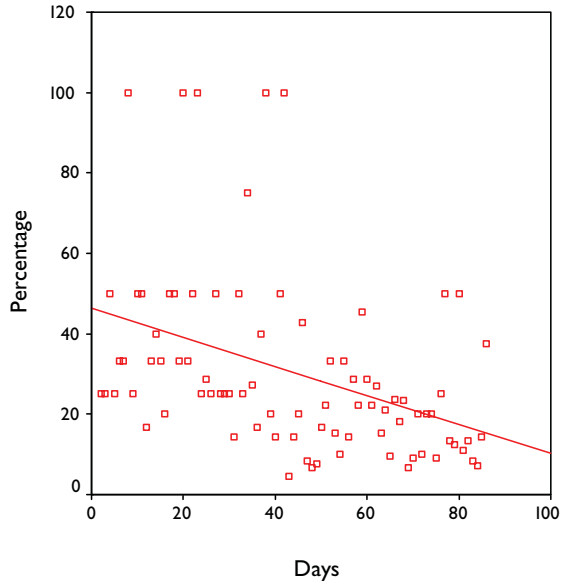
as positive water quality tests (Fig. 7.10, $r = 0.39$, $P < 0.001$) declined overall during the pre-Olympic and Olympic period. As shown in Fig. 7.8–7.10, unsatisfactory results periodically increased and decreased, which is related to the starting days of the test events where inspectors conducted intensive inspection and sampling. The percentage of unsatisfactory inspection results during the first period of inspection was 22.8% (339), whereas only 3.7% (96) of the last inspections, before the Olympic Games, presented unsatisfactory results (Table 7.8).

During the first sampling, positive microbiological test results were confirmed in 117 (12%) of the samples, whereas during the last sampling before the Athens 2004 Olympic Games, 102 (13%) of the samples were positive. Positive microbiological test results remained quite stable from January

2003 to May 2004, increased during June and July of 2004 and declined during the Olympic period (Table 7.9).

The 223 hotels contracted by the Athens 2004 Olympic Games Organizing Committee to be used as accommodation sites received satisfactory inspection results in the last inspection before the Olympic Games. During the first inspection, 76 (34%) of the 223 hotels had received “unsatisfactory” or “relatively satisfactory” inspection results, and they had a mean improvement of 9.2 points during the last inspection before the Athens 2004 Olympic Games. During the first water sampling of the 223 hotels, 232 (14.6%) of the 1584 samples collected turned positive. No positive water microbiological test result was reported during the last microbiological test before the Athens 2004 Olympic Games (8).

Fig. 7.10. Regression of the percentage of positive microbiological test results 100 days before the end of the Athens 2004 Olympic Games, $r = 0.40$, $P < 0.001$



Postevent assessment

The programme of daily inspections inside and outside the Olympic venues during the games was carried out without major problems. As a result, no outbreaks of any kind were observed during Athens 2004 Olympic and Paralympic Games due to consumption of food or water from an Olympic venue or cruise ship. Only isolated cases of gastroenteritis in Athens and in Crete that were not connected to the games were observed. In parallel, the temperatures during August, luckily, were not high enough to create a serious danger to the spectators attending outdoor events. In addition, the electronic communication between environmental health agencies of all Olympic cities via a special network was quite successful in facilitating timely surveillance. Daily reporting of the inspection results allowed the executives to be informed in real time and take decisions at a short notice.

A study was designed to evaluate the scoring system implemented in the inspection programme for the Athens 2004 Olympic Games and to determine the contribution of standardized scored inspections in the assessment of the presence of *Legionella* spp. in cooling towers and water supply.

Inspection scores of water supply systems (of hotels and Olympic venues) and cooling towers were combined with water microbiological test results from samples collected from the above sites. This study documented a strong correlation (water supply systems relative risk = 1.92, cooling towers relative risk = 1.94) between unsatisfactory inspection scoring results and *Legionella*-positive microbiological test results (in excess of 10 000 colony-forming units per litre) and suggests the utility of inspection scoring systems in predicting *Legionella* proliferation in water systems and in preventing Legionnaires' disease (28).

Another study was conducted to evaluate the inspection grading system for swimming pools. Unsatisfactory inspection results in swimming pools were significantly associated with positive

water microbiological test results (relative risk = 2.5, $P < 0.05$). The inspection scoring system seemed to be effective in assessing microbial water quality (29).

Lessons learned

During summer 2004, the entire world shared the power and magic of the Athens 2004 Olympic and Paralympic Games, which were carried out with absolute success. Environmental health planning and response contributed to the success of public health aspects of the Olympic Games. Methods used to deliver environmental health services were assessed for their efficiency and ability to enhance desired public health outcomes. The epidemiological surveillance findings and the gradual improvement of the results of the inspections and the water quality tests indicated the effectiveness of the environmental health surveillance programme applied. The increase of positive microbiological test results during the last two months before the Olympics may be related to the fact that most of the first sampling was conducted inside the Olympic venues immediately after their construction. The increase of unsatisfactory inspection results of food premises from January to May 2004 may be attributed to the thorough inspections conducted by the inspectors after the outbreak of salmonellosis.

The environmental health surveillance system deployed for the Athens 2004 Olympic Games was more comprehensive than systems applied during previous Olympic Games. New features included: a) the integration of standardized inspection results from 17 different site categories together with the laboratory results of microbiological tests, b) the highly detailed electronic formation of inspection reports directly linked to suggested corrective

actions and c) the application of a geographical information system. The system computerization and the electronic network allowed electronic data exchange and production of reports at any time during the day, and data could be compared with epidemiological surveillance findings. The electronic system could automatically detect positive microbiological results or premises that failed inspection and schedule counterchecks. Applying emerging technology proved to be useful in environmental health surveillance.

A successful response to early reports of poor food-handling practices illustrates the importance of centralized control and communication and rapid response capabilities (9). The hotel restaurant mentioned above that was identified as the possible source of a salmonellosis outbreak in August 2003 had received an unsatisfactory inspection grade one week before the outbreak occurred. The Athens 2004 Olympic Games Organizing Committee had not been informed of the inspection result, since the communication and response structure had not yet been established. Communication mechanisms of the prefectural departments of public health should involve the Athens 2004 Olympic Games Organizing Committee at an early stage. Efficient cooperation with the Organizing Committee partners, the inspectors of the prefectural departments of public health and the personnel of the Health Command Co-ordination Centre are key factors ensuring effective communication processes and timely response. In

future Olympic Games (and other mass gatherings), environmental health programmes should aim to successfully deliver environmental health services not only during the Olympic Games but also during pre-Olympic events.

After the information exchange network was installed in January 2004, the inspection grading results were shared with the Athens Olympic Games Organizing Committee to evaluate the functioning, reliability and compliance of hotels and Olympic venues during the test events. Hotels with inspection results graded as unsatisfactory or those that did not take the recommended corrective actions for improving water quality were not used as accommodation sites. Most of the inspected businesses improved their environmental health-related issues significantly by showing compliance with regulations and following the instructions for improving water quality, probably to avoid negative publicity and aggravating financial consequences (30). This is a strong indication that the inspection grading system may be an effective tool to motivate change within the industry

in order to protect public health (30). After the information exchange network was successfully established, no other disease outbreak was recorded. Single small outbreak incidents may not have been reported, but this seems unlikely due to the comprehensive disease surveillance during the test events and the Olympic Games.

Although insufficient infrastructure and limited time did not affect the effectiveness of the programme, the delays of the venues' construction works and the failure to provide timely funding of the environmental health preparations deferred the implementation of the programme. Of the premises of public health interest located in the five official Olympic cities, 12.7% (5724) were inspected within two years. Planning for the public health system in Atlanta took more than two years (1), and in Sydney it took almost three years (2). For future mass gatherings, timely allocation of appropriate financial resources and construction of venues will allow sufficient time to specify and test the environmental health surveillance system.

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CHAPTER 8

Food safety and the role of the Hellenic Food Authority

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Introduction

The Hellenic Food Authority is a state organization established in 2000 under the Ministry of Development. During the Olympic Games, it had central offices located in Athens and five directorates in Attica, Thessaloniki, Larissa, Patras and Heraklio, the main geographical areas of Greece.

The Hellenic Food Authority is the legal entity responsible for food safety and is complemented by other state organizations under the Ministry of Rural Development and Food, the Ministry of Health and Social Solidarity, the Ministry of Development and the respective local authorities throughout Greece.

Within the framework of its responsibilities defined by its contractual agreement with the Ministry of Development and the Athens 2004 Olympic Games Organizing Committee for the design of the operational plan for the regulation and safeguarding of food hygiene and quality during the Olympic Games, in 2001 the Hellenic Food Authority organized an Expert Scientific Committee for the purpose of producing a relevant operational plan.

The operational plan was produced by the Expert Scientific Committee appointed by the Management Board of the Hellenic Food Authority (Management Board Decision No. 33 of 3 October 2001) which, under the Vice-Director of the Hellenic Food Authority, included participation by Despina Vassiliadou (Professor of Microbiology and Food Hygiene, Aristotle University of Thessaloniki), Constantinos Genigeorgis (Professor of Food Hygiene, Aristotle University of Thessaloniki), Nikos Traios (Veterinarian, Head of the Hellenic Food Authority Regional Directorate for Central Macedonia), Stavros Panoulis (Veterinarian),

Rodios Gamvros (Chemist), Theodoros Kalitsis (Veterinarian) and Ilias Anagnostopoulos (Director of the Department of Planning of the Food Services Directorate of the Athens 2004 Olympic Games Organizing Committee).

The priority axes of the operational plan were:

- determination of food requirements during the course of the Olympic Games (responsibility of the Ministry of Rural Development and Food);
- preparation, monitoring and controlling food enterprises before the start of the Olympic and Paralympic Games;
- planning and development of response mechanisms in the event of emergencies and food-related crises during the Olympic and Paralympic Games;
- assurance of food safety during the Olympic and Paralympic Games;
- proposals for methods of intervention (institutional, functional and organizational); and
- implementing the operational plan on a trial basis.

The operational plan had two strategic goals.

- The first goal was to achieve the highest possible level of food safety with respect to production, import, transport, sale and distribution during the 2004 Olympic and Paralympic Games, for the purpose of protecting the health of athletes, spectators and more generally consumers. This was to be achieved by an organizationally and functionally unified system of services for food safety during the Olympic and Paralympic Games.

- The second goal was to be prepared for immediate and effective response and management of any food-related crisis appearing within the country or originating from abroad that could influence the safety of food during the Olympic and Paralympic Games. The timely and effective management of a crisis was supported by an action plan with a precise description of all the parties involved and their respective responsibilities, which would permit the fastest possible intervention to effectively manage and deal with a food-related crisis and to

carry out effective measures. The action plan designed to deal with a potential food-related crisis during the Olympic and Paralympic Games was undertaken in the context of the broader planning efforts for preparedness of the government bodies involved with safety to ensure that they could effectively deal with a food-related crisis.

The operational plan specified intervention measures (institutional, functional and organizational) to be undertaken before the Olympic Games started.

Preparation activities before the Olympic Games

The period of time from 2002, when the operational plan was finalized, until the beginning of the Olympic Games was divided into two periods.

The first period included (a) preparing all the relevant regulatory bodies; (b) regulating all the enterprises involved with processing, packaging, storage, transport, sale and distribution of high-risk foodstuffs and mass consumption; and (c) regu-

lating all the catering services that would supply food to all Olympic venues (both athletic and non-athletic).

The second period (one month before the Games began) included preparing the infrastructure for the points of sale of food within the Olympic venues and completing preparatory activities for caterers to supply all Olympics venues.

First period

Bodies participating

The participating bodies were:

- the Hellenic Food Authority and the prefectural veterinary, health and hygiene, commerce and agriculture departments, which were supervised and coordinated by the Hellenic Food Authority;
- the Athens 2004 Olympic Games Organizing Committee;
- the food enterprises, especially emphasizing the enterprises that produced high-risk foods intended for mass consumption as well as caterers (enterprises providing food services) active in all the Olympic venues;
- the General Chemical State Laboratory, the

laboratories of the official list of the Hellenic Food Authority, the veterinary laboratories of the Ministry of Rural Development and Food and the laboratories of the Ministry of Health and Social Solidarity selected based on the following criteria: accreditation, the type of laboratory test, the level of experience and the time taken to produce the results; and

- many professional organizations.

Activities (general)

The activities included:

- improving the organization and staffing of the Hellenic Food Authority and publishing all legislative regulations specifying the division of responsibilities, the relationships and the cooperation of the Hellenic Food Authority with the relevant bodies of the Ministry of Rural Development and Food, the Ministry of Health and Social Solidarity, the Ministry for the Interior, Public Administration and Decentralization (local authorities) and the Ministry of Economy and Finance (General Chemical State Laboratory);
- introducing institutional changes and improving infrastructure for implementing effective and credible controls to ensure the achievement of the highest possible level of safety for the foods produced, stored, transported and distributed; and
- identifying the increased personnel needs (inspectors, laboratory technicians, etc.) in the course of the Olympic Games and meeting these through the cooperation of the relevant bodies and their effective coordination by the Hellenic Food Authority and through the participation of volunteers: university and college graduates specializing in areas of interest to the Hellenic Food Authority.

In order to deal effectively with increased needs, all control and inspection plans were re-evaluated to take account of the increased concentration of groups of people and the limited time available to respond.

Activities

The Hellenic Food Authority:

- created the appropriate infrastructure to safeguard the principle of traceability and the principle of prevention and established central control programmes in accordance with the levels of risk of food enterprises, which it directed towards its regional offices and the collaborating prefectural authorities;
- approved and implemented the plan for restructuring the control mechanism based on new EU principles regarding a unified concept of control, the principle of prevention, aiming at establishing a more effective and credible control system;
- signed protocols of cooperation with the General Chemical State Laboratory, the Athens 2004 Olympic Games Organizing Committee, the Ministry of Health and Social Solidarity and the Ministry of Rural Development and Food that delineated in detail the responsibilities of each organization;
- ensured the availability of the necessary laboratory facilities, creating laboratory networks to cover control needs and promoting the improvement of their infrastructure, with laboratories selected based on the type of laboratory examination, the time required to obtain the results, the geographical location of the laboratory (at points of entry into the country and at Olympic venues) to conduct laboratory tests in the framework of the preparations of food enterprises to meet safety standards and requirements;

- initiated microbiological and chemical inspections based on the protocols of cooperation with the aforementioned laboratories, to describe the existing situation with respect to food that is ready for consumption and to initiate immediate corrective action;
 - had the necessary means to ensure the credibility of the controls and the inspections of enterprises and their products (establishing laboratory networks, strengthening laboratory equipment, ensuring that inspectors are adequately equipped, developing computerized services, developing databases of common reference and developing communication networks linking collaborating organizations) and, in this framework, trained its inspectors so that they could respond to the demands of the new inspection system;
 - developed communication mechanisms with the Hellenic Centre for Infectious Diseases Control;
 - promoted through professional organizations (and, if the professional organizations could not contribute, the Hellenic Food Authority promoted on its own initiative) the implementation of 16 guides to good hygiene practice for the most important professional branches, planned for their dissemination and trained the personnel of the Hellenic Food Authority and the collaborating regional authorities in a unified concept of inspection and regulation of these guides;
 - produced a training package on the basic principles of food hygiene and promoted educational programmes on the topics of control and inspection of the effective application of hygiene rules in food enterprises, the application of safety systems (hazard analysis and critical control points (HACCP)) and regulation of compliance with the provisions of the prevailing legislation;
 - intensified the inspections of food enterprises that produce food for mass consumption, emphasizing the levels of risk of the food produced, carried them out to ensure compliance with all provisions of current legislation and, in collaboration with the respective local authorities, inspected hotels, hospitals and restaurants and other eating places in the tourist areas of all Olympic cities;
 - determined the hygienic specifications the Athens 2004 Olympic Games Organizing Committee should consider when selecting the food enterprises to supply the Olympic venues during the Olympic Games;
 - determined the hygienic rules to be complied with by the selected food enterprises during transport and upon receipt of supplies and foods, during storage, preparation, heat treatment, serving and display of foods within Olympic venues;
 - determined the specifications for all eating places within all Olympic venues, where food enterprises would be active;
 - determined legislative provisions relating to issues of food safety and to possible violations during the Olympic Games and the legislative provisions with respect to licensing of eating places within all Olympic venues;
 - prepared, supervised and controlled the 16 catering services contracted by the Athens 2004 Olympic Games Organizing Committee to provide food inside the Olympic site; and
 - evaluated each of the catering services selected as potential food suppliers for their food safety systems: personnel training, their infrastructure, documentation, etc., which led to additional measures to ensure full compliance and the determination of the inspection parameters of the food supply plan during the Olympic events.
- The professional organizations, in collaboration with the Hellenic Food Authority, produced, disseminated and distributed the 16 hygiene guidelines relating to their branches. Among these, the Pan-Hellenic Federation of Restaurant Owners provided for the immediate dissemination of the hygiene guidelines for enterprises of mass consumption, mass catering and confectionery, with the aim of ensuring the hygienic safety of food in restaurants and confectionery.

Second period (one month before the beginning of the Games)

Activities outside the Olympic venues

The Hellenic Food Authority was responsible for ensuring food safety within all Olympic venues in Athens, Thessaloniki, Volos, Patras and Heraklio. There was a clear division of remits and responsibilities between the Hellenic Food Authority and the prefectural departments of public health (see Chapter 7). In addition, based on its overall mandate, it was responsible for ensuring to the extent possible the safety of all food in the country and avoiding any type of food poisoning.

The participating bodies and organizations were:

- the Hellenic Food Authority and the prefectural veterinary, hygiene, commerce and agriculture departments, which were supervised and coordinated by the Hellenic Food Authority, inspecting food enterprises that are active outside the Olympic venues in their vicinity;
- the Hellenic Food Authority and its task groups, supervising the preparation of the infrastructure of all eating places within all the Olympic venues;
- the Athens 2004 Olympic Games Organizing Committee;
- the caterers selected to supply all Olympic venues;
- the General Chemical State Laboratory, the laboratories on the official list of the Hellenic Food Authority and the laboratories of the Ministry of Health and Social Solidarity and the Ministry of Rural Development and Food;

Within the Olympic venues, the Athens 2004 Olympic Games Organizing Committee and the caterers who had been selected to supply the athletic venues

during the Olympic Games played a special role. They were responsible for ensuring adequate preparation of these facilities according to standards determined by the Hellenic Food Authority.

Training of the Hellenic Food Authority volunteers, the personnel of the Athens 2004 Olympic Games Organizing Committee as well as the personnel of the enterprises that are to supply foods in the Olympic venues was initiated on topics relating to the regulation and control of compliance with rules of hygiene in the food enterprises, the application of safety systems (HACCP) and control of compliance with the provisions of the relevant legislation.

Within the Olympic venues

The Hellenic Food Authority was mainly responsible for:

- supervising and controlling all contracted caterers for every Olympic city; and
- controlling all food suppliers in the Olympic cities.

The participating bodies and organizations were:

- the Hellenic Food Authority;
- the Athens 2004 Olympic Games Organizing Committee; and
- the caterers selected to supply all Olympic venues.

The Athens 2004 Olympic Games Organizing Committee and the caterers made efforts to complete

the facilities for eating places within all Olympic venues, whether athletic or not.

The caterers continually inspected their enterprises and trained their personnel on the basic rules of food hygiene and safety.

The Athens 2004 Olympic Games Organizing Committee, together with its services, continually inspected the specified points within the Olympic venues where the infrastructure was prepared to enable the food enterprises to begin their operations.

The Hellenic Food Authority carried out daily inspections to ensure that the facilities of the eating places complied with its specifications. During the last 13 days before the Olympic events started, the Hellenic Food Authority visited all athletic venues and training areas, the Olympic village, the Media Centre and hotels where mass-media staff stayed.

The Hellenic Food Authority completed preparations with the 16 caterers selected to supply all Olympic venues (whether athletic or not). The preparations concerned:

- determining a food supply plan for each of the 531 supply points in 43 athletic and non-athletic venues inside the Olympic site; and
- inspecting many restaurants in tourist-oriented places in the centre of Athens in collaboration with the respective prefectural departments in Athens.

The food supply plan in most of the food service premises inside the athletic venues was scheduled for the supply of packaged food products and pre-cooked meals from the contracted catering services. In four places where athletic events were taking place, the Media Centre, the Sponsors' Hospitality Centre, the Olympic Village and in seven places where media staff were staying, the food served was

cooked on-site. Every athletic venue had a food outlet for mass-media staff.

Activities a few days before the beginning of the games

Thirteen days before the Olympic events started, the Hellenic Food Authority inspected all athletic venues and training areas, the Olympic village, the Media Centre and hotels where mass-media staff stayed. More specifically, during that time the following were accomplished.

- The Hellenic Food Authority inspected the athletic venues and conducted continual surveillance where food outlets were operating (Olympic Village, Media Centre, training centres, and welcoming centres for mass-media staff). A specific checklist was issued and used throughout the Games (Table 8.1).
- The Hellenic Food Authority focused on the places where meals were to be prepared outside the Olympic Village. Solutions were applied for the problems of health certification and personnel training in accordance with directives issued by the Hellenic Food Authority. The Hellenic Food Authority continually collaborated with all the food enterprises to ascertain that they were fulfilling their commitments.
- The Hellenic Food Authority had a daily programme for supervising the athletic venues (26 teams of inspectors per day) according to the athletic programme of the Olympic Games, with parallel supervision of the contacted caterers. Volunteers were used as needed, thereby permitting inspectors to be released so they could pursue other tasks.
- The Hellenic Food Authority determined the distribution of inspectors by area, resolved issues relating to equipment and mobile telephones and developed a detailed food-sampling scheme.

Table 8.1

Checklist for the inspection of temporary food establishments at the Olympic sports sites



Information on the inspection		
Date:		Time of inspection:
Olympic sports site		
Address:		
Telephone/fax:		
Responsible person:		
Food service company of the establishment:		
The establishment:		
Supplies foodstuffs <input type="checkbox"/>	Type of food	
prepares foodstuffs <input type="checkbox"/>	Type of food	
cooks food <input type="checkbox"/> - That is prepared <input type="checkbox"/> - That is defrosted <input type="checkbox"/>	Type of food	
receives frozen food <input type="checkbox"/>	Type of food	
Type of inspection		
INITIAL:	DAILY RE-INSPECTION	SAMPLING
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Samples were taken from ready-to-eat meals provided by the caterers.

- The Hellenic Food Authority reinspected and monitored more than 200 food suppliers.
- The Hellenic Food Authority supervised and controlling the inspection work of the local authorities in summer camps, fast-food outlets, restaurants etc.

Table 8.2 provides more detail.

Activities during the Olympic events

During the Olympic Games, three levels of continuous inspection of eating places within all Olympic venues were developed. Managers of the caterers active within the Olympic venues carried out the first level, specially trained scientists of the Athens 2004 Olympic Games Organizing Committee the second level and the inspectors of the Hellenic Food Authority the third level.

Table 8.2

Details for the preparation of food inspection during the Athens 2004 Olympic Games

	Inspected	Sampling	Deviations – reinspection	Approved	Not approved	Sent to court
Inspection of catering enterprises						
Attica Olympic area	14	65		14		
Attica	8		4			
Thessaloniki	2	2		2		
Thessaloniki Olympic area	17	1		17		
Patras	11		2	2	3	
Crete	2			2		
Crete Olympic area	3		3			
Thessalia Olympic area	7	5	5	1	1	
Thessalia						
Total no. of catering enterprises	64 (19)	73	14	38		
Inspection of Olympic hospitals						
Attica Olympic area	18		10	8		
Attica	32		25	7		
Thessaloniki Olympic area	3			3		
Thessaloniki	4			4		
Patras Olympic area	1		1			
Patras	5		5	1		
Crete Olympic area	1		1	1		
Crete	6		5	1		
Total no. of hospitals	70 (23)		47	24		

Table 8.2 (cont.)

	Inspected	Sampling	Deviations – reinspection	Approved	Not approved	Sent to court
Inspection of Olympic hotels						
Attica	74		50	24		
Thessaloniki Olympic area	1			1		
Thessaloniki	78		1	77		
Patras Olympic area	1		1			
Patras	27		13	11	3	
Crete Olympic area	2		2			
Crete	8		8			
Thessalia	27		15	9	3	
Total no. of hotels	191		75	11		
Suppliers	150		30	120		
Restaurants						
Attica	185		160	150		
Thessaloniki	190		5	185		
Patras	85		15	66	4	
Crete	21		20	20	1	
Thessalia	115		90	25		
Total no. of restaurants	596		290	445		
Water-bottling companies	20		12	8		

Additional inspections in connection with Athens 2004 Olympic Games (from 1 January to 30 May 2004)

Category of food enterprise	Total number	Inspected	Sampling	Acceptability		
				Deviations and reinspection	Approved	Not approved
Manufacturing and packaging	5 000	324		60	324	0
Distribution and transport	7 000	186		23	186	0
Retailing	22 000	731		63	731	0
Food service and catering	42 000	774		166	774	0
Manufacturers that sell to retail outlets	8 000	630		111	630	0
Total	84 000	2 645		423	2 645	0

During the period of the Games, the Hellenic Food Authority's inspectors supervised continually and systematically all 531 food outlets inside the Olympic sites in the five Olympic cities, Athens, Thessaloniki, Volos, Patras and Heraklio. Checking compliance with the instructions given to the caterers was essential. The main problems identified during that period had to do with the infrastructure and equipment of the eating places; noncompliance with hygienic rules and with food-handling and catering procedures (such as exposure of food to the sun, heat, etc). The Hellenic Food Authority took drastic measures on several occasions (destroying food that had been characterized as unsafe), and corrective interventions in 183 food outlets and instructions to food handlers were able to prevent episodes of food-related illness. During the Games, more than 200 food samples

were taken from food outlets in the Olympic venues. The results of the analysis indicated the effectiveness of the surveillance. Not one single case of food poisoning or other related illness was recorded, although more than 10 million meals and snacks were prepared and consumed during the Olympic Games period. Finally, throughout August 2004, the Hellenic Food Authority operated a four-digit hotline for consumers to report problems, complaints and deficiencies.

The Centre for Biological Control of the Army, the Hellenic Centre for Infectious Diseases Control, the respective local authorities, the General Chemical State Laboratory and the volunteers that were assigned specific roles by the administration supported the work of the Hellenic Food Authority.

Emergency plan for immediate response to potential food crisis incidents

The timely and effective management of a potential crisis was based on the existence of a plan of action that precisely described the participating bodies and their responsibilities, allowing swift intervention for effective management, dealing with the crisis and taking the necessary measures.

The bodies included in the plan were:

- the Hellenic Food Authority:
 - the Athens 2004 Olympic Games Organizing Committee (from the Hellenic Food Authority personnel);
 - the laboratories on the official list of the Hellenic Food Authority;
- the General Chemical State Laboratory;
- the laboratories of the Ministry of Rural Development and Food;
- the Ministry of Health and Social Solidarity:
 - the Hellenic Centre for Infectious Diseases Control;
 - the Health Coordination Command Centre;
- the Athens 2004 Olympic Games Organizing Committee:
 - Health Services Department;
- an interministerial team;
- the Ministry of Rural Development and Food; and
- the General Secretariat for Civil Protection.

Activities (general)

The Hellenic Centre for Infectious Diseases Control developed a mechanism for the immediate notification of possible food poisoning. Then the Hellenic Food Authority and Hellenic Centre for Infectious Diseases Control developed a mechanism for immediately confirming the causes of food poisoning. The source of the suspect food would be identified: food produced within the Olympic venues, water in the Olympic venues, food produced in Greece and distributed within the Olympic venues or imported food.

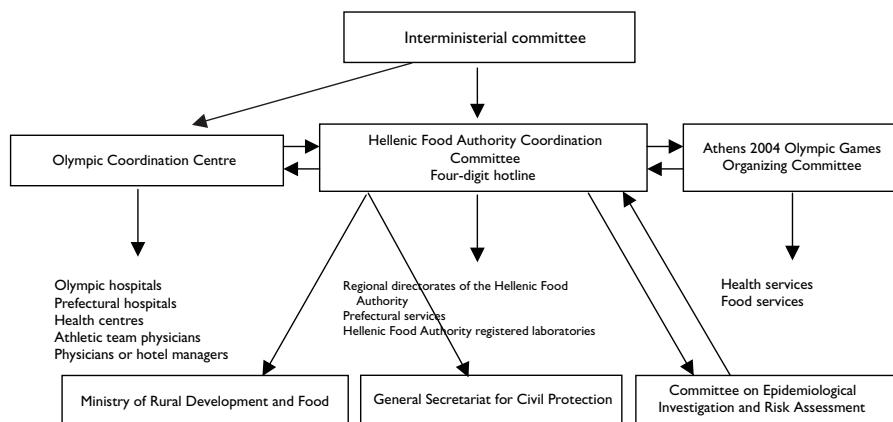
The Hellenic Food Authority and the local authorities developed a mechanism for immediate management and notification of the problem. The Hellenic Food Authority would manage the problem at the central and regional levels and the Hellenic Food Authority, in collaboration with the local authorities, would take immediate measures to eliminate or restrict the extent of the problem by blocking suspected foods, conducting laboratory analysis using

the fastest possible techniques, re-examining parameters and procedures, etc. and by imposing severe penalties. The Hellenic Food Authority further established links between these mechanisms.

The plan for dealing with a potential food crisis during the Olympic Games was related to the point where the crisis emerges and envisioned activating the following mechanisms.

A coordinating body was established at the central offices of the Hellenic Food Authority to evaluate potential health risks from foodborne incidents. This coordinated body was functioning in collaboration with related bodies in the Ministry of Health and Social Solidarity, the Ministry of Rural Development and Food, the Athens 2004 Olympic Games Organizing Committee, the Interministerial Committee for Coordinating the Olympic Games Preparation and the General Secretariat for Civil Protection according to the scheme in Fig. 8.1.

Fig. 8.1. Interagency cooperation and communication links during the Athens 2004 Olympic Games



Conclusions

The main conclusion and lesson to be learned is the importance of coordination and the collaboration of all parties involved in food safety. Nevertheless, clear and well-defined tasks for each participating organization are crucial.

This kind of coordination and collaboration did not exist before to such an extent. The success was so effective that it was decided that the same scheme operating during the Olympic Games, with appropriate modification, will be the basis of the food safety system applied there after across the whole country.

CHAPTER 9

Monitoring drinking-water quality in holding tanks at Olympic venues

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Introduction

This activity ensured the safety of drinking-water in holding tanks at the Olympic venues against the risk of contamination resulting from an accidental or deliberate act. Physicochemical parameters, heavy metals and pesticides were monitored to ensure their compliance with the EU drinking-water directive (1). Particular emphasis was given to the possible presence of chlorinated pesticides, since these toxic organic compounds are easily accessible and completely soluble in water, making detection impossible

without analysis. No other public authority monitored the quality of water in holding tanks, but various meetings between the competent authorities emphasized the need to protect the health of athletes and the personnel from the risk of potential poisoning by the consumption of contaminated water. The Laboratory of Sanitary Engineering and Environmental Health of the National School of Public Health was solely responsible for this activity.

Methods

Preparation activities and technical interventions

A communication programme was established to determine which Olympic venues contained drinking-water holding tanks, initially with the relevant authorities of the Special Service of Public Works & Olympic Works 2004 and the General Secretariat for the Athens 2004 Olympic Games, which were responsible for monitoring the construction of the Olympic works and subsequently with the construction site engineers responsible for the projects.

Fifteen water holding tanks were registered. The tanks were printed and labelled on a map. Exploratory visits were made to the Olympic venues, where the necessary information was given to the technicians responsible for the water supply projects to ensure that the water was constantly renewed to

keep it potable. In addition, sampling points were determined where water representative of the water in the holding tanks would be sampled instead of water from the main water supply provided by the Athens Water Supply and Sewerage Company. Finally, information was provided on the correct cleaning and disinfection procedure for the holding tanks prior to use.

Sampling and analysis

Samples were taken before the Games began, during the Olympic and Paralympic Games and after the Games. These were transferred under refrigeration to the Laboratory of Sanitary Engineering and Environmental Health of the National School of Public Health, where the necessary analysis was

performed within 24 hours. The research staff of the laboratory together with external associates was actively involved in the sampling, transport and timely analysis of samples.

The parameters monitored were physicochemical (pH, conductivity, ammonia, nitrates, nitrites, cyanides and fluorides), heavy metals (cadmium, lead, copper and chromium) and pesticides. In particular, the pesticides α -BHC (benzene hexachloride), β -BHC, δ -BHC, lindane, heptachlor, aldrin, endosulfan I, heptachlor epoxide, *p-p'*-DDE (1,1-dichloro-2,2-bis(*p*-chlorophenyl)ethylene), dieldrin, endosulfan II, *p-p'*-DDD (1,1-dichloro-2,2-bis(*p*-chlorophenyl)ethane), endosulfan sulfate and methoxychlor were considered.

Results

Development of a rapid method for determining the concentration of pesticides

More than 700 compounds are registered as pesticides and are in use today. Many more compounds once used and now banned continue to persist in the environment. Concern has risen in recent years over the ability of these compounds to act as endocrine disrupters in wildlife and humans, even at extremely low concentrations. Despite being extremely toxic, chlorinated pesticides are easily accessible to the public. The EU drinking-water directive (1) sets a limit of 0.1 $\mu\text{g/l}$ for total pesticide concentration and a limit of 0.03 $\mu\text{g/l}$ for aldrin, dieldrin, heptachlor and heptachlor epoxide. Current methods for the analysis of pesticides with gas chromatography/mass spectroscopy (GC/MS) cannot achieve such low concentrations without optimizing

Results

The results from the analysis were archived and registered in an electronic database to allow comparative assessment between tanks and variation over time. In addition, a geographical information system was used where Olympic projects were recorded and the results were presented in a map view.

Reporting

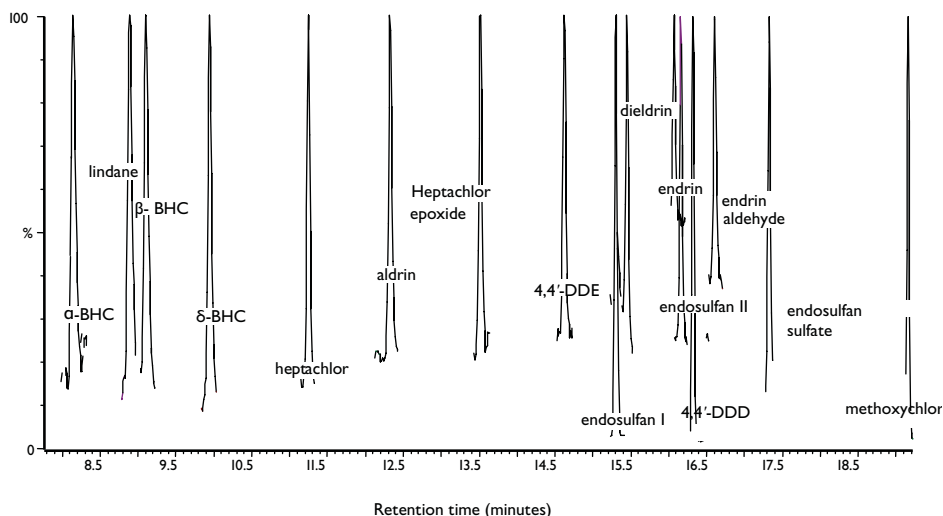
The results were communicated on a daily basis to the Olympic Games Office, which in turn updated the Health Coordination Command Centre.

chromatographic conditions and sample concentration (2,3). A method was therefore developed that addresses the issue of sample concentration and the optimization of chromatographic conditions using solid-phase extraction GC/MS (4).

In the technique developed, 1 litre of sample water is passed under vacuum through a cartridge containing a specific sorbent that retains the compounds of interest. The organic compounds retained on the sorbent are then eluted from the cartridge with small quantities of an appropriate solvent. An optimized system was achieved by determining the minimum amount of solvent necessary to elute the retained compounds and yet give satisfactory recovery.

After the concentration was determined, the chlorinated pesticides were accurately identified and confirmed by optimizing the chromatographic system. The efficiency of the system was considered in

Fig. 9.1. Combined pesticide chromatogram showing pesticide retention times



regard to sensitivity and optimum resolution in the shortest possible time. Selected ion monitoring was used to increase the sensitivity for target analytes by using selective detection of ions most indicative of the compounds of interest. Reference spectra and retention times for analytes were obtained by measuring calibration standards under the same conditions used for samples. The GC/MS method developed gave excellent separation for the analytes concerned.

Calibration for the analytes concerned was satisfactory, giving $R^2 \geq 0.995$ for each analyte (Fig. 9.1).

Compliance with the EU drinking-water directive

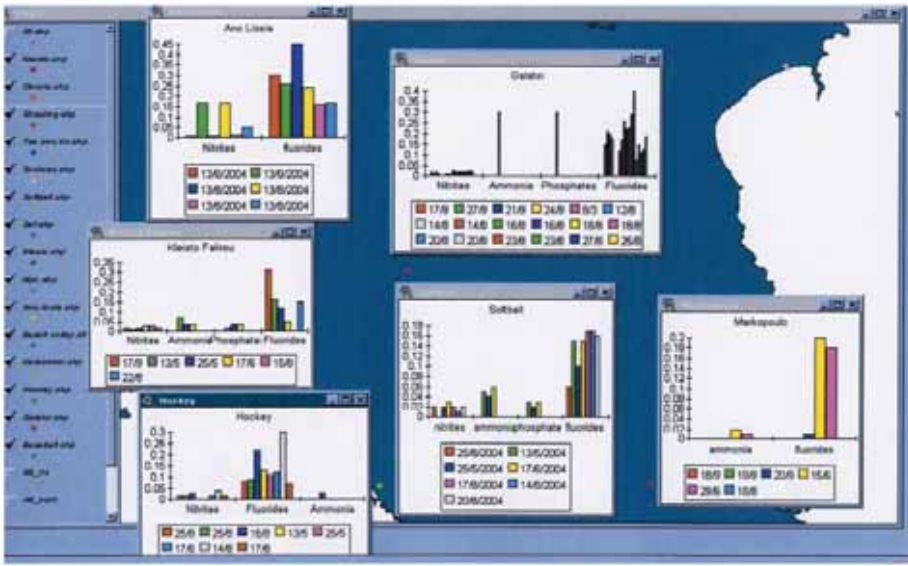
Samples from 15 Olympic venues were collected daily and analysed during the Athens 2004 Olympic and Paralympic Games. Almost 3000 analyses were performed in total. The results were stored in a database and were presented in geographical information system map views. Fig. 9.2 shows a characteristic view of nitrites, ammonia, phosphates and

fluorides in the water tanks of six of the venues of the Athens 2004 Olympic Games.

Physicochemical parameters in all samples were measured (5) and found to be in compliance with the EU drinking-water directive (1). Chromium was the only heavy metal exceeding the drinking-water limit value of 50 µg/l (measured value 65 µg/l), in only one of the water tanks, the one at the shooting venue, and this was attributed to the piping work.

For pesticides, the only parameter exceeding drinking-water limit values was endosulfan. This was detected in 3 of the 15 Olympic venue water tanks, a total of four times and at concentrations of 0.2–1.6 µg/l. This was further investigated by analysing water samples from the main water distribution network. Similar concentrations were detected in the main water supply, and the possibility of accidental or deliberate contamination was ruled out. This result did, however, exceed the limit value of the EU drinking-water directive (1), and the source needed to be investigated further. The water was continually monitored for the concentration of endosulfan during the Olympic and Paralympic Games, and endosulfan was not detected again.

Fig. 9.2. GIS map view showing concentrations of nitrites, ammonia, phosphates and fluorides in the drinking-water sampled at Olympic venues



Conclusions

This work showed that the water stored in tanks at the Olympic venues was of good quality and did not present any health risks to the athletes, the organizing authorities and the public. This was the result of good engineering practices followed during the construction of the Olympic works but also of the strict security measures observed throughout the Athens 2004 Olympic and Paralympic Games.

This was the first time that pesticides in drinking-water were monitored systematically in Greater

Athens. The method developed proved to be accurate and rapid with very low detection limits and permitted many samples to be analysed in a short time.

The Laboratory of Sanitary Engineering and Environmental Health of the National School of Public Health proved very effective in monitoring the quality of drinking-water and in providing support and advice to the Ministry of Health and Social Solidarity in protecting public health.

Lessons learned

At the Olympic venues, water holding tanks were constructed as a safety net in case of a shortage or a cut-off in the main water supply due to deliberate contamination.

A programme was put forward and implemented for using this holding tank water when not used for consumption for secondary uses such as watering and the washing down of areas, thus ensuring the continual replenishment of the holding tank water and maintaining its wholesomeness on a daily basis.

Safeguarding the quality of water intended for human consumption is of major importance and must be achieved both through line monitoring and proactive source protection. Water can be rendered unsuitable for consumption not only by adding toxic pollutants undetectable by the naked eye but also by

adding easily accessible substances that can affect colour and odour. The water holding tanks were therefore locked and secured, and security staff guarded the access routes to prevent accidental or deliberate water contamination.

As a result of the strict security measures in place at the Olympic venues, access even by the public health inspectors authorized for sampling was time consuming. Coupled with the fact that the quality of drinking-water had to be confirmed before any consumption took place, sampling had to be carried out very early in the morning, well in advance of the commencement of the daily activities. Coordinating the sampling efforts was essential since samples had to be extracted and analysed simultaneously. This required planning not only among the public health inspectors but also with the security staff to ensure that access could be obtained when required.

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CHAPTER 10

Laboratory support in environmental health monitoring

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Despina Perimeni and Alkiviadis Vatopoulos

Introduction

The Department of Microbiology of the National School of Public Health was involved in two main environmental health activities during the Athens 2004 Olympic Games:

- providing testing services to support the environmental inspections of targets of public health importance, including the safety of drinking-water and recreational water and food; and
- developing laboratory capacity to respond to potential incidents involving the deliberate use of biological agents.

Environmental testing services

Water examination

In 2001, the Ministry of Health and Social Solidarity established the Olympic Planning Unit, which was responsible for devising a plan for environmental health surveillance of numerous targets of public health importance, including preventing Legionnaires' disease. Water supply systems of hotels and Olympic venues, cooling towers and decorative fountains were registered and inspected in Athens and the other four Olympic cities (Thessaloniki, Patras, Volos and Heraklio) from June 2002 through July 2004. All these inspections included sampling for possible *Legionella* contamination.

Sample collection

Shower heads

At least four water samples were drawn from the nearest shower heads supplied by the hot water storage heater. The first sample was collected from hot

water discharged from the shower head immediately after it was turned on and the second after one minute of flow time. The third sample was collected from cold water discharged from the shower head immediately after it was turned on and the fourth after two minutes of flow time. When the water supply system comprised more than one ring, four water samples were drawn from the shower heads on each ring.

Cooling towers

One sample was collected from the water returning to the cooling tower in addition to a sample from the cooling tower pond, as far away from the fresh water inlet as possible.

Decorative fountain

One sample was collected from each decorative fountain pond.

Samples were drawn in sterile 0.5-litre glass bottles and the temperature, pH and free chlorine were measured.

To neutralize residual free chlorine, sodium thiosulfate was added in sterile bottles for bacteriological analysis, and acid-preserved glass bottles were used for chemical determination.

Collection bottles were returned to the laboratory immediately after sampling for bacteriological and chemical and physical examination; if analysis could not begin within 24 hours, samples were kept refrigerated (1).

Microbiological analysis methods

Water samples collected from water supply systems, cooling towers and decorative fountains were tested for *Legionella* spp. using methods in accordance with ISO 11731 (1) and for aerobic count at 37°C for a minimum of 48 hours of incubation, as determined by the pour-plate method according to ISO 6222 (2).

To detect *Legionella* spp., 0.2-litre water samples were concentrated by membrane filtration (0.45-µm pore sized polyamide filter, Millipore, Billerica, MA, USA and white hydrophilic mixed cellulose ester membrane, Pall Life Sciences, Ann Arbor, MI, USA). The filter membrane was resuspended in 10 ml of Ringer's solution and vortex-mixed for 2 minutes. To reduce contamination by other microorganisms, 2 ml of this suspension was heat-treated (50°C for 30 minutes in a water bath). Two 0.1-ml aliquots of the original and concentrated specimens (heat-treated and untreated, 1:10 diluted and undiluted) were each spread on duplicate plates of GVPC *Legionella*-selective medium (bioMérieux, Marcy l'Etoile, France and Biolife, Milan, Italy). The plates were incubated at 37°C in a humidified environment for 10 days and read from day 4 at the dissecting microscope. Suspected colonies with a mottled surface or an iridescent and faceted cut-glass appearance were counted from each sampling. Three colonies of each kind of suspected colonies on a

GVPC plate were subcultured on buffered charcoal yeast extract (BCYE) agar (with cysteine) (BioMérieux and Biolife) and nutrient agar (cysteine-free) media (LAB M, Lancashire, United Kingdom) for >2 days. Only nutrient agar-negative colonies grown on BCYE were subsequently identified by an agglutination test (*Legionella* Latex Test, Oxoid). The test allows a separate identification of *Legionella pneumophila* serogroup 1 and serogroups 2–14 and detection of seven *Legionella* (polyvalent) spp. (other than *L. pneumophila*) that have been implicated in human disease: *L. longbeachae*, *L. bozemanii* 1 and 2, *L. dumoffii*, *L. gormanii*, *L. jordanis*, *L. micdadei* and *L. anisa*. The results are expressed as colony-forming units per litre (CFU/l), counting the GVPC plate with the highest number of confirmed colonies and taking into account the sample's dilution. The detection lower limit of the procedure was 500 CFU/l. Before and during the research period, the Laboratory participated in an external quality control scheme for *Legionella* detection in water (Quality Management, Lancashire, UK), through a periodic distribution of water samples added with unknown *Legionella* spp. and concentration. The total microbial counts at 37°C for 48 hours were obtained twice by the pour-plate method on yeast extract agar (LAB M).

Although the ISO method itself (1) requests 10 days to draw out results, an early warning system was established between the Laboratory and the Olympic Planning Unit to inform them about any high bacterial loads of *Legionella* spp. (exceeding 10 000 CFU/l) of any sample.

Microbiological test results: quantitative assessment

The microbiological test results were considered *Legionella* positive if the bacteria count exceeded 10 000 CFU/l in at least one sample or more than

1000 but less than 10 000 CFU/l in more than two samples collected from the water supply system (3).

The microbiological test results of samples collected from cooling towers or decorative fountains were considered *Legionella* positive if the bacteria count exceeded 10 000 CFU/l in one sample or the *Legionella* bacteria count exceeded 1000 CFU/l but less than 10 000 CFU/l in at least one sample and the aerobic count exceeded 100 000 CFU/l.

A total of 2150 samples from 1681 sites were analysed during the study period, as shown in

Tables 10.1 and 10.2, which show the main results. Up to 3.7% of all sites were contaminated with *Legionella* exceeding 10 000 CFU/l, whereas moderate contamination was present in an additional 12.6% of the sites.

As expected, cooling towers were the type of site contaminated most frequently.

The results were incorporated in the standardized inspection report, and each site was graded based on a scoring system generated by the Olympic Planning Unit.

Table 10.1 Environmental sampling performed by period and bacterial load

Period A (June 2002–December 2003)		
Bacterial load (colony-forming units of <i>Legionella</i> per litre)	Number of specimens tested	Percentage
<500	337	76.6%
500–1 000	29	6.6%
1 000–10 000	48	10.9%
≥ 10 000	26	5.9%
Total	440	100.0%
Period B (January–June 2004)		
Bacterial load (colony-forming units of <i>Legionella</i> per litre)	Number of specimens tested	Percentage
<500	559	80.4%
500–1 000	33	4.7%
1 000–10 000	89	12.8%
≥ 10 000	14	2.0%
Total	695	100.0%
Period C (July–September 2004)		
Bacterial load (colony-forming units of <i>Legionella</i> per litre)	Number of specimens tested	Percentage
<500	770	78.9%
500–1 000	47	4.8%
1 000–10 000	122	12.5%
≥ 10 000	37	3.8%
Total	976	100.0%

Table 10.2

Environmental samples for each type of sampling site and bacterial load

Type of site	Bacterial load (colony-forming units of <i>Legionella</i> per litre)								Total <i>n</i>
	<500		500–1 000		1 000–10 000		≥ 10 000		
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	
Water supply systems	1 391	78.9	99	5.6	229	13.0	45	2.6	1 764
Cooling towers	107	57.8	8	4.3	36	19.5	34	18.4	185
Decorative fountains	91	105.8	4	4.0	3	3.0	1	1.0	99
Ships	84	97.7	0	0.0	2	2.3	0	0.0	86
Swimming pools	8	100.0	0	0.0	0	0.0	0	0.0	8
Total	1 681	78.5	111	5.2	270	12.6	80	3.7	2 142

Conclusions

Cooling towers followed by water supply systems of sites sampled were the main cause of concern, while decorative fountains located outside buildings seemed to be of no importance for microbiological test results, although the majority of their inspection reports were unsatisfactory. In fact, the only positive microbiological test results for decorative fountains were from those located inside buildings. Further studies might give more answers for factors

influencing the proliferation (such as sunlight) of *Legionella* spp.

Moreover, ships and swimming pools did not seem to pose any serious concern either.

From January 2003 through May 2004, positive microbiological test results remained rather stable, increased during June and July 2004 and eventually declined during the Olympic period (Tables 7.8 and 10.1).

Food inspection

The laboratory was part of the Hellenic Food Authority network of laboratories responsible for checking bottled or mineral water, food or feed samples during the pre-Olympic and the Olympic period of the Athens 2004 Olympic Games. As planned, its role would be supportive and specific in case the rest of the laboratories were overloaded or in case of special investigations requiring implementation of special molecular typing of the microorganisms coming from food.

For this reason, such molecular methods as pulsed field gel electrophoresis, enterobacterial repetitive intergenic consensus (ERIC) polymerase chain reaction (PCR) and repetitive element sequence-based (REP) PCR were developed and well established for the investigation of potential waterborne or foodborne epidemics.

No such event occurred during the time period, so 28 food samples were routinely tested.

Development of laboratory capacity to respond to the potential deliberate use of biological agents in the context of surveillance for public health

Infrastructure

Within the Department of Microbiology, a brand new section was created by building up a Biosafety Level 3 laboratory (P3) and appropriate equipment was acquired. Various national and international bodies inspected and approved both the premises and equipment.

Training

Since 2003, appropriately vaccinated senior staff members of the Department were trained at the Health Protection Agency, Strategic Response Capability Training, Porton Down, Salisbury, United Kingdom at least three times, as well as in Greece, for various time periods, not only on microbiological techniques but more generally on wider issues concerning facing the deliberate use of biological agents in the context of public health.

Quality control

The P3 laboratory successfully underwent internal (three times) and external quality control by the Health Protection Agency, Strategic Response Capability Training, Porton Down, Salisbury, United Kingdom (twice).

Biological agents that might potentially be deliberately used to be handled in the laboratory were:

- *Bacillus anthracis*
- *Yersinia pestis*
- *Francisella tularensis*
- *Burkholderia pseudomallei*.

These infectious agents could be detected and isolated, identified and typed by conventional methods (culture and biochemical identification) as well as by molecular methods (mainly by PCR) in both clinical and environmental samples.

Lessons learned

During the pre-Olympic and Olympic period, the laboratory was officially involved in four incidents, all proven to be false alarms, and analysed 21 environmental samples.

- Close collaboration among the inspection authorities, the surveillance system and the public health laboratories at both the national and international levels is of utmost importance and

the main lesson learned during the Athens 2004 Olympic Games.

- An appropriate risk assessment procedure is equally important to control the kind of samples flowing to the testing laboratories, thus saving financial and human resources.
- Establishing international cooperation on matters of laboratory support vastly increases the scientific capacity of the laboratories involved in such fields and specific projects.
- The obligation to achieve the highest professional performance among the continually increasing numbers of samples arriving per day, especially from July 2004 to September 2004, while facing routine work and the ability of the laboratory to respond to the potential deliberate use of biological agents. It was proven that creating a relatively small but well-trained team of scientists and technicians could respond to this challenge very well.

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CHAPTER 11

Mosquito surveillance and control

Nikolaos Vakalis, Eleni Patsoula
and Anna Samanidou-Voyadjoglou

Introduction

The transmission of diseases with insect vectors and the problem of nuisance from mosquitoes are of special interest to the international community. The special consideration for public health issues due to the organization of the Athens 2004 Olympic Games comprises an additional factor for intensifying the efforts towards reducing the population of insect vectors and the health risks related to them.

The movement of a considerable number of mainly undocumented immigrants affects several parameters of public health. The large number of visitors that arrived in Greece during the Olympic Games also imposed similar potential dangers.

This project aimed to study the Attica prefecture, with special interest in the areas where athletic

events were carried out or athlete residences. The study included the areas of East Attica (Olympic Rowing Centre), of the Olympic complexes in Maroussi, Faliro, Piraeus and Thracomakedones (Olympic Village).

The aims included: to record in detail all the types of potential mosquito breeding sites in these areas, to study all mosquito species that breed in each site, to observe mosquito population fluctuation throughout the year, to evaluate the risks associated with the presence of several mosquito species and to contribute to planning and implementing a successful programme for managing the mosquito population to reduce the presence of mosquitoes and maintain it at acceptable levels using environmentally sound methods.

Material and methods

Before collection was initiated, the area was visited in early March 2003 to spot the potential mosquito breeding sites, plan the timing of initiating the study,

locate the collection sites and organize the sampling frequency. Further, the areas were explored to locate appropriate sites for setting special light traps.

Study area

The study area included the region of Schinias in East Attica (Olympic Rowing Centre), the Olympic Stadium in Maroussi, the Agios Kosmas Olympic Sailing Centre, the Faliro Olympic Complex, the

Vouliagmeni Olympic Centre, the Markopoulo Olympic Equestrian Centre and the Olympic Village in Thracomakedones (Fig. II.1, II.2 and II.3).

Fig. II.1. South-eastern part of the Schinias marsh in October: a biotope for *Ochlerotatus detritus*



Fig. II.2. A temporary flood of the marsh in June, with a high density of *Ochlerotatus detritus*



Fig. II.3. A temporary flood in K. Soulli outside the western part of the rowing canal in May: high density of *Culiseta subochrea*



Collection of immature stages

All breeding sites were arranged in groups according to their type. In the Schinias area, four main breeding sites were recorded: a) canals, b) the main marsh, c) temporary floods from overflowing of the canals or marsh and d) artificial sites such as artificial fountains and shallow wells. During the sampling period, due to the unusual intensity of rainfall, the whole area resembled a lake.

Every week the scientific team conducted sampling in specific spots in all biotopes within two of the domains (totally four) in which the study area was divided to facilitate collection. All places of the study area were therefore examined every fortnight.

According to the weather conditions, systematic sampling started in May and lasted until September.

Immature stages were collected using devices that are used worldwide for this purpose. The collected

material was placed in special plastic bags in which the collection coded number site and date were marked and transferred to a portable refrigerator to transport them alive to the Laboratory of Entomology of the National School of Public Health. In the Laboratory, each collection was placed in special incubation containers until the mosquitoes reached the appropriate stage for further study and classification. When mosquitoes reached the adult stage, they were killed with chloroform and pinned.

A study of their taxonomic character followed using a stereoscope. Each individual mosquito was labelled with all collection information, genus and species names; this is kept for future reference in the entomological collection of the Department.

Further, all collection and taxonomic data are kept in electronic files for further elaboration.

Collection of adult stages

After the study area was thoroughly investigated, four different areas were chosen where the specific light traps were placed. The four areas comprised a settlement in the northern part of the marsh, another settlement in the west part of the marsh, an old pumping station in the north-western part and an abandoned house built in the marsh.

One light trap per week was placed in these specific areas from June onwards. The light traps were placed late in the afternoon, and the following morning all mosquitoes captured were placed in individual

vials. The same procedures for labelling and killing mentioned above were followed. Further, resting adult mosquitoes were collected and studied.

The collected and captured mosquitoes were examined and classified in species based on external morphological character according to the keys for identifying Greek mosquitoes (1–3). *Anopheles maculipennis* forms a complex of species that shares common morphological character and includes malaria vector species, and a molecular technique was applied to determine the endemic species in the study area.

Programme for mosquito abatement

In the study areas, the mosquito population was abated under the supervision of the Environmental Department of the Athens 2004 Olympic Games Organizing Committee. In the region of Schinias in East Attica, the larvicide *Bacillus thuringiensis*

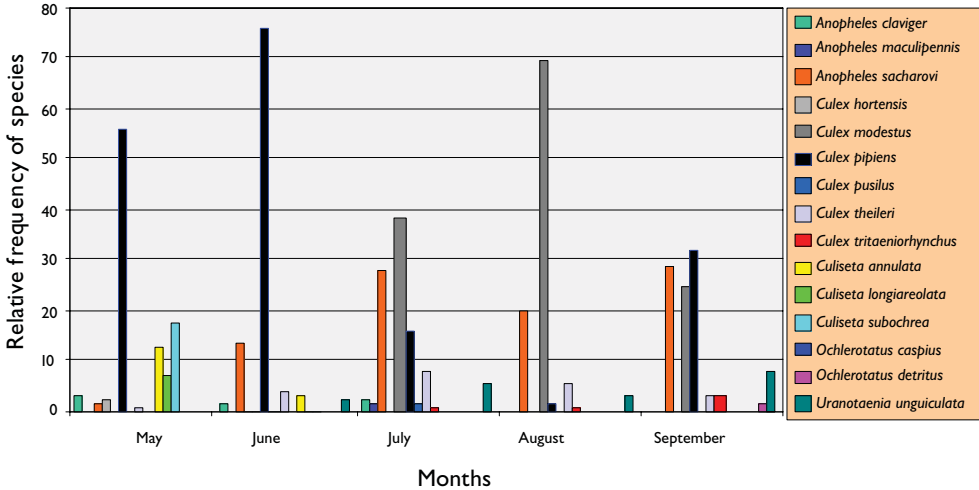
israelensis was used, which exhibits selective action in mosquito larvae without affecting the rest of the aquatic organisms, humans or the environment. In the other Olympic Games sites, adult mosquitoes were abated with permethrin.

Results and conclusions

During the first month of the sampling period, the most abundant species in the area was *Ochlerotatus detritus*. Two more species, *Culex theileri* and *Culiseta annulata*, were identified, but in very low numbers.

During the main period of the study from May to September, 15 species belonging to 5 genera were recorded. The species were: *Anopheles claviger*, *Anopheles sacharovi*, *Culex hortensis*, *Culex modestus*,

Fig. II.4. Relative frequency of mosquito species, May–September 2003



Culex pipiens, *Culex pusillus*, *Culex theileri*, *Culex tritaeniorhynchus*, *Culiseta annulata*, *Culiseta longiareolata*, *Culiseta subochrea*, *Ochlerotatus caspius*, *Ochlerotatus detritus* and *Uranotaenia unguiculata*.

Fig. II.4 presents species abundance and fluctuation between May and September.

From July to September, a large population of *Anopheles sacharovi* mosquitoes and smaller populations of *Culex pipiens* and *Culex modestus* were identified in houses within the study area. The species biting during sampling times (before noon) was mainly *Culex modestus*; during the evening, *Anopheles sacharovi* and *Culex modestus* were a nuisance.

According to the results of the study so far and records from the resident population, the mosquito nuisance is serious from early spring onwards.

During the initial weeks of the study in March, *Ochlerotatus detritus*, a nuisance to humans, was already abundant.

In May, several species were present in the study area in large numbers. At the time all sites under

study were flooded due to heavy rainfall. *Culex pipiens* was in all collection sites apart from the canals, where *Anopheles claviger* was abundant.

In the floods of the north-western part of the study area, *Culiseta annulata* and *Culiseta subochrea* were most frequent. In the floods from the overflow of the marsh, in addition to *Culex pipiens*, *Culex hortensis*, *Culex theileri*, *Culiseta longiareolata* and *Anopheles sacharovi* were also recorded. All temporary floods drained by the end of May.

During May, the canals were full of water and *Anopheles claviger* was abundant. The next most frequent species, although in lower density, was *Culex pipiens*. In these sites *Anopheles sacharovi*, *Culex theileri*, *Culiseta annulata* and *Culiseta subochrea* were also present.

In all the spots studied in the main marsh, the density of *Culex pipiens* was exceptionally high during May. At lower density were *Anopheles sacharovi*, *Culex hortensis*, *Culex theileri*, *Culiseta annulata*, *Culiseta subochrea*, *Ochlerotatus caspius* and *Uranotaenia unguiculata*.

In several shallow wells or fountains containing rain-water, a large number of *Culex pipiens* and *Culiseta longiareolata* were collected. *Culiseta annulata* and *Culiseta subochrea* larvae were rarely collected.

In June, the most frequent species in the whole study area was again *Culex pipiens*. Moreover, its density was higher compared with other months.

At the time, the temporary floods and shallow wells had drained and the frequency of the species at these sites was very low.

In the canals, *Anopheles claviger* were present, although in lower density. The canal levels had dropped, and some canals had many *Gambusia* spp., a fish known to feed on larvae. These factors might have contributed to the decline in mosquitoes collected in the canals.

In the marsh, the water level had also dropped, but *Culex pipiens* was present in high density at these sites and *Anopheles sacharovi* had increased its population compared with the previous month. *Culex theileri*, *Culiseta annulata* and *Uranotaenia unguiculata* were also present.

Traps were placed at four different sites in the study area. The main species was *Anopheles sacharovi*. During one night in a single light trap, 83 adults were captured. *Anopheles claviger*, *Culiseta annulata*, *Culiseta longiareolata*, *Culiseta subochrea*, *Culex modestus*, *Culex pipiens*, *Culex theileri*, *Ochlerotatus caspius* and *Ochlerotatus detritus* were captured in lower density.

In July, the main sites in the study area were the canals and the main marsh that had drained in some spots, but there were several bodies of stagnant water throughout it. In those sites, the frequency of *Anopheles sacharovi* and *Culex modestus* increased substantially, while the frequency of *Culex pipiens* had significantly declined. The frequencies of *Culex theileri*

and *Uranotaenia unguiculata* increased as well, whereas *Culiseta annulata* and *Culiseta subochrea* were rare. The presence of *Culex tritaeniorhynchus* was sporadic, whereas *Ochlerotatus caspius* and *Ochlerotatus detritus*, which used to be abundant in the area, were completely absent at the time at the time.

In July, the water level and dense vegetation fluctuated in the canals. Compared with the previous months, the population of *Anopheles claviger* was lower and that of *Anopheles sacharovi* was higher. Further, the frequency of *Culex pipiens* was lower. In some canals where the population of *Gambusia* spp. was high, no mosquitoes were observed.

During that month, the study was extended within the rowing canal at the request of the employees, who complained of mosquito nuisance during the night. Mosquito larvae were not detected at all as the whole construction and the watersides are completely inappropriate as mosquito breeding sites. Apparently, the nuisance was due to the presence of mosquitoes in the area in general. Light traps were also placed in two selected spots within the rowing canal. Significantly fewer mosquitoes were captured that night than in the light traps placed in other spots outside the rowing canal but close to it. This phenomenon was probably due to the bright illumination of the rowing installations.

For the month of July, the results of the light traps reflected an enormous increase in the frequency of *Anopheles sacharovi*, which is in accordance with the results of the larval collection for the same time period. In one month, in a single light trap the 479 adults included *Anopheles claviger*, *Culex modestus*, *Culex pipiens*, *Culex theileri*, *Culex tritaeniorhynchus*, *Culiseta annulata*, *Culiseta longiareolata*, *Culiseta subochrea*, *Ochlerotatus caspius* and *Ochlerotatus detritus*. The density of *Uranotaenia unguiculata* was high, but it is a species without importance to human health as it feeds on amphibians.

During August, the water levels in the canals of marsh continued to fluctuate. In the canals, the frequency of *Anopheles sacharovi* further increased and practically completely replaced *Anopheles claviger*. The latter was not spotted again in any of the collection sites. However, *Culex pipiens* and *Uranotaenia unguiculata* were captured, and *Culex pipiens* and *Uranotaenia unguiculata* were captured in the same sites in lower frequency.

In the marsh, *Anopheles sacharovi* continued to be abundant. The density of *Culex theileri* and *Uranotaenia unguiculata* was stable, although lower. Compared with previous months, the *Culex pipiens* population declined. In contrast, *Culex modestus* was very dense and was the dominant species in that collection site. *Culex tritaeniorhynchus* was also rare during August.

Significantly fewer adult mosquitoes were captured in light traps during August than in previous months and compared with the number of larvae collected. This was due to high winds in the area throughout this month, rendering mosquito motility difficult.

The species captured included *Anopheles sacharovi*, *Culex modestus*, *Culex pipiens*, *Culiseta subochrea* and *Uranotaenia unguiculata*.

In September, *Anopheles sacharovi* increased further in several collection sites in the canals. The only other species present was *Culex pipiens* in moderate density.

In the marsh, the water level increased and the most

prevalent species were *Anopheles sacharovi*, *Culex modestus* and *Culex pipiens*. The frequency of the first was similar to that in the previous months, whereas that of *Culex modestus* was lower. *Culex pipiens* presented with an increase. *Culex theileri*, *Culex tritaeniorhynchus* and *Uranotaenia unguiculata* were also collected at a lower density. *Ochlerotatus detritus* reappeared.

In the light trap numerous species were captured, although in smaller numbers compared with July. Species included: *Anopheles sacharovi*, *Culex modestus*, *Culex pipiens*, *Culex tritaeniorhynchus*, *Culiseta annulata*, *Culiseta subochrea*, *Ochlerotatus caspius* and *Uranotaenia unguiculata*. The small number of adult mosquitoes captured in September may be due to the lower night temperatures forcing the mosquitoes to choose well-protected spots.

The study continued until September 2004, and the mosquito problem still existed. *Anopheles sacharovi*, *Culex modestus*, *Culex theileri*, *Uranotaenia* and other larvae were collected in large numbers from the marsh. *Ochlerotatus detritus* was more frequent in places close to the Schinias beach. Further, *Culex hortensis* reappeared.

Collection was performed for brief time intervals during this time period to ascertain cessation of mosquito motility, the fluctuation of water levels in the different biotopes, which species transform in the larval stage and to record initiation of mosquito activity for the following period. These observations are helpful for determining the most appropriate time for initiating larval control programmes.

Results of mosquito abatement programme with insecticides

A comparison of results of the study in 2004 with those of previous years demonstrates an undisputed decrease in the mosquito population, thus minimizing the risk of transmission of diseases. In certain sites, the decrease was remarkable, indicating a successful completion of the abatement programme.

Of particular importance was the use of *Bacillus thuringiensis israelensis* in the Schinias region in East Attica, which includes Schinias National Park. Both the marsh and the canals are biotopes for a variety of fish, birds, amphibians and insects, and the use of *Bacillus thuringiensis israelensis*, which is a selective larvae insecticide, is the unique solution for environmentally sound mosquito population abatement. Further, many of the organisms that coexist with mosquito larvae in the above biotopes feed on them, thus contributing to a further reduction in the mosquito population.

The major concern was to guarantee the environmental compatibility of the abatement programme and the setting of ecological specifications for achieving optimal performance in the programme.

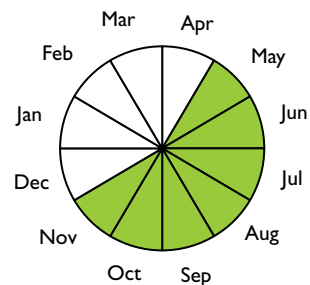
The effectiveness of the mosquito abatement programme was further assessed with the observations recorded in all study areas until September 2004. In the Schinias area, in the marsh, many sites were dry and larvae of *Culex pipiens* were rarely collected. Further, a large number of *Gambusia* spp. and tadpoles were present in all the bodies of stagnant water in the marsh. In the Makaria fountain canal, a few *Anopheles sacharovi* larvae were collected. Also, in the light traps, a few adult mosquitoes were captured.

The main mosquito species found in the area and their importance for public health are as follows.

Anopheles sacharovi

Anopheles sacharovi was present in the study area from May onwards, both in the canals and the main marsh, although at a low frequency. Its frequency started increasing in all collection sites and stabilized at high levels from June onwards. In the canals, the higher density was observed in August, September and October. This species is a known and dangerous malaria vector. The high density of its population in combination with the presence of a significant number of immigrants from Asia in the area and the arrival of tourists from malaria-endemic countries for the Athens 2004 Olympic Games imposed a danger for introducing malaria in the Schinias area (Fig. II.5).

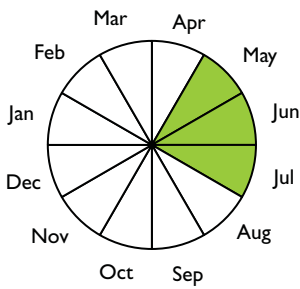
Fig. II.5. Months in which *Anopheles sacharovi* is present



Anopheles claviger

Anopheles claviger infrequently bites humans. In some countries it is a malaria vector, but in Greece it was never found to be infected, even when malaria was endemic. Its population was high in the canals during the initial months of the study. From August onward, no larvae were collected. In previous years, larvae of *Anopheles claviger* were collected along with *Anopheles sacharovi* until late in the autumn (Fig. II.6).

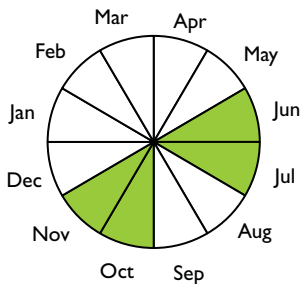
Fig. II.6. Months in which *Anopheles claviger* is present



Anopheles algeriensis

Anopheles algeriensis usually bites animals, very rarely humans and is not implicated in malaria transmission. It was captured only once in a light trap during the study, in contrast to previous years (Fig. II.7).

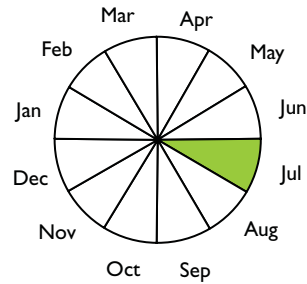
Fig. II.7. Months in which *Anopheles algeriensis* is present



Anopheles pseudopictus

Anopheles pseudopictus was captured only once in a light trap at the end of July. This species is very frequent in other places in Greece. It breeds in brackish water with vegetation towards the end of the summer. It is considered a secondary vector of malaria and as an arboviral vector. Larvae of this species were not collected in the study area (Fig. II.8).

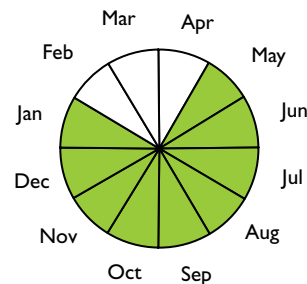
Fig. II.8. Months in which *Anopheles pseudopictus* is present



Culex pipiens

Culex pipiens is the most frequent species worldwide. It breeds practically in all still water, both in urban and in rural areas. Its density was high in the temporary floods during May, but it continued breeding in large numbers during the following months in the marsh. This species is an arboviral vector, including West Nile virus. Further, it is of most nuisance during the warm months (Fig. II.9).

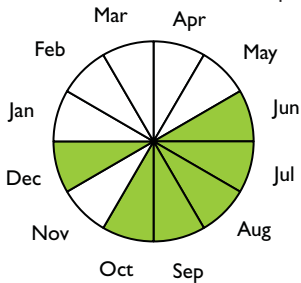
Fig. II.9. Months in which *Culex pipiens* is present



Culex modestus

Culex modestus was extremely highly present in the marsh during the summer and continued to be until the study ended. It bites on humans and, similar to the above species, is a vector of West Nile virus and other arboviruses and of the dog filaria, *Dirofilaria* spp. There is therefore a possibility of introducing viral diseases transmitted with mosquitoes if individual carriers from endemic areas are established in the area. *Culex modestus* was a nuisance at the times of collection throughout the marsh (Fig. II.10).

Fig. II.10. Months in which *Culex modestus* is present



Culex theileri

Larvae of *Culex theileri* were collected in several spots in the marsh at low but stable frequency. It usually bites animals and rarely humans.

Culex hortensis

Larvae of *Culex hortensis* were often collected in temporary floods of the marsh in May and reappeared in October. It bites animals rather than humans.

Culex tritaeniorhynchus

The presence of *Culex tritaeniorhynchus* was sporadic, but it is implicated in transmitting dangerous

arboviruses such as the Japanese encephalitis virus in Asian countries where the frequency is rather high.

Culiseta annulata* and *Culiseta subochrea

Both *Culiseta annulata* and *Culiseta subochrea* are a nuisance to humans. They usually attacked members of the collection group during daytime.

Culiseta longiareolata

Culiseta longiareolata usually bites chickens, but when it is present at a high frequency it bites humans as well. Following *Culex pipiens* it is the most abundant species in urban areas, mainly in artificial fountains.

Ochlerotatus caspius

In past years, *Ochlerotatus caspius* was the dominant species in the marsh throughout the summer, but it was rare during the period of collection. It still poses a problem for the area, as many breeding sites favour its development. Larvae of the species breed in marshy areas, and the eggs remain alive on dry soil for several months. It attacks humans even during the daytime and is considered an arboviral vector.

Ochlerotatus detritus

Ochlerotatus detritus appeared in the area from early spring and is a major nuisance for the residents. From March onwards, it was present both as adults and larvae in most sites of the marsh under study. During the summer its presence was rare, however, but from September it reappeared. At the beginning

of October, massive populations were collected at the east side of the marsh. It usually breeds on brackish water, and its eggs remain alive on dry soil for several months. Besides being a nuisance, it is an arboviral vector.

Uranotaenia unguiculata

Uranotaenia unguiculata was very frequent in the marsh during the collection period, and many adults were captured in the traps. This species is not a nu-

sance to humans, as it bites amphibians.

Conclusion

The main conclusion of this study was that the risk for introducing diseases transmitted by mosquitoes was increased in the area surrounding the rowing canal (malaria, viral encephalitis and dirofilariasis). Further, the high frequencies recorded for such species as *Anopheles sacharovi*, *Culex modestus*, *Culex pipiens*, *Ochlerotatus detritus* and *Ochlerotatus caspius* that bite humans affect the area residents, as cases of dermatitis and allergy are rather frequent.

Other Olympic Games installations

The study areas included the Agios Kosmas Olympic Sailing Centre, the Vouliagmeni Olympic Centre, the Olympic Stadium in Maroussi and the Markopoulo Olympic Equestrian Centre.

In all these areas, mosquito-breeding sites were observed, such as stagnant coastal water and inland water.

Collection was performed weekly from April onwards, and larvae were collected. They were transferred to the laboratory, where they were bred until they reached the most appropriate stage for study and classification.

The only species present in the study areas were *Culex pipiens* and *Culiseta longiareolata*. Adult mosquito motility was studied with the special light traps that were placed in selected spots in all study areas once a week. The material collected was transferred to the laboratory, where the number of mosquitoes

captured was counted and they were classified in species. The frequency of both species was rather low: 2–3 mosquitoes per night. Only towards the end of September did the number of *Culex pipiens* adults reach 7–8 per night.

Another method used in these areas for studying mosquito populations was oviparous light traps. These are containers with water and herbs placed in selected sites. They were checked every week for the presence of mosquito ova. The material collected was transferred to the laboratory, bred until they reached the most appropriate stage for species and classified. In this case, as well, the only species present at a low frequency were *Culex pipiens* and *Culiseta longiareolata*.

These results show that the mosquito nuisance is occasional in these four Olympic Games venues. If individual carriers are present in the areas, the risk of arboviral transmission from *Culex pipiens* exists.

Molecular identification of *Anopheles* spp.

PCR was used for the molecular identification of the collected *Anopheles*. The protocol aims to amplify a specific region of a recombinant DNA gene using a special set of primers that have also been used by scientific teams in the United Kingdom and Germany working in the same field (4–6).

Initially, DNA was extracted from single mosquitoes (1–2 legs or part of the abdomen were used). The sample was homogenized in the appropriate enzyme buffer, incubated and DNA was purified with phenol/chloroform (6). PCR followed and the target DNA was amplified. The primers set used was 5, 85F and 285R, which amplify a region of ITS2 gene (7,8). The product size differs among the *Anopheles* species. For *Anopheles sacharovi*, the product is 494

base pairs (bp) versus 472 bp for *Anopheles maculipennis*. The PCR results were verified with restriction enzyme analysis of the PCR products, which produces different patterns, rendering identification easier. The enzyme *Alu I* has five restriction sites within the *Anopheles sacharovi* product, producing six smaller DNA sequences, whereas two restriction sites within the *Anopheles maculipennis* product produce three smaller DNA sequences. These two species are difficult to identify in some cases based only on morphological characters. A further approach for verifying the results is DNA sequencing.

So far this method has been applied in 170 mosquito samples, and the results are in accordance with those of microscopic observations.

Examination of mosquitoes for the presence of virulent factors

Culex spp. mosquitoes captured with the light trap method during July and August were examined for the presence of West Nile virus (9,10). In total, 1100 mosquito samples were examined in pools of 10. Mosquito pools were homogenized and RNA was extracted using the QIAamp viral RNA kit (QIAGEN, Valencia, CA, USA). Reverse transcription (RT)-PCR was performed with a One-Step RT-PCR kit (QIAGEN), using the oligonucleotides described by Lanciotti et al. (11) that amplify a specific 408-bp region. West Nile virus RNA was not detected in any pool examined.

Anopheles mosquitoes captured with the light trap method during July and August were examined for the presence of *Plasmodium*; 660 mosquito samples were examined, DNA was extracted and a specific PCR method for malaria diagnosis was used. This PCR protocol is used for routine diagnosis in the Department and can differentiate between *Plasmodium falciparum* and *Plasmodium vivax* (12). It is a multiplex PCR using three primers: PL3, PL4 and PL5. The primer sequence is based on small-subunit recombinant RNA sequences. Primers PL3 and PL4 amplify a 266-bp *Plasmodium vivax*-specific

region, whereas PL3 and PL5 amplify a 346-bp *Plasmodium falciparum*-specific region.

Plasmodium DNA was not detected in any sample examined.

Conclusions and lessons learned

The Athens 2004 Olympic and Paralympic Games presented individual and complex demands for mosquito surveillance and control. A variety of insect vectors are present, especially during the summer, in most of the Olympic venues (Olympic Rowing Centre in Schinias, East Attica, the Olympic Stadium in Maroussi, the Agios Kosmas Olympic Sailing Centre, the Faliro Olympic Complex, the Vouliagmeni Olympic Centre and the Markopoulo Olympic Equestrian Centre) and athlete residences (the Olympic Village in Thracomakedones). Collecting and identifying all mosquito species present and planning and organizing an effective abatement programme was a necessity and a challenge. The large number of expected athletes and visitors concentrated in the Olympic venues, the existence of a variety of mosquito species and the presence in the same areas of a considerable number of mainly undocumented immigrants originating from countries where malaria and other insect vector-transmitted diseases are endemic presented a major public health challenge.

All mosquito species from the study areas were collected and recorded for a long period of time. Based on the results of these studies, effective mosquito abatement programmes were organized and implemented. In the Schinias area, where most of the species were recorded, the larvicide *Bacillus thuringiensis israelensis*, which exhibits selective action in mosquito larvae without affecting the rest of the aquatic organisms, humans or the environment, was used.

Further, mosquitoes were examined for the presence of virulent factors (*Plasmodium* spp. and West Nile virus) using DNA-based molecular biology techniques (PCR). The absence of genetic material of these factors was verified in all samples.

In Greece, a similar approach for recording mosquito species and organizing and implementing abatement programmes has been taken in the past decade in collaboration with the prefectural departments of public health. The most important issue is the continuous implementation of successful programmes for managing the mosquito population to reduce their presence and maintain their population at acceptable levels using environmentally sound methods. Performing similar mosquito surveillance projects in other European countries is very important, as the mosquito population circulates between neighbouring countries. Mosquito population management programmes should therefore be considered on a European basis rather than in a national basis. Towards this goal, efforts to increase the capacity and coordination between the health authorities of all European countries are a particular challenge, and additional budgeting for personnel, equipment and training for all parties involved should be considered. Further, the continuous transfer to Europe of illegal immigrants from countries where vector-transmitted diseases are endemic and the reintroduction of such diseases in Turkey and other countries in Asia imposes a major public health challenge and renders the mosquito surveillance and control programmes of great importance.

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PART 4

**Prehospital and hospital preparedness
and care and disease prevention
and health promotion activities
for the Athens 2004 Olympic Games**

Introduction

An effective emergency medicine service is an essential precondition for any cultural, athletic, religious or political gathering regardless of its size or nature. The Athens 2004 Olympic Games posed a great challenge to the prehospital emergency services not only in being able to respond to the conventional demands of a mega-event but also in becoming familiar and well equipped with state-of-the-art technology and knowing how to deal with the potential deliberate use of biological and chemical agents or radionuclear material. Similarly, the hospital system required extensive adjustment to deal with a wide range of naturally expected but also extreme situations including communicable diseases and the potential deliberate use of biological and chemical agents or radionuclear material. This part describes in detail the special preparations of the National Centre for Emergency Care and the Sismanogleion General

Hospital, one of the designated Olympic hospitals in Greater Athens. Specially designed health services were created to meet the health care needs of all people who would be physically present inside the Olympic venues ("inside the fence") at any time throughout Greece during the Athens 2004 Olympic and Paralympic Games. A network of first aid health care stations was developed in the Olympic venues, supported by the Health Services Department of the Athens 2004 Olympic Games Organizing Committee and the National Centre for Emergency Care if needed. The Olympic Village Polyclinic delivered mainly primary care services but also specialized health care for athletes and other accredited members of the Olympic delegations. The last part of this chapter deals with the preparation and experience of the health services provided inside the designated Olympic venues.

CHAPTER 12

Preparedness of emergency medical services

Anastasia Zygoura, Michalis Syndos

and Vasilios Kekeris

Introduction

Mass gatherings, especially of the magnitude and complexity of the Olympic Games, always represent a challenge for emergency medicine delivery systems. For the Athens 2004 Olympic Games, the National Centre for Emergency Care was responsible for providing emergency medicine care and transport to hospitals for all people that would attend the event and to provide health care to everyone in a potential mass-casualty incident. To achieve this, planners built

on the experience in organizing health care coverage for other international athletic gatherings in Greece, such as the 6th World Championships in Athletics in Athens in 1997 but also the documented experience gained from previous Olympic Games (Atlanta in 1996, Sydney in 2000 and Salt Lake City in 2002) (1–8). Certainly the perceived threat of the deliberate use of explosives, biological and chemical agents or radio-nuclear material was higher than in previous events.

The National Centre for Emergency Care

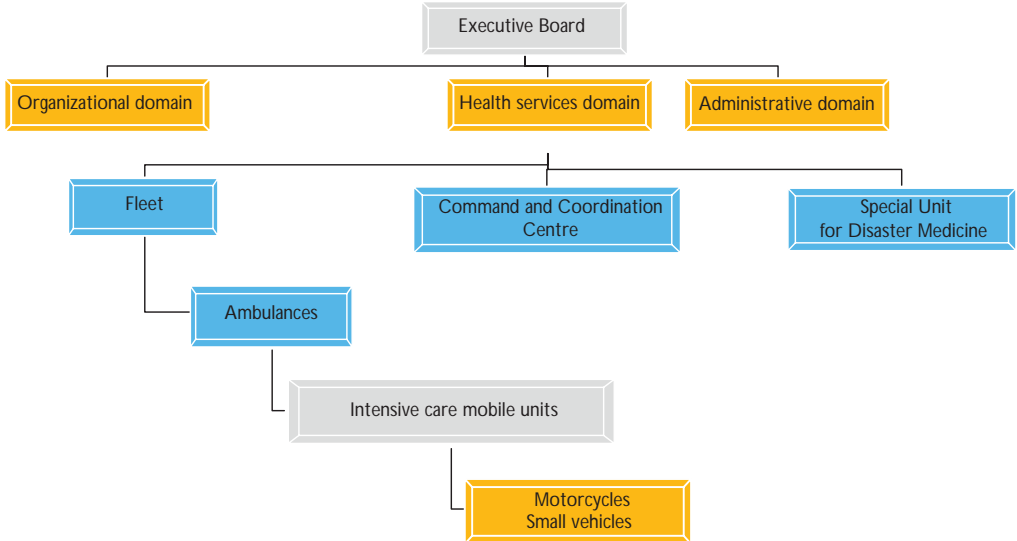
The National Centre for Emergency Care is the emergency medical system in Greece, providing pre-hospital emergency care and transport to hospitals. It is integrated into the National Health Service and is supervised by the Ministry of Health and Social Solidarity. National Centre for Emergency Care services have pan-Hellenic coverage, with headquarters in Athens and 12 regional centres: Athens, Thessaloniki, Patras, Heraklio, Larissa, Kavala, Ioannina, Lamia, Alexandroupolis, Tripolis, Kozani and Mytilini. Fig. 12.1 shows the operational structure of the National Centre for Emergency Care. It also has a well-organized centre for continual training of interdisciplinary staff (physicians, nurses and other health care personnel) in all aspects of emergency medicine and health care.

The National Centre for Emergency Care delivers emergency care through: the Command and Coordination Centre – the gateway to the emergency medical system – which:

- receives all calls for emergency medical assistance responding to the nationwide three-digit call numbers (166 or 112) and, based on medical dispatch protocols, classifies them according to severity;
- selects and mobilizes the most appropriate response (basic life support ambulance or advanced life support intensive care mobile unit), guides ambulance crews in providing specialized life support where appropriate, coordinates with hospital emergency departments and provides information on the condition of people being transported;
- activates in case of major incidents or disasters ambulances as well as units from other emergency services (fire services, police etc.); and
- records and registers all the data and the information related to the transported people.

The Command and Coordination Centre is supervised by a physician at all times, who also coor-

Fig. 12.1. Structure of the National Centre for Emergency Care



directs the deployment of specialized units and provides advice in crises.

The Command and Coordination Centre functions through communication technologies (systems that were upgraded for the Athens 2004 Olympic Games) including:

- wireless communication networks: very high frequency and ultra-high frequency systems;
- wired communication network with the emergency departments;
- a unified informatics registration and processing system; and
- 24-hour operation in a modern building environment.

There are three types of services.

Basic life support ambulances (Fig. 12.2) have two rescuers and basic life support and automated external defibrillator equipment (no medication and no intravenous fluids).

Advanced life support intensive care mobile units (Fig. 12.3) have two rescuers, one emergency physician, basic life support equipment plus an electrocardiograph, defibrillator, respirator, medication and intravenous fluids.

Advanced life support motorcycles (Fig. 12.4) and advanced life support small vehicles (Fig. 12.5) have one rescuer, one emergency physician, basic life support equipment plus electrocardiograph, defibrillator, medication and intravenous fluids. These vehicles express the new strategies in responding to emergencies, taking into consideration problems in large cities (traffic jams, increase in population, sudden and unpredictable increase in needs for emergencies, mountainous and rural regions, overcrowded events and disaster and crisis situations).

Before the Olympic Games, the National Centre for Emergency Care staff included: 108 physicians, 1914 paramedics and 284 administrative personnel and had in its possession 435 basic life support ambulances, 77 advanced life support intensive care mobile units, 16 advanced life support emergency

Fig. 12.2. Basic life support ambulance



Fig. 12.4. Advanced life support motorcycle



Fig. 12.3. Advanced life support intensive care mobile unit



Fig. 12.5. Advanced life support small vehicle



motorcycles and 3 helicopters. The city of Athens was covered by 80 basic life support ambulances during the day (1 per 50 000 inhabitants) and 40 during the night shift. Successfully covering the city and

the athletic venues during the Athens 2004 Olympic Games required extra employment and extra provisions in ambulances and specific vehicles to empower the National Centre for Emergency Care.

Preparing for the Athens 2004 Olympic Games

Through a memorandum of cooperation signed by the Ministry of Health and Social Solidarity and the Athens 2004 Olympic Games Organizing

Committee, the National Centre for Emergency Care undertook to provide the following:

- full coverage and high-quality standards of the specified health care services required during the Athens 2004 Olympic and Paralympic Games;
- full health care coverage of all places and locations in which the Olympic events would take place;
- a well-structured, functional and unified net of health services; and
- capacity to deal with the consequences of unusual and extreme situations in public health such as mass-casualty incidents, natural disasters

or the potential deliberate use of explosives, biological and chemical agents or radionuclear material.

The Ministry of Health and Social Solidarity operational plan for the Athens 2004 Olympic Games specifies the content of these objectives and promoted interventions aiming to upgrade the provision of health services, including primary health care, hospital care and public health and hygiene and emergency medicine services (see Chapter 2).

Planning by the National Centre for Emergency Care

During the Athens 2004 Olympic Games, the National Centre for Emergency Care provided emergency prehospital health care. This task far exceeded its usual obligations, requiring an optimal state of readiness. The essential goal of the National Centre for Emergency Care during the Athens 2004 Olympic Games was to provide emergency prehospital care and to transport every person requiring further health care from Olympic and Paralympic venues to the Olympic hospitals. As no specific injury pattern was anticipated, the National Centre for Emergency Care had to be agile and flexible so that it would be able to respond promptly and effectively in any situation involving accident and emergency. In addition, the National Centre for Emergency Care was to have direct access to patients in case of a mass-casualty incident, and the standard procedures as described in the civil protection plans of the Hellenic State would be followed. To respond to the Olympic requirements, the National Centre for Emergency Care established an operational planning committee, which prepared a detailed programme of work (Fig. 12.6–12.8) in accordance with the objectives of priority axis 3 (emergency medicine) of the

Olympics plan of the Ministry of Health and Social Solidarity. Issues that had to be taken into consideration were:

- the number of people present during the games, including visitors, athletes, members of the International Olympic Committee, members of the Olympic Family, VIPs, journalists, security personnel and volunteers and maintaining a high service level for the city inhabitants;
- the number of competition venues that had to be covered with personnel and vehicles (33 venues during the day and different cultural venues and the city at night);
- the duration of the events: the Olympic Games would last for 16 days and the Paralympic games for 14 days, test events started in August 2003 and continued until June 2004 as well as the Torch Relay;
- weather conditions in Greece during summer might create serious health problems; and
- preparedness for dealing with emergencies or mass-casualty incidents involving a multicultural, multilingual crowd.

Fig. 12.6. Operational plan of the National Centre for Emergency Care for the Olympic Games

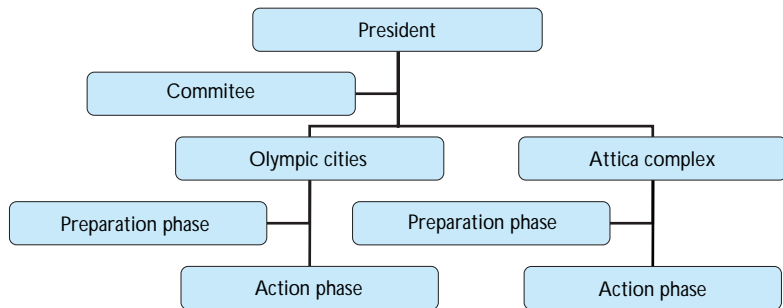


Fig. 12.7. Preparation phase of the operational plan of the National Centre for Emergency Care for the Olympic Games

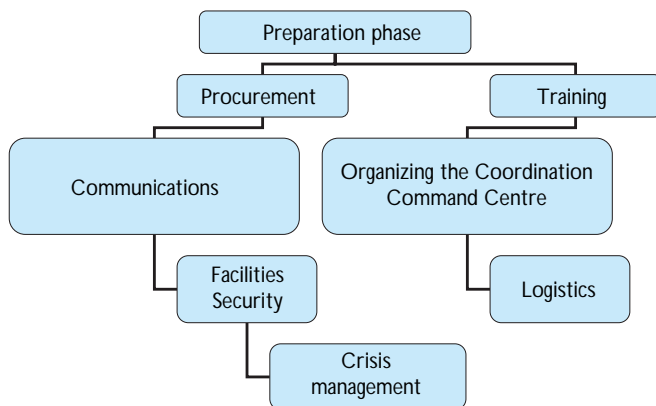


Fig. 12.8. Action phase of the operational plan of the National Centre for Emergency Care for the Olympic Games

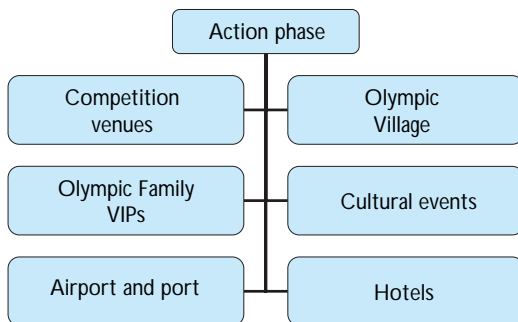
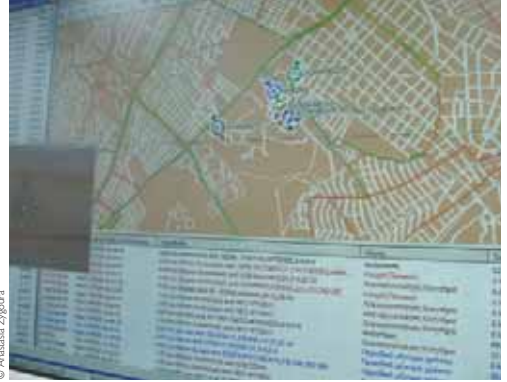


Fig. I2.9 and I2.10. Command and Coordination Centre – emergency dispatcher and automatic vehicle location map on wall screen



Facing and carrying out such tasks led to planning for the development of the National Centre for Emergency Care. The objectives of the planning were:

- constructing an improved infrastructure for the Command and Coordination Centre of the National Centre for Emergency Care;
- enhancing and improving all the necessary means of ground and air transport of the National Centre for Emergency Care;
- improving the communication system – a wireless communication network, developing and installing systems for telemedicine and a unified coordination and information system;
- increasing human resources;
- training the National Centre for Emergency Care personnel; and
- mass-casualty planning to respond to the potential deliberate use of explosives, biological and chemical agents or radionuclear material and other emergencies and mass-casualty incidents.

The services the National Centre for Emergency Care provided during the Olympic Games were:

- safe transport to the Olympic hospitals;
- assistance in providing emergency prehospital health care and transport inside the Olympic

venues if and when the Health Services Department of the Athens 2004 Olympic Games Organizing Committee requested this; and

- action based on the civil planning for the management of mass-casualty incidents and crises.

The plan of the National Centre for Emergency Care identified the following main requirements. A new Command and Coordination Centre needed to be constructed and procedure manuals prepared for managing various types of emergencies. A new storey was added to the National Centre for Emergency Care building and most of it was occupied by the new Command and Coordination Centre room (Fig. I2.9 and I2.10) equipped with state-of-the-art communication technology. Further, a crisis management operation room (Fig. I2.11) was added for assembling the Crisis Management Team of the National Centre for Emergency Care in case of a mass-casualty incident or disaster. From there the members of the Team coordinated the actions undertaken by the National Centre for Emergency Care physicians and paramedics on site. The National Centre for Emergency Care is integrated into the state unified command and control system in case of major incidents and functions under the coordination of the General Secretariat for Civil Protection, jointly with the Health Coordination

Fig. 12.II. Crisis management operation room



Command Centre of the Ministry of Health and Social Solidarity, the Hellenic Police coordination centre, the Hellenic Fire Brigade coordination centre and any other agencies involved.

Logistics

The means of ground transport of the National Centre for Emergency Care strongly needed to be enhanced and improved, so the following were planned to be procured:

- 270 ambulances;
- 25 mobile intensive care units;
- 12 motorcycles;
- two mobile coordination centres;
- two vehicles for managing mass casualties;
- medical and pharmaceutical equipment; and
- equipment for managing mass-casualty incidents from hazardous materials, biological and chemical agents or radionuclear material or other extreme situations.

All these were purchased as initially planned except that the number of mobile intensive care units required was reduced to 20 to procure more

motorcycles (21 instead of 12) to ensure a better response in covering special Olympic competitions such as city and mountain cycling and the marathon.

Recruitment

New highly skilled personnel were recruited: health care personnel and paramedics to cover the increased needs of the National Centre for Emergency Care during the Olympic Games. An estimated 110 physicians and 1500 paramedics were needed to achieve that goal. Finally, 68 physicians were employed, but due to legislation issues and bureaucratic inflexibility only 300 of the 1500 programmed paramedics were employed, so in addition, paramedical personnel were seconded from other parts of Greece.

Communications

The communication of the National Centre for Emergency Care was incorporated into the TETRA (terrestrial trunked radio: professional mobile radio and walkie-talkies) communication system and connection of the National Centre for Emergency Care with the command, control, communication, computer and intelligence system C4I supervised by the Olympic Games Security Division of the Hellenic Police, installation of satellite ambulance location and navigation system – automatic vehicle location and general packet radio service plus modern equipment for transferring medical information (telemedicine system at the aeromedical evacuation department).

Safety of installations

Security services were needed to protect the installations and ambulances.

Accreditations

The National Centre for Emergency Care personnel and vehicles needed to be accredited to access the Olympic venues.

Administration

Personnel inside the installations needed meals, and all personnel from other parts of Greece needed meals and accommodation.

Training

Health care personnel and paramedics underwent intensive training (57 refresher courses) in cardio-pulmonary resuscitation (basic and advanced life support), prehospital trauma life support, advanced trauma life support and managing mass-casualty incidents from hazardous materials, biological and chemical agents or radionuclear material. In addition, booklets with up-to-date protocols in basic and advanced life support were prepared and published and were distributed to all ambulances.

Plan for each Olympic venue

Such a plan included the number of ambulances and mobile intensive care units corresponding to the sports event and the installation. Site maps were available for all health care personnel.

Crisis management

The largest mass gathering since the events of 11 September 2001 required preparing plans for dealing with the possible deliberate use of explosives, biological and chemical agents or radionuclear material together with the management of mass-casualty situations. During the Athens 2004 Olympic Games, the National Centre for Emergency Care had a team of experts specializing in managing incidents caused by hazardous materials, biological and chemical agents or radionuclear material on 24-hour alert.

Collaboration with other institutions

Interagency cooperation was necessary in the framework of planning for the response to the potential deliberate use of biological and chemical agents or radionuclear material during the Olympic Games. The institutions involved were: the Olympic Games Security Division of the Hellenic Police (liaison personnel assigned at their command centre); the General Secretariat for Civil Protection; the Health Coordination Command Centre (and liaison personnel) of the Ministry of Health and Social Solidarity; the Hellenic Centre for Infectious Diseases Control, which had also planned for personnel to be available on site for a potential deliberate use of biological and chemical agents or radionuclear material; and the Hellenic Fire Brigade. To develop the response capacity and strengthen collaboration between these agencies, several exercises were undertaken, including Hercules Shield, Blue Odyssey and Olympic Guardian (described in Chapter 6).

Implementation and outcomes

Athletic test events

The first test for the operational plan and effectiveness of the National Centre for Emergency Care took place during the athletic test events in August 2003. Sixteen ambulances, five mobile intensive care units and five motorcycles were used to cover the athletic venues in which the test events were carried out. During these events, the National Centre for Emergency Care transported 28 people (athletes, workers and members of the Olympic Family; Fig. 12.12) from athletic and non-athletic installations (the Olympic Rowing Centre, Panathinaiko Olympic Stadium, street cycling in the centre of Athens, the Agios Kosmas Olympic Sailing Centre and hotels) to the designated hospitals. Also, two teams of the Special Unit for Disaster Medicine of the National Centre for Emergency Care were on 24-hour alert during the same period to be able to act promptly in a mass-casualty incident. The National Centre for Emergency Care and the Health Services Department of the Athens 2004 Olympic Games Organizing Committee addressed the experience and lessons learned from the test events in joint sessions.

The Torch Relay

The lighting ceremony for the Olympic Flame took place in ancient Olympia, and the flame travelled around the world for the first time. The National Centre for Emergency Care undertook to cover the Olympic torch relay in Greece with health care personnel. It deployed mobile intensive care units and motorcycles from the central bureau of the National Centre for Emergency Care in Athens and its region-

al branches. The National Centre for Emergency Care accompanied the Olympic Flame from its arrival on 25 March 2004 around the country until its arrival in the Olympic Stadium on 13 August 2004.

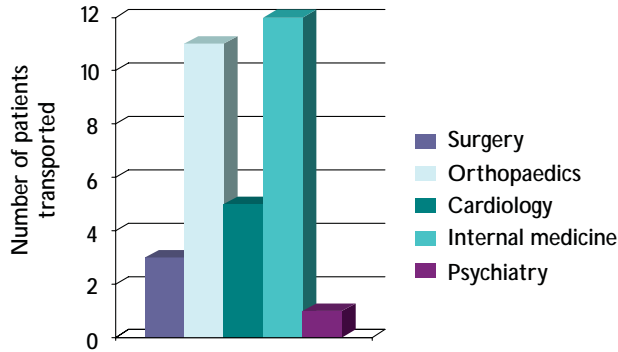
The Olympic Games: Greater Athens

Aiming to cover all the athletic venues, the places of accommodation of the athletes and of the Olympic Family, the VIPs and officials and the Zappeion Media Centre, the National Centre for Emergency Care had 100 ambulances, 13 mobile intensive care units and 5 motorcycles daily during the Olympic Games. In addition, the National Centre for Emergency Care had another 100 ambulances, 8 mobile intensive care units and 4 motorcycles to cover the needs of the population of Athens. During August 2004, the National Centre for Emergency Care in Athens handled 25 225 incidents, of which 413 involved transport from the Olympic venues to the Olympic first aid health care centres, to the Olympic hospitals or to the Olympic Village Polyclinic. Fig. 12.13 shows the daily number of patients transported by the National Centre for Emergency Care as well as the related admissions from 13 to 22 August 2004. Fig. 12.14 shows the distribution of patients transported by the National Centre for Emergency Care during the Olympic period by cause of admission.

Results

Overall, the National Centre for Emergency Care operations throughout the Olympic and Paralympic

Fig. 12.12. Patients transported according to treatment specialty during the Olympic test events in August 2003



periods functioned well and were praised by the local and international press. The National Centre for Emergency Care was successful in providing a high level of everyday health care services. Continuous communication between the National Centre for Emergency Care, the Health Services Department of the Athens 2004 Olympic Games Organizing Committee and the Health Coordination Command Centre of the Ministry of Health and Social Solidarity turned out to be very important, creating a real-time information network referring to the level of health care services provided.

Documentation processes were also enhanced, being double-checked among the three centres (Fig. 12.15).

The response to unusual situations was well planned and organized. In three cases of potential deliberate use of biological and chemical agents or radionuclear material, the National Centre for Emergency Care responded promptly according to the plan (all three were false alarms). Interagency cooperation developed without difficulty, mainly as a result of experience gained during the training events and exercises.

Outcomes and lessons learned

Emergency preparedness for mass gatherings relies on effective planning to prevent and reduce morbidity and vulnerability, especially in emergency situations. The experience from the Athens 2004 Olympic Games provided an excellent basis for improving the entire emergency services system not only for future mass gatherings to be held in Greece but also for other extreme situations that involve mass casualties or particular aspects of public health in order to protect and promote public health. Further, a unified system of defining the injuries and

illnesses that occur during mass gatherings needs to be developed to facilitate evaluation and research on mass gatherings.

The experience gained from the Athens 2004 Olympic Games in terms of capacity-building and organizational development provided a source of valuable expertise for dealing with different mass-casualty situations and the potential deliberate use of biological and chemical agents or radionuclear material in Greece or in other parts of Europe.

Fig. 12.13. Daily number of patients transported by the National Centre for Emergency Care and related admissions in Greater Athens, 13–22 August 2004

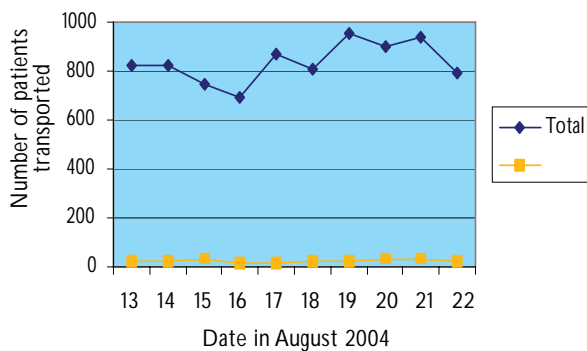


Fig. 12.14. Results of transport of patients (specialty of treatment or death) by the National Centre for Emergency Care and related admissions in Greater Athens, 13–22 August 2004

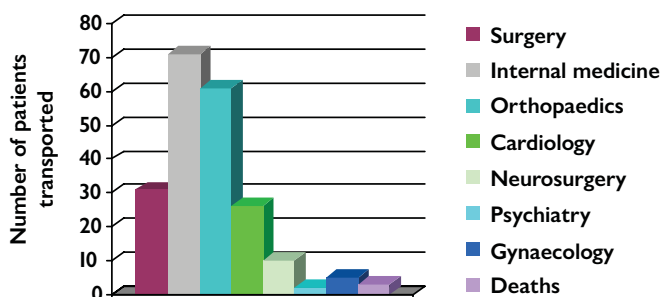


Fig. 12.15. Communication between health care command centres



The plans developed have already been further developed and been put into practice on other occasions successfully.

The teamwork developed during the Olympic Games preparation led to better knowledge and understanding of work tasks and responsibility and to better cooperation and coordination between many agencies and service providers. Progress has already been made by continuing joint training and exercises

and joint planning for various situations. An important heritage, the extra equipment that was provided for the Games, has been used to enhance emergency health services in the regions of Greece, thus improving health care for the population of those areas. The Games of the XXVIII Olympiad in Athens were successful, and all the international media reported it to be the best Games ever. Our health services fulfilled the requirements of the organization, contributing to the success of the Games.

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CHAPTER 13

Olympic hospital preparedness and the case of Sismanogleion General Hospital

**Marianthi Vafeiadou
and Adamantia Egglezopoulou**

Introduction

All Olympic hospitals were asked to develop plans to respond to situations of emergency and crises. These situations could be the result of problems inside the hospital such as loss of power and water supply, fire or nosocomial disease outbreak or the result of external causes either natural, such as earthquakes, fire, heat-waves and flooding or deliberate, with massive casualties and injuries or exposure to biological and chemical agents or radionuclear material. The main objective of these plans was to develop the capacity to deal with these situations and to apply internationally and nationally agreed standards in this domain. In this context, the hospital and its outreach structures should have the ability to mobilize and coordinate their resources effectively to be able to respond to various crises; their staff should have the knowledge, skills and willingness to treat, protect and support psychologically their patients; and in general have introduced and tested the necessary alertness and response procedures.

Sismanogleion General Hospital was asked to develop the first pilot plan for response to emergency events in anticipation of the Athens 2004 Olympic Games. The plan addressed the need for organizing the administrative, health care and technical services of the hospital. The activities of these services needed to be described completely and analytically. Moreover, specific details concerning a) personnel,

b) equipment, c) technical infrastructure and d) adequacy of medical and pharmaceutical devices and supplies had to be presented. It also included determining the roles and responsibilities of all parties in training and planning. Novel issues for the hospital included the need for 24-hour preparedness of the departments of emergency services and of vital sections of the hospital; training personnel in handling personal protective equipment and in managing the victims in these situations; auxiliary emergency services areas outside the main hospital building with availability of cold and warm water for mass decontamination procedures; and acquiring personal protective equipment (such as B¹ and C² level uniforms) to be used for the potential deliberate use of biological and chemical agents or radionuclear material as well as relevant pharmaceutical stockpiling.

The specific response plan of the hospital (Fig. 13.1) for the potential deliberate use of biological and chemical agents or radionuclear material focused around several issues. The functions of the Accident and Emergency Department are key, since this is the first hospital area that will be called to respond to the potential deliberate use of biological and chemical agents or radionuclear material. These events may involve unknown numbers of victims that present at points in time that cannot be predicted, with symptoms of varying severity and complexity that

¹ B level protective clothing (high respiratory – lower skin protection compared with A level), non-encapsulating, liquid tight suit, non air-tight, durable plastic boots or over boots, latex gloves and butyl gloves. Respiratory protection: a) self-contained breathing apparatus (positive pressure respirator with pump and filter (PARP) and full face-mask or b) full face-mask in combination with filter (for biological and chemical agents or radionuclear material)).

² C level protective clothing (lowest respiratory – lower skin protection compared with A level) non-encapsulating, partially liquid tight suit protection (Tyvek – F type), non-air-tight, shoe covers, latex gloves and nitrile gloves and high-protection safety goggles. Respiratory protection: a) well-fitting mask with filter P3 type, or b) full face-mask in combination with filter (for biological and chemical agents or radionuclear material).

Fig. 13.1. Sismanogleion General Hospital: cover of the operational plan for responding to Olympic emergencies



may require intensive care. If a person with symptoms reports voluntarily, the Emergency Room physician immediately notifies the Accident and Emergency Department General Coordinator Physician, who notifies the General Plan Coordinator (General Administrator), who activates the Incident Command System and the Incident Management Council.

The Incident Command Team includes:

- the general plan coordinator;
- the Olympic coordinator;
- the Accident and Emergency Department General Coordinator physician (in charge);
- the head nurse of the hospital; and
- the head infectious diseases physician.

The Incident Command Team evaluates the event; determines the available resources; initiates action; is in charge of determining the hot, warm and cold zones immediately; isolates every contact case; controls the flow of personnel; determines secure areas for triage, transfer and management of patients; reports to the administrator in charge (governor of the hospital); and reports to the Health Coordination Command Centre, the Olympic Security Command

Centre and the civil defence management support team.

If a case presents after notification from the appropriate agencies (the National Centre for Emergency Care, the Health Coordination Command Centre, etc.), the general plan coordinator immediately notifies and thereafter activates the Incident Command System and the Incident Command Team. The Accident and Emergency Department functions in a potential deliberate use of biological and chemical agents or radionuclear material included: triage process; immediate diagnosis and response to life-threatening conditions; basic and advanced life support; admission to appropriate wards service and continuity of care; short-term care in the Accident and Emergency Department; minor surgical and orthopaedic procedures; secure nursing in isolation or intensive care areas within the Accident and Emergency Department for acutely and severely ill patients; and following standard procedures according to guidelines as indicated.

The Accident and Emergency Department team operated on a 24-hour basis and consisted of an internist, a surgeon, a cardiologist, an anaesthesiologist, nursing staff and auxiliary staff. A log was kept with all the names of the health care staff available on call. They all had to be trained in responding to the potential deliberate use of biological and chemical agents or radionuclear material. A special area outside the main emergency room was assigned to mass triage and decontamination procedures. After decontamination, "clean" cases were to receive care in regular wards. A permanent decontamination unit was available on a 24-hour basis equipped with necessary cleaning material and collecting boxes for contaminated substances and linen. Special procedures were to be followed for contaminated water. Triage procedures would be followed according to the capacity and sufficiency of the hospital resources, with the main principle of simplicity giving priority to: immediate life-threatening conditions such as airway

obstruction and massive bleeding and then multiple severe injuries and minor injuries.

The simple triage and rapid treatment (START) system was to be used in triage, focusing on three observations during a 60-second period and labelling victims based on a colour code: black for dead; red for immediate management; yellow for non-emergency management; green for minor severity with no immediate health care need. Triage was considered necessary even if it was performed prior to arrival at the hospital at the incident scene. If coding changed during the stay, the previous coding would be kept as a prognostic indicator. Simple clinical examination would substitute in such an instance for a mobile radiological unit and ultrasonography for computed tomography. Establishing diagnosis would be less important than immediate response and management. Attention would be given to all patients and not to the ones nearest to a physician or more expressive since silent or less vocal patients

may be more severely ill. For surgical procedures, priority would be given to life-saving laparotomy and thoracotomy procedures as well as to major vascular procedures if a limb were threatened. No other routine surgery would be performed even if rooms and staff were available.

Management of dead bodies was also planned. Transfer to other institutions would be arranged if surge capacity had been reached. Follow-up meetings for discussion of problems and conclusions arising during the handling of the incident were planned. A special team was created to handle entry and security related to the potential deliberate use of biological and chemical agents or radionuclear material. Special attention was provided to the security and psychological support of the staff. All planning was based on the theoretical assumption that the hospital is capable of managing on short notice a number of victims equivalent to about 20% of its bed capacity.

Implementation and outcomes

Staff responded and coped well with the 24-hour on-call arrangements. The intense work schedule that was extended beyond the regular shifts was exhausting for the personnel, but there was a very high level of motivation and commitment to deliver a good and safe Olympics. Most shared the sentiment of a "sense of pride and professionalism that kept us all going". Certainly the exercises made a big difference in empowering and motivating staff. Any future activation of such measures in the future would be easier. Communication difficulty arose among several agencies. The incident command was based on a small flexible team of people that would quickly initiate all procedures and would control the actions and the flow of information and communication with the

Health Coordination Command Centre. Training was accepted better when it was organized within working hours.

Good scoring was achieved in tabletop exercises. However during real scenarios several mistakes were made that were discussed and corrected during future drills. Personal protective equipment was too difficult and almost impossible to use for more than 10 minutes during August, the warmest summer month in Greece. Coordinators encouraged personnel to complete daily epidemiological surveillance reports. The previous experience this hospital had with measures against SARS was of tremendous value. Training and applying triage procedures in the

Accident and Emergency Department was of extreme usefulness during the Athens 2004 Olympic Games and during on-call days thereafter. Problems with communication inside the hospital resulted in delays. Communicating with the entire staff in a crisis situation would have been problematic. This problem was corrected in part with emergency

communication introduced by the coordinator physician. The most serious problem recognized during the implementation of the planning was lack of sufficient adequately trained personnel for mass casualties. The need for continual training was evident, and this should take place at least once annually in the future.

Emergency response plan for the Olympic Games

Introduction

Emergency planning for hospital responsiveness started with assigning the Sismanogleion General Hospital the following tasks: to develop a pilot contingency plan and to be restructured to become a pilot Olympic hospital. All other designated Olympic hospitals in Greece then adopted the pilot plan. The Olympic hospitals, after assessing their actual needs, adapted the plan (which drew on several national plans and guidelines for dealing with emergencies) accordingly and provided for equipment, supplies and staff training.

Major hospital units in Greece were experienced in dealing with major incidents and natural disasters. Further training was needed in risk management related to the potential deliberate use of biological and chemical agents or radionuclear material and cooperation between all the involved parties. Apart from health care services, efforts were focused on the following organizational issues: food supply, clothing, cleaning, observance of hospital staff working hours, security service and administrative and technical support.

Every hospital should have its own contingency plan for disaster management. The goal was to develop in

Sismanogleion General Hospital a detailed and feasible contingency plan for managing internal and external disasters. The plan would include measures for countering acute incidents that might affect public health during the Athens 2004 Olympic Games and every other emergency that could occur.

The contingency plan aimed at the rapid and effective response to emergency risks and disasters:

- internal incidents, such as prolonged power failures, disruption of the water supply network, disruption of the telecommunication network, fire and outbreak of an epidemic in the hospital;
- natural disasters, such as earthquake, fire, heat-wave and flood; and
- human-triggered disasters, such as multiple casualties, high numbers of casualties, exposure to biological agents, exposure to chemical agents and exposure to radionuclear material.

Components

The major components of the plan were:

- defining preparedness levels;
- an alarm plan and how the alarm plan is to be activated and communicated;

- action calendars for officials involved with disaster preparedness;
- planning for receiving and allocating patients;
- planning for decontamination if needed;
- planning for mobilizing accident and emergency departments;
- planning for psychological and social care;
- planning for information (relatives, public and the mass media);
- organizing management and collaboration;
- planning for dispatching health care teams;
- planning for services and supply of food, materials etc.; and
- planning for measures to be taken in chemical accidents, fire injuries, and radionuclear or epidemic disasters.

Expected results

The results expected were:

- rapid mobilization and coordinated use of the hospital potential to ensure that necessary pre-emptive and suppression measures are taken for countering emergency incidents arising from natural disasters or human-triggered deliberate events;
- responsiveness of the staff (knowledge, experience, willingness and effectiveness) in treating people and protecting public health;
- health care capacity to deal with severely injured people; and
- availability of psychological support for injured people and their families.

Stages

Preparation

Preparation included collecting data, identifying parameters, carrying out feasibility studies and setting up

work teams and defining their duties, obligations and the level of accountability as well as the communication mechanism between the different work teams.

Planning

Planning was a precondition for successfully implementing the plan. It defined the strategic and operational framework for developing and implementing the plan in the Hospital. All methods, means and alternative solutions were designed and selected in accordance with this.

Training

Training was a precondition for implementing contingency plans. Staff had to be trained accordingly to counter effectively major incidents that could severely affect public health and the social and economic life of the region. The Hospital staff had to be trained both by internal and external trainers specializing in prevention and responsiveness procedures. The main component of the training was crisis management according to the specialization, position and duties allocated to each staff member.

The training team offered three training cycles to all health care staff – 18 hours of briefing on countering the potential deliberate use of biological and chemical agents or radionuclear material and 3 hours of practical training on oxygen breathing devices. Attendance certificates were handed out. The Accident and Emergency Department staff (under the responsibility of the Director and the head nurse) received additional training in three cycles: nine hours of briefing and five hours of practical training. Further, briefing and practical training of seven hours divided into four cycles took place for the health care staff on life-saving methods (European Resuscitation Council certificates) and use of an automatic resuscitation device. Finally, the nursing staff received two hours of briefing and practical training in two

consecutive sessions for countering the potential deliberate use of biological and chemical agents or radionuclear material as well as mass disasters.

The topics of the workshops included:

- planning of crisis management and inspection of procedures and responsiveness mechanisms;
- security and security measures;
- countering violent attacks and managing psychological factors;
- countering disproportionate threats (biological and chemical agents or radionuclear material);
- security of information systems;
- communication at times of crisis;
- hospital organization and inspection procedures;
- operational responsiveness of “vulnerable” departments;
- preparation of the hospital clinic departments;
- emergency responsiveness exercises; and
- training and exercises in response to earthquakes and heat-waves and the use of fire extinguishers and management of fire incidents.

Organization

The organizational plan set the directions and the inspection procedures for implementing the plan. The aim was to define, assign and organize optimally all activities in the Hospital for achieving the best results.

The organization stages include the following:

- assigning roles and responsibilities;
- nominating the team charged with implementing the plan and other related projects;
- identifying all human potential involved in the whole procedure and assessing personnel responsiveness in terms of such aspects as knowledge, experience, willingness, effectiveness, emotional reaction, reaction to physical stressors after simulation and competence in coordinating treatment and protecting public health; and

- defining such major components as timetable, equipment and communication mechanism.

Implementation

During this stage, the crisis management mechanism is deployed.

Return to normal operation

The normal operation of the Hospital is restored. Mistakes, failures or omissions are identified and priorities are set among emergencies. Operational problems that might occur are solved by using the available means. In a specially assigned and arranged area outside the central entrance of the outpatient department, which is adjacent to the main entrance of the Accident and Emergency Department, the protective equipment – B and C level – was stored as well as the triage and decontamination equipment.

Procedures

Coordination Centre

The emergency management Coordination Centre was located on the first floor of the main building of the hospital. One administrative employee provided administrative assistance to the Incident Management Council. In case of an emergency, the Coordination Centre would move to the building hosting the Incident Management Council. The Coordination Centre was in a 24-hour state of preparedness during the Olympic Games. It was in direct contact with the Administration, the General Plan Coordinator, the coordinator physician and all the involved teams or individuals. After receiving all the necessary information, the Coordination Centre would decide whether to activate the communication mechanism and the plan activation mechanism according to the level of importance of the communication:

“important and urgent”, “important and not urgent” or “not important and not urgent”.

Receiving injured people

First, the hospital had to evaluate its capacity and establish a list of situations it can handle (first aid services and treatment). In accordance with the traffic plan in and outside the Hospital, the Coordination Centre and the Planning Manager could activate the mechanism for evacuating walking patients and visitors in the Accident and Emergency Department and the surrounding buildings. Based on the information received by the Coordination Centre, the departments that can provide first aid services to the injured people could be activated (depending on the nature, the extent and the level of emergency). If the cases could be handled in the Hospital, the Department of Surgery would be activated to receive injured people and the relevant departments for potential victims of chemical agents. The following departments would also be activated:

- the laboratory department;
- the pharmacy;
- the supervision department;
- the nutritional department;
- the Infections Control Committee; and
- the storeroom (protective linen clothing and equipment staff).

Hospital evacuation

According to the emergency countermeasures, in case of internal or external public health emergency or threat, the hospital discharge mechanism would be activated for patients who can go home to free up the hospital beds. This includes:

- assessing patients;
- issuing an early discharge order;
- carefully handling and storing the patient’s history file;

- evacuating based on the clinical state of the patients: walking, in moderate condition, in critical condition and moribund;
- transporting patients to a safe location; and
- making arrangements with neighbouring hospitals in coordination with the Ministry of Health and Social Solidarity and the regional health authority to which the hospital belongs or reports.

Hospital lock-up (hospital in isolation after a quarantine imposed by the health authorities)

In case of extensive natural or deliberate disasters, the following procedures were to be followed:

- establish agreements with the Ministry of Health and Social Solidarity and regional health authority;
- restrict access to the public except for individuals called up by the coordinating body; and
- in case the communication and supply network is affected, securing the following services: electric power generators, distribution of water and food for 24 hours, waste management, staff supervision and washing machines and dryers.

Visitors who could be accommodated in the Hospital amphitheatre could be used as auxiliary staff if needed. All individuals involved in implementing the plan had to be identified during the crisis (distinctive clothing).

Activating the staff called in

The goals were:

- to ensure that the staff called in had access in cooperation with the staff responsible for security;
- to ensure that the staff responsible for notification acted on the order of the General Coordinator;
- to ensure notification by conventional phone,

mobile phone, fax or e-mail;

- to ensure a predefined meeting point for the staff called up from home and to define roles; and
- to ensure that hospital cars and motorcycles were available.

Mass media

A waiting area was established at a safe distance from the Accident and Emergency Department, the Command Centre and the visitors. Sanitation, water and food were to be available in the waiting area. Further, a trained spokesperson was designated for communication with the mass media.

A procedure was determined for issuing press releases. Coordination arrangements were made between the spokesperson and the regional health authority, the Ministry of Health and Social Solidarity and the General Secretariat for Civil Protection. All arrangements for the activation of the spokesperson were to be made in consultation with the Hospital Administrator, who would have prior consultations with the Health Coordination Command Centre of the Ministry of Health and Social Solidarity. Finally, a press conference room was designated.

The communication system of the Hospital

The Hospital has a two-way communication system. Communication methods include:

- oral, written (circulars and documents), automatic (telephone lines, internal telephone lines, cell phones, fax, computer etc.);
- formal via channels established by the administration and informal between the different teams; and
- collective (conferences, meetings or training

sessions) and individual through the exchange of personal views between the decision-making staff members.

The head of each department would take into account the recommendations made by his or her superior on work productivity, conditions and time efficiency. There would be two types of communication based on the existing hierarchy: vertical communication (orders, instructions and briefing) and horizontal communication (facilitating cooperation). A system of recorded and vocal messages would be available in case of an emergency for the simultaneous dissemination of messages.

Regular technical maintenance ensured the seamless operation of the communication system. Staff received training in the communication mechanism and methods.

Conventional telecommunication systems (internal and external fixed telephony, internal wireless telephony and mobile telephony) supported the system of emergency response. The switchboard operator ranks the calls according to the level of emergency priority and notifies the hospital departments (filling out a special form: who, where and why).

There were "priority telephone lines" or "emergency telephone lines". The emergency phone calls were distinguished by a characteristic sound. The waiting messages or recorded information messages were in Greek and English. An alternative telecommunication systems (TETRA system: terrestrial trunked radio: professional mobile radio and walkie-talkies) was installed: wireless and mobile phone system, with multiple channels (direct mode operation) availability. This requires visual contact to work. A PC was continuously connected to the Internet and a fax machine.

Conclusions

For the Athens 2004 Olympic Games, a hospital emergency response plan was needed in case of natural or deliberate public health disasters. Some designated Olympic hospitals had to improve their accident and emergency department capacity and facilities, including creating decontamination units (fixed or mobile) and negative pressure rooms for infectious diseases. Moreover, hospitals were supplied with medical devices, protective gear, stockpiled medications and the necessary supplies for dealing with the potential deliberate use of biological and chemical agents or radionuclear material. Storehouses were built to protect the medical supplies in

case of disaster. All plans for installing air-conditioning systems in mortuaries and outdoor water pumps for massive decontamination as well as determination of outdoor areas for triage were implemented.

The intensive training of various groups of staff for managing the potential deliberate use of biological and chemical agents or radionuclear material and other potential public health emergencies was essential for team-building, learning new skills and running at high alertness levels on a 24-hour basis. Staff cooperation spirit and readiness was high round the clock before and during the Olympic Games.

CHAPTER 14

Health Services Department of the Athens 2004 Olympic Games Organizing Committee

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Introduction

Since Greece is a small country and the Olympic Games is a huge event of global significance, the Athens 2004 Olympic Games Organizing Committee faced enormous challenges in preparing for the Olympic Games.

Some of the facts showing the size of the events are:

- the Olympic Games are larger than 35 world championships together, with more than 17 500 athletes and officials from 202 countries; and
- about 7000 people participated in carrying the Olympic torch within Greece, from Ancient Olympia, the birthplace of the Olympic Games, to its final destination in the Olympic Stadium during the Opening Ceremony.

The importance of the event can also be acknowledged from the huge mass-media attention, with about 20 000 mass-media staff reporting news relating to the Olympic Games daily, and up to 3.5 billion people watching it on television.

The main objective of the Health Services Department of the Athens 2004 Olympic Games Organizing Committee was to provide a comprehensive, accessible and efficient health care programme to everyone requiring assistance while attending the Olympic Games and associated events. The Olympic Family (athletes, officials and VIPs), spectators and the mass media were included in this coverage free of charge.

The Doping Control Station provided doping control services in accordance with the International Olympic Committee Medical Commission guidelines.

In preparing for this goal, an estimate was made from previous experience about the numbers of patients, type of medical incidents expected as well as necessary health care services and equipment to be used. The availability and use of emergency medical services were of paramount importance. The experience of providing health care services from the Sydney 2000 Olympic Games was used, as several members of the Athens Health Services Department visited Sydney during the Games. Taking into account the different structures of the two cities, Athens needed to make several adjustments to improve the planning and collaboration of all participating agencies that were involved in providing health care services.

The assistance provided by the Ministry of Health and Social Solidarity was of paramount importance in implementing the planning of the Health Services Department of the Athens 2004 Olympic Games Organizing Committee. Mass gatherings, and as such any events with more than 1000 people, require extensive planning concerning prehospital care, primary health care on site, ambulance coverage, hospital preparedness in case of need and last but not least public health and preventive services. The general planning gave special attention to continuing high-quality health care services provided to Greek citizens without any hindrance due to the Athens 2004 Olympic Games and to using the infrastructure created for the needs of the Athens 2004 Olympic Games after the Games. Consequently, a formal memorandum of understanding signed between the Ministry of Health and Social Solidarity and the Athens 2004 Olympic Games Organizing Committee specified the responsibilities of both parties, including

all the test events of the Olympics and Paralympics held during 2003 and 2004.

The Ministry of Health and Social Solidarity was

responsible for the following activities and functions provided to the Health Services Department of the Athens 2004 Olympic Games Organizing Committee.

Activities and functions

Olympic hospitals

Specific public hospitals were designated as Olympic hospitals for the athletes, VIPs, spectators and mass media (see Chapter 16). New facilities and buildings were added, emphasizing the accident and emergency departments, intensive care units and upgrading rooms. New operational plans were prepared to deal with all possible problems and threats, including the potential deliberate use of biological and chemical agents or radionuclear material.

Public health and hygiene

Several agencies and institutions were responsible for maintaining all aspects of public health and hygiene, including water, food, environment (including air quality and pollen), heat-related prevention measures and communicable disease surveillance and response. In addition, a cruise ship inspection programme was implemented and a syndromic surveillance programme was enforced during the Olympic Games (see Chapters 4 and 5).

The operational planning of participating agencies was significantly upgraded. All relevant agencies involved in environmental management were placed under the scientific guidance of the National School

of Public Health (see Chapter 7), which provided guidance and education for all public health workers involved in checks during the Olympic Games. The Hellenic Centre for Infectious Diseases Control played the key role in implementing the communicable disease surveillance and response programmes, including the syndromic surveillance programme (see Chapters 3–5).

Planning for mass health care needs

The Ministry of Health and Social Solidarity collaborated with the Ministry of Public Order Planning in organizing planning for mass health care needs. An important part of preparing for this aspect was participating in all kinds of exercises from table top to full scale.

The Olympic Village Polyclinic

A 5000-m² primary care health facility was built inside the Olympic Village and equipped with state-of-art imaging facilities, such as computed tomographic and magnetic resonance imaging scanners and provided 24-hour services for all inhabitants of the Olympic Village.

Medical interpreters

This service was especially organized for the Olympic Village Polyclinic and operated inside the building. Six interpreters were present during the Polyclinic's normal working hours for six different languages (Arabic, Chinese, English, French, Russian and Spanish).

Emergency prehospital care and transport

The National Centre for Emergency Care provided emergency prehospital care and transport enhanced by new ambulances, mobile intensive care units, motorcycles and newly hired trained personnel (Fig. 14.1).

The Health Services Department of the Athens 2004 Olympic Games Organizing Committee was in charge of the following fields.

Health care stations inside the venues

The Health Services Department established and operated more than 200 primary care health facilities for first aid services inside the venues. Each venue had separate stations for the athletes, officials and VIPs and for the spectators. All were equipped with appropriate equipment and disposable material donated or supplied directly from vendors after appropriate tenders. The equipment included but was not limited to first aid and surgical instruments and other emergency medical equipment such as automatic external defibrillators. After the end of the Athens 2004 Olympic Games, all remaining material was donated to the Ministry of Health and Social

Solidarity. Volunteer physicians, nurses and physical therapists operated the athletes' stations, while roving volunteer first aid teams replaced the physical therapists for the spectators' stations.

Staffing of the Olympic Village Polyclinic

The Health Services Department of the Athens 2004 Olympic Games Organizing Committee made arrangements for staffing the Olympic Village Polyclinic with volunteer physicians, mainly through the Faculty of Medicine and Faculty of Dentistry of the National and Kapodistrian University of Athens, although personnel from the three branches of the Armed Forces Medical Corps were also used.

Health care services inside the venues

The Health Services Department was in charge of all health care services inside competition venues where the Athens 2004 Olympic Games took place as well as non-competition venues and training sites. These services were offered to members of the Athens 2004 Olympic and Paralympic Games mission members, athletes, escorts, spectators, VIPs, mass-media staff, sponsors, volunteers and staff of the Athens 2004 Olympic Games Organizing Committee and employees of the venues. Emergency medical services were provided free of charge from 30 July until 30 August 2004 for the Olympic Games and from 17 September until 30 September 2004 for the Paralympic Games. The National Centre for Emergency Care ambulance service, with experienced physicians and rescuers as crew members, provided the link between the Olympic venues and the operating network of Olympic hospitals.

Fig. 14.1. Greece's emergency medical system was equipped with several new ambulances and personnel to cope with the demands for instant access to first aid care around sports venues (left) and the Olympic Village (right).



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Operation of the Olympic Village Polyclinic

The Olympic Village Polyclinic (Fig. 14.2) was the major health care facility inside the Olympic Village, providing health care solely to the inhabitants and workforce of the Olympic Village. During the busiest period of the Olympic Games, it encountered about 500 to 600 episodes of care daily. The Emergency Department, operating 24 hours per day, was staffed by a team that included a general surgeon and an internist, with a cardiologist, an anaesthesiologist and an orthopaedic surgeon on stand-by. Two ambulances and a mobile intensive care unit were also assigned to the Department.

During the Paralympics, a unit for orthotics, prosthetics and wheelchair repairs was also operated to offer services to athletes using such devices.

In addition to the Emergency Department (Fig. 14.3), a wide variety of services were also offered daily from 08:00 until 22:00 through appointment bookings. These were classified in the departments listed below:

- Outpatient Department, including the following clinics: internal medicine, orthopaedics, cardiology, surgery, gynaecology, dermatology, otorhinolaryngology, dentistry, ophthalmology and psychiatry;
- Imaging Department, offering magnetic resonance imaging, computed tomography, X-ray and ultrasound diagnostic scans;
- Laboratory Department, performing microbiological, haematological and biochemical tests;
- Physical Therapy Department, comprising a gymnasium, physical therapy and hydrotherapy areas; and
- Department of Pharmacy, dispensing drugs to athletes and members of national Olympic committees following proper prescription by a qualified and accredited physician.

The Olympic Village Polyclinic especially emphasized musculoskeletal injuries and disorders. Such episodes were encountered in the following areas:

- sports injuries;
- general orthopaedics;
- diseases and injuries of the foot and ankle;
- diseases and injuries of the spine; and
- physical therapy and rehabilitation.

Fig. 14.2. The Olympic Village Polyclinic was located at the outskirts of the Olympic Village, next to the residential zone and near the visitors' area



Physical therapy services included electrotherapy, hydrotherapy and therapeutic massage.

In total, 223 health care stations were operating during the Olympic Games in the various venues. All had basic first aid equipment as well as automated external defibrillators. Of these, 120 were serving athletes and 76 were treating spectators. First aid stations were stationed at fields of play, seating areas, training facilities and non-competition venues such as the official hotels of the Olympic Family, the Media Centre, the youth camp, Athens International Airport, the port and other Games-related areas (27 stations). At each competition venue, there was an athletes' station and at least a spectators' station. An ambulance unit was assigned for approximately every 20 000 spectators. A back-up unit was reserved for replacement, depending on the area and the needs of the game but also according to the rules of the international federation of the specific sport and the guidelines of the International Olympic Committee.

Every athletes' health care station was staffed with the following personnel:

- a physician with special training in sports injuries;
- a physical therapist;
- a nurse; and
- an ambulance crew.

Every spectator health care station was staffed with:

- a physician and a nurse;
- first aid providers specializing in cardiopulmonary resuscitation moving around the spectator areas (1 team per 10 000 spectators depending on the area and the feasibility of access); and
- an ambulance crew.

Special attention was given to planning and providing health care services for specific activities of the Olympic Games such as the Opening and Closing Ceremonies, the Olympic Torch Relay and the marathon.

Inside the Olympic Village, specially equipped facilities for health care and physical therapy (Fig. 14.4) were provided to health care crews from all 201 participating national teams, depending on the size of each team.

Fig. 14.3. The Polyclinic Emergency Department comprised six examination cubicles (left) and a fully equipped surgery (right), a recovery area and an isolation room



Results

The various facilities provided 10 564 episodes of care; 88% were people who were accredited, and 45% of these involved athletes (Table 14.1). The vast majority of cases were treated at the Olympic Village Polyclinic ($n = 8017$) (Table 14.2), where 45% of appointments were referred to the Outpatient Department, 22% to the Physical Therapy Department, 16% to the Imaging Department, 12% to the Emergency Department and 5% to the Laboratory Department. The Department of Pharmacy dispensed 2641 prescriptions to Polyclinic visitors.

Most cases encountered at the Polyclinic Outpatient Department concerned dental and ophthalmological treatment (Fig. 14.5), with 955 and 666 episodes respectively. Orthopaedics treatment accounted for 1025 episodes, of which 389 dealt with injuries of the foot and ankle. Similarly, the internal medicine clinic encountered 296, the dermatological clinic 226, the otorhinolaryngological clinic 186, the cardiological clinic 95, the surgical clinic 83, and the gynaecological

clinic 46. The psychiatric clinic had fewer than 10 episodes.

Statistical data on illness were generated using the medical encounter forms, where a coded diagnosis was filled in for every episode of care. Data analysis showed that 52% of diagnoses referred to orthopaedic problems, and only 0.5% were for heat-related illness. This reflects the mild weather experienced during the Athens 2004 Olympic Games as well as the positive outcome of preparations and planning in preventive medicine implemented by the Athens 2004 Olympic Games Organizing Committee and the Government of Greece. Planning was based on targeting the general public about heat-related injuries. Table 14.3 lists the 10 most frequent types of illness.

Patients were transferred to a tertiary hospital after being initially transported to one of the designated Olympic hospitals. The whole process was coordi-

Fig. 14.4. The Physical Therapy Department of the Olympic Village Polyclinic was equipped with special physical therapy and rehabilitation facilities such as a hydrotherapy area with state-of-art therapeutic swimming pool (left) and a physical therapy section that included an isokinetic control unit (right). All facilities and equipment were available to qualified health care personnel after appointment booking.



nated by the Coordinating Centre of the Health Services Department of the Athens 2004 Olympic Games Organizing Committee, the Olympic hospital coordinator and the Health Coordination Command Centre of the Ministry of Health and Social Solidarity. Admissions figures did not statistically differ from those of the Sydney 2000 and Atlanta 1996 Olympic Games. Similar activities were undertaken in the other four Olympic cities in which football preliminaries took place and, in the special event of shot-put, held in Ancient Olympia, the birthplace of the Olympic Games.

The Athens 2004 Olympic Games enlisted 2586 health care volunteers. The Armed Forces Medical Corps also contributed significantly, with 622 health care professionals and 25 ambulances. Twenty peo-

ple were recruited as employees to run the Health Services Department of the Athens 2004 Olympic Games Organizing Committee. They were in charge of the entire project and coordinated the collaboration between all the involved agencies. The whole affair would not have been possible without the participation of the Ministry of Health and Social Solidarity, the Ministry of National Defence, the Hellenic Centre for Infectious Diseases Control, the National Centre for Emergency Care, the Hellenic Food Authority, the National School of Public Health and the prefectural departments of public health, the Faculty of Medicine and Faculty of Dentistry of the National and Kapodistrian University of Athens and the volunteers of the Scientific Council of the Athens 2004 Olympic Games Organizing Committee.

The Paralympics

The Paralympics, an event of major importance for athletes with disabilities, are second only to

the Olympic Games in their magnitude. The best athletes with disabilities participate in the Games

and achieve records that outweigh the performance of their able-bodied counterparts in many cases.

The founding father of the Paralympics was Ludwig Guttmann, who in 1944 introduced sport as part of his patients' rehabilitation programme at the Stoke Mandeville Hospital in Aylesbury, United Kingdom. In 1948, he organized the first national competition so that it coincided with the opening ceremony of the 1948 London Olympic Games. The competitors were mainly disabled veterans of the Second World War. In 1955, new facilities for hosting the games were built in the Hospital's backyard. Gradually, the

competition was enlarged with the addition of different sports (fence, track race and swimming). In 1960, the first Disabled Olympics was held in Rome, shortly after the Summer Olympics.

The journey of the Paralympics started on 22 September 1989, when the International Paralympic Committee was founded. Today, the International Paralympic Committee has more than 150 Member States, represented by national Paralympic committees. Further, five international sports confederations represented at the Athens 2004 Paralympic Games embodied different categories of disability:

Table 14.1

Cases examined in all the health care facilities of the Olympic venues during the Athens 2004 Olympic Games

Status of person	n	%
Accredited participants	9 287	88
Non-accredited spectators	1 277	12
Athletes	4 141	45
Olympic Family	558	6
Total	10 564	100
Disease categories		
Heart	320	3
Dental	1043	10
Gastrointestinal	400	4
Ear, nose and throat	472	4
Eye	853	8
Heat related	49	0.5
Orthopaedic	5457	52
Nervous system	353	3
Mental disorders	16	0.2
Respiratory	224	2
Skin	795	8
Other	582	6
Total	10 564	100

Table 14.2

Cases examined in the Olympic Village Polyclinic during the Athens 2004 Olympic Games

Status of person	n	%
Athletes	4091	51
Officials	2088	26
Others	1838	23
Total	8017	100
Disease categories		
Heart	171	2
Dental	1044	13
Gastrointestinal	296	4
Ear, nose and throat	295	4
Eye	772	10
Genitourinary	300	4
Heat related	6	0.1
Orthopaedic	4472	56
Nervous system	93	1
Mental disorders	3	0.04
Respiratory	97	1
Skin	226	3
Surgery	83	1
Female reproductive system	46	0.6
Other	113	1
Total	8017	100

Fig. 14.5. Dental care (left) and eye care (right) accounted for most episodes of care at the Outpatient Department of the Olympic Village Polyclinic



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Table 14.3

Ten most frequent types of diagnosis during the Athens 2004 Olympic Games (coding letters based on the diagnosis codes in the 2004 medical encounter form)

	Group	Diagnosis
1	Musculoskeletal	<i>L11</i> Hip/femur (<i>b</i> - Muscle lesion/rupture)
2	Dental	<i>H5</i> Restoration
3	Eye	<i>J4</i> Vision disorders
4	Dental	<i>H8</i> Other
5	Musculoskeletal	<i>L13</i> Ankle/tarsus/toes (<i>v</i> - Other)
6	Dental	<i>H1</i> Mouth guard
7	Musculoskeletal	<i>L5</i> Lumbar spine (<i>v</i> - Other)
8	Musculoskeletal	<i>L13</i> Ankle/tarsus/toes (<i>d</i> - Sprain/strain ligament)
9	Musculoskeletal	<i>L12</i> Knee (<i>v</i> - Other)
10	Musculoskeletal	<i>L13</i> Ankle/tarsus/toes (<i>p</i> - Tendonitis)

- International Blind Sports Association: blind and visually impaired athletes;
 - International Sports Federation for Persons with Intellectual Disability: athletes with intellectual disability;
 - International Sports Organization for the Disabled (now International Wheelchair and Amputee Sports Federation): athletes with orbital disorders;
 - International Stoke Mandeville Wheelchair Sports Federation (now International Wheelchair and Amputee Sports Federation): athletes with spinal cord injuries and poliomyelitis; and
 - Cerebral Palsy International Sports and Recreation Association: athletes with cerebral palsy.
- 170 physical therapists;
 - 290 first aid officers;
 - 150 staff with general duties; and
 - 50 repair technicians for orthotic, prosthetic and wheelchair repairs.

Since there might be difficulty in finding volunteers for the Paralympic Games, the Athens 2004 Olympic Games Organizing Committee signed a memorandum of understanding with the Ministry of National Defence so that 650 members of the three branches of the Armed Forces Medical Corps could provide their services. A contractor employed 50 repair technicians for the Paralympic Games. The remaining staff comprised volunteers.

Athens hosted the 12th Summer Paralympics Games from 17 until 28 September 2004. The operational differences between the Olympics and the Paralympics are as follows. The Paralympics had fewer physicians and other health care providers (1200):

- 300 physicians of different specialties;
- 240 nurses;

The Paralympic Games had fewer participants and thus fewer health care stations (for athletes and spectators):

- 4000 athletes;
- 2000 official escorts;
- 950 referees;
- 3000 mass-media representatives; and
- 2500 official guests.

The Paralympic Games had fewer involved hospitals (less supporting hospitals). The Olympic hospitals for the athletes and VIPs remained the same, but the hospitals for spectators and the mass media were reduced.

Orthotic, prosthetic and wheelchair repair services were limited to repairing and replacing orthotic, prosthetic and wheelchair parts and did not include technical upgrading. A service centre operated inside the Paralympic Village during training and competition periods. The service centre was located within the residential zone. Auxiliary service centres were operating in specific sports facilities (such as athletics, wheelchair rugby, wheelchair tennis, table tennis, cycling and archery), and mobile units were available at the remaining facilities (shooting, equestrian, long-distance running and marathon). The mobile units offered free services to accredited athletes, escorts, referees, members of the International Paralympic Committee, national Paralympic representatives and members of the Paralympic Family.

In the Paralympic Games, a physical and rehabilitation health care centre operated 24 hours per day. A spinal cord unit also operated at the same hospital. In the Paralympic Games, the sports facilities and the Polyclinic had rehabilitation physicians.

In the Paralympic Games, there was wheelchair access to the Emergency Department and to hospitals, in combination with easily accessible restrooms. Further, the Paralympic Games had accessibility to sports and non-sports facilities for individuals using wheelchairs. This was taken into account during the preparation for the Olympic Games as well, and thus there was no need to make additional adjustments during the transitional period between 30 August and 17 September 2004.

The Paralympic Games had special pharmaceutical material, such as medication for controlling spasms and special self-greasing catheters for paraplegic individuals.

Results

Similar to the Olympic Games, the vast majority of episodes of care were treated at the Olympic Village. The Olympic Village Polyclinic encountered 3546 episodes during the period of the Paralympics. Of these, 43% accounted for visits to the Outpatient Department, 19% to the Physical Therapy Department, 15% to the Imaging Department, 17% to the Emergency Department and 6% to the Laboratory Department. The Department of Pharmacy dispensed 1070 prescriptions to Polyclinic visitors.

Most episodes concerned dental and ophthalmological treatment, with 286 and 323 episodes

respectively. Orthopaedic treatment accounted for 373 episodes, of which 30 dealt with injuries of the foot and ankle. Similarly, the internal medicine clinic encountered 224 episodes, the dermatological clinic 109, the otorhinolaryngological clinic 95, the cardiological clinic 44, the surgical clinic 36 and the gynaecological clinic 19. Similar to the Olympic Games, the psychiatric clinic had less than 10 episodes. Similar to the Olympic Games, statistical analysis of diagnoses from medical encounter forms showed that most injuries had to do with musculoskeletal injuries. Table 14.4 lists the 10 most frequent types of illness.

Post-Olympic polyclinic operation

The Ministry of Health and Social Solidarity responded to calls for health care delivery reform by designing models based on preventive and person-centred health care systems. The establishment of Health Units S.A. in 2004 – a state-owned company serving the public interest – created an innovative operational tool for providing high-quality health care services to citizens while complying with the rules of a competitive market economy.

Inspired by the technical knowledge acquired during the Athens 2004 Olympic Games, the advanced infrastructure and the state-of-the-art biomedical equipment, the company decided to implement a project that would alter the operation and organization of clinical services. This transformed the Olympic Village Polyclinic into a centre of excellence in primary care, physical therapy and rehabilitation.

Today, it is known for:

- providing high-level integrated primary care clinical services to citizens;
- providing high-quality health care services in physical therapy and rehabilitation; and
- developing specialized services in athlete support, disease prevention and health promotion, home care, telemedicine, teleconsultation and e-health.

Quality in diagnosis, therapy and continuous care is enhanced by using information and communication technologies in the form of hospital, laboratory and radiology information systems, a picture archive and communication system and an integrated, patient-centred electronic medical record. In addition, electronic clinical workflows are devised in a way that

Table 14.4

Ten most frequent types of diagnosis during the Athens 2004 Paralympic Games (coding letters based on the diagnosis codes in the 2004 medical encounter form)

	Group	Diagnosis
1	Eye	J4 Vision disorders
2	Skin	E7 Other
3	Dental	H8 Other
4	Ear, nose and throat	D7 Other
5	Musculoskeletal	L15 Other (v – Other)
6	Musculoskeletal	L5 Lumbar spine (v – Other)
7	Dental	H2 Consultation
8	Musculoskeletal	L13 Ankle/tarsus/toes (v – Other)
9	Musculoskeletal	L8 Shoulder (b – Muscle lesion/rupture)
10	Dental	H5 Restoration

allows flawless transition from conventional procedures to a complete paperless and filmless hospital environment. The development of a management information system that monitors the business

process and management of health care delivery within the network of Health Units S.A. primary care centres will provide a new model for integrating the health care enterprise in Greece.

CHAPTER 15

Disease prevention and health promotion activities

**Agis D. Tsouros, Maroulio Lekka,
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Introduction

The Olympic Games offer unique and multiple opportunities for health promotion on a very large scale that can benefit the millions of viewers as well as the population of the country and cities hosting the Games (1,2). Athleticism and sport are entry points for promoting physical activity and active living in the broadest sense as well as tobacco-free lifestyles and healthy eating. This chapter focuses on three of the most important health promotion and disease prevention activities during the Athens 2004 Olympic Games covering three main domains: implementing tobacco-free Olympics (by the Athens 2004 Olympic Games Organizing Committee); organizing the Olympic Day Run (by the Municipality of Athens); and preventing negative public health effects due to high temperatures and heat-waves (by the Ministry of Health and Social Solidarity and the National School of Public Health). A cross-sectional survey of the stakeholders of the Athens 2004 Olympic Games (including all official private sponsors) covering 44 agencies identified 10 health promotion programmes that were initiated under the umbrella of the Athens 2004 Olympic Games (3). These included tobacco-free Olympics, safe sex with the free distribution of condoms, information on Mediterranean food products, promotion of physical activity and protection from the sun and the heat. The total cost of the programmes was estimated at €943 000, a relatively small fraction (0.08%) of the overall cost of the Athens 2004 Olympic Games.

The potential of the Olympics for health promotion was not fully exploited, although the stakeholders of the Athens 2004 Olympic Games recognized this as an important priority. For example, the National School of Public Health and the National Board of Public Health prepared a proposal for a major health

promotion programme during the Athens 2004 Olympic Games that would have addressed physical activity, healthy nutrition and nonsmoking on a large scale, and the Minister of Health approved this in February 2004. The programme was divided into three subprojects for the periods February–April, May–September and October–November 2004. The actions and interventions would be based on partnerships at all levels (national, regional and local), on citizen participation and the use of modern and high-quality mass media. The main goals of the programme were to conduct a limited number of large-scale interventions and to motivate and urge the participation of all relevant stakeholders such as the Ministry of Culture and Sports, the Athens 2004 Olympic Games Organizing Committee, the Ministry of National Education, the regional health authorities and the municipalities, most notably the Municipality of Athens, an active member of the WHO European Healthy Cities Network. The interventions would include a specially designed Healthy Olympics web site, leaflets and newspaper articles, posters, television spots and radio messages, conferences, technical workshops and debates in the mass media, events and the use of International Olympic Committee and world sporting personalities.

However, the reality of the intensive preparations for the public health and health care emergencies of the Athens 2004 Olympic Games made health promotion and this proposal a lesser priority. A noteworthy initiative was the organization of a series of health promotion events (from January to February 2004) linked to the Athens 2004 Olympic Games including radio spots and a conference organized by the three regional health authorities covering the parts of Greater Athens that were primarily aimed at the

local population. The only large-scale event with huge participation and considerable mass-media attention was the Tour of Athens in May 2004. Thousands of runners of all ages and many nationalities took part in the pre-Olympic event and enjoyed the city without traffic, pollution and noise.

Other significant efforts included International Olympic Committee officials distributing an information kit related to preventing HIV transmission to every Olympic athlete. This was an important step to attempt to educate the “ambassadors” of all countries about one of the most severe global crises in public health. Coupled with the free distribution of condoms in the Olympic Village Polyclinic, both the International Olympic Committee and the Athens 2004 Olympic Games Organizing Committee showed their intense interest in preventing HIV infection and, in so doing, promoting a healthier lifestyle. No data are available on how many

condoms were distributed in the Polyclinic since such information was not recorded to protect confidentiality. Local sponsors covered the cost of the programme, signalling a model that could successfully be used in both sport events but also in other mass gatherings.

Overall, Greece made a small but significant step forward on health promotion in the context of the Athens 2004 Olympic Games. Future organizers of Olympic Games and other mass athletic events could plan and give priority to health promotion in the same systematic way they would pay attention to issues of public health safety and preparedness for deliberate incidents. The Athens experience also showed that separating the organizational components of the Olympic Games dealing with public health safety and health promotion could have resulted in a more balanced investment of energy, efforts and outcomes.

Tobacco-free Athens 2004 Olympic Games

The World Health Organization (WHO) and United States Department of Health and Human Services through its Centers for Disease Control and Prevention collaborated with the World Olympians Association, the International Olympic Committee, Greece’s Ministry of Health and Social Solidarity and Athens 2004 Olympic Games Organizing Committee to publicize the tobacco-free policy during the Athens 2004 Olympic Games and promote the health benefits of an active, tobacco-free lifestyle.

According to Greece’s legislation on smoking and specifically Ministerial Decisions No. 76017 (F.E.K. 1001, B, 01.08.2002) and No. 82942 (F.E.K. 1292, B, 12.09.2003), smoking is banned from

public areas, means of transport and premises providing health care services. Smoking is allowed only in specific designated areas, properly separated and designated as “smoking areas”.

The Department of Public Hygiene of the Ministry of Health and Social Solidarity issued a circular banning the sale of all the tobacco products from the stands of both public and private hospitals in Greece, with the objective of preventing disease and promoting public health.

Smoking and the use of other tobacco products were not permitted during the Olympic and Paralympics Games (Law No. 2833/2000) except in

designated areas in the Olympic venues. More specifically, according to this policy, smoking was prohibited:

- in all athletic or non-athletic indoor facilities under the jurisdiction of the Athens 2004 Olympic Games Organizing Committee;
- in all areas of the athletic facilities in which Olympic competition took place; and
- in the sitting rows and the ancillary areas of the open athletic facilities.

Every open-field athletic facility had a designated outdoor area that complied with all fire safety regulations where smoking was permitted. The regulation was enforced with the help of the Hellenic Police, the Olympic Games Security Department, the Athens 2004 Olympic Games personnel, the Health Services Department and the Spectator Services.

Tobacco billboard advertising of tobacco products was also banned during the Olympic and Paralympics Games period (Law No. 3204/2003).

According to WHO, tobacco kills more than 4 million people each year. Statistics indicated that the prevalence of smoking among adults in Greece in 2003 was 39% (46% of men and 31% of women) (4), with an annual cigarette consumption rate (in 2000) of 3000 per person (5).

Tobacco consumption rates in Greece have been rising, and the Athens 2004 Olympic Games served as a positive way to promote smoke-free living, physical activity and good nutrition.

Research indicates that smoking negatively affects athletic performance, and participation in sports not only serves to prevent the initiation of tobacco use among youth but is also a positive way young people can express themselves without tobacco and reap the benefits of physical activity.

The Tobacco Free Sports public education activities of WHO and the United States Centers for Disease Control and Prevention included collaborating with the Ministry of Health and Social Solidarity during the Athens 2004 Olympic Games and utilizing athletes as spokespeople to endorse a smoke-free healthy lifestyle as critical to achieving their highest potential to resonate important health messages.

These activities during the Athens 2004 Olympic Games were part of a global Tobacco Free Sports campaign the United States Centers for Disease Control and Prevention, WHO and their international partners launched in Geneva, Switzerland in 2001.

According to the International Olympic Committee, the Olympic Games are one of the few major sports events that has never allowed any commercial advertisement or sponsorship by tobacco companies since the first Olympic Games in 1896. This policy has been further reinforced since 1988, when the International Olympic Committee and WHO, in cooperation with the organizing committees of the Games, banned smoking in all sports venues.

A successful smoke-free policy was in place during the Sydney 2000 Olympic Games, in cooperation with the government and local health groups. All venues and participants were smoke-free, and messages about tobacco-free and healthy lifestyles were promoted throughout the event. High-profile athletes such as Stacy Dragila, the world record holder in women's pole vaulting, were on hand to speak out against tobacco use in Australia. She had participated in press conferences with representatives from the International Olympic Committee as well as high-level officials from the Government of Australia.

The Olympic policies and anti-tobacco promotions have worked well. In an evaluation of the smoke-free policy at the Sydney 2000 Olympic Games by the United States Centers for Disease Control and

Prevention and WHO, 137 of 148 athletes, journalists and spectators surveyed reported they had not noticed any tobacco advertising or promotions during the Games (6).

The 2002 Winter Olympic and Paralympic Games in Salt Lake City were also tobacco-free and promoted similar healthy lifestyle messages targeting young people. The Salt Lake City Organizing Committee's "A Healthier You 2002" programme motivated Utah residents not only to stop using tobacco but also to engage in regular physical activity, eat less fat and more fruits and vegetables, drink little or no alcohol,

wear seat-belts and helmets and get all recommended screenings and immunizations. To nudge people along this healthier path, physicians in Utah gave their patients written prescriptions for regular physical activity, good nutrition and other healthy behaviour (7).

The spectators of the Athens 2004 Olympic Games by and large complied fully with the nonsmoking policy in Olympic venues, a remarkable achievement. No effort was made to record systematically or to survey smoking behaviour during the Athens 2004 Olympic Games.

The Tour of Athens¹

The Olympic Games and other major sporting events offer to the hosting cities a great opportunity to improve their environment for their citizens' benefit as well as for their visitors and to promote physical activity and active living (6). After the Olympic Games end, most host cities acquire new athletic facilities, substructure and a valuable organizing experience. The Municipality of Athens developed a large voluntary services-based programme (Show Them the Athens You Love) and improved greatly the cleanness and safety of the road network, including several thousands of kilometres of new pavements. Great importance was also attached to people with disabilities being able to access various buildings. Show Them the Athens You Love consisted of a multilingual information and hospitality network addressed to all visitors during the Athens 2004 Olympic Games and Paralympic Games. Further, the Municipality organized the Tour of Athens. This is one of the most popular mass events and every year attracts many participants from Greece and other

countries. The Youth and Sports Organization has organized the Tour of Athens since 1984. Every year thousands of people – children, adults, older people, disabled people and people from other cities – fill the streets of Athens with joy and make the city look different. It is their own way to convey each time the message of brotherhood, of joy in sports, physical activity and of "fair play".

In 2004, the 21st Tour of Athens inaugurated a new international sports event. Athens became the first city to host the Olympic Day Run, giving special prestige to an already recognized institution (Fig. 15.1 and 15.2). The idea was to upgrade the social role of sports, to promote the continuous participation of the individual in sports events, to implement the idea of sports for all and to promote the eternal values of Olympism. The Olympic Day Run was endorsed as the new international institution of the International Olympic Committee and will take place every year in each city hosting the Olympic Games.

¹ The Press Office of the Youth and Sports Organization of the Municipality of Athens contributed to this section.

Fig. 15.1. The former Mayor of Athens, Dora Bakoyannis, gives the start signal for the Olympic Day Run



Fig. 15.2. Thousands of people participated in the Olympic Day Run



The Hellenic (national) Olympic Committee entrusted this task to the City of Athens and to the Youth and Sports Organization, celebrating together with the Tour of Athens the Olympic Day Run. The Tour of Athens is not a speed course. It is a participation course and a cultural event. The standard course of 8 km includes the entire city's sightseeing route, the archaeological sites and the historical monuments. The course for people with disabilities and children is 700 metres, and older people have the choice of running 3.5 km or 700 metres. Organizers took care of the needs of all the participants, especially for people with disabilities, security and first aid and ambulance

stations that were provided throughout the course. They also paid special attention to giving out information on how to join the Tour and on good preparation, thus imparting a sense of confidence to citizens. The Tour was based on the successful cooperation of several sectors and agencies including ministries, the Hellenic Police, the traffic police, agencies involved in preventing and responding to the deliberate use of explosives, biological and chemical agents or radionuclear material, public and private hospitals, the municipal sanitation and parks services, the road building service, the municipal police and volunteers.

Learning points

Many cities all over the world organize similar running courses, and even more want to incorporate such tours in their sports activities framework.

The success of such an event requires:

- detailed planning, as such a popular sports and cultural event can leave nothing to chance;
- choosing suitable routes that will attract massive participation and enhance the city, including different routes and distances for every category;
- creatively using many means to attract massive public participation: in Athens, the contribution of the public transport system offering free transport for the runners made a big difference;
- organizing cultural activities simultaneously;

- ensuring the cooperation of both the public and private sectors in well-defined activities for each to avoid confusion;
- ensuring sponsorship based on explicit criteria;
- using volunteers;
- using a good advertising company to produce promotion films, radio messages and brochures to promote the positive image and the benefits of the Tour;
- encouraging the participation of young people and athletes including scouts, students as well as athletes;
- cleverly planning alternative routes in the city for vehicular traffic in case of emergency;
- re-planning the traffic in the free side of the city as well as the public transport itineraries carrying the participants to the starting-point and receiving the tired runners to transfer them back home;
- designing a system to ensure that designated routes are open and obstacles removed;
- creating meeting points and a communication system between all the route stations to prevent anyone from getting "lost";
- clearly marking and separating the routes;
- providing an adequate supply of drinking-water and toilets along the routes;
- having a good sound system at the starting-point and the finishing point; and
- providing correct instructions and repeating them to avoid health problems, injuries and other incidents.

One of the key points in organizing such events is to be aware that athleticism is a way of life for not only professional athletes but all citizens. This means inspiring citizens to be more physically active so that they can enjoy both the health and social benefits of physical activity and sports. The sports activities, far from being restricted exclusively to fields, courts and gyms, are also expanded in the streets, in the parks in the squares and are being embraced by all citizens' groups. The built environment can offer numerous opportunities for active living close to where people live in their neighbourhoods, on the way to and from work, at work and in green spaces and leisure areas. The popular running courses and especially the Tour of Athens will surely continue, greatly invigorated by the Athens 2004 Olympic Games, providing a chance for all citizens to have fun and to celebrate togetherness and active living.

Preventing negative public health effects of high temperatures and heat-waves

The Department of Epidemiology and Biostatistics for the Athens 2004 Olympic Games was responsible for developing a programme of activities for preventing negative public health effects of high temperatures and heat-waves. Athens may have prolonged periods of high temperatures during the summer. In Greece, heat-wave conditions are defined by at least three consecutive days exceeding 37°C. In major metropolitan areas, such as Athens, the city's infra-

structure and concentration of asphalt and concrete (the urban heat island) can be responsible for trapping heat and pollution, leading to even more severe conditions. Human bodies can adjust to changes in environmental temperatures. However, with extended exposure to sunlight or heat-wave conditions, and especially with high humidity, the body may not be able to maintain its temperature at normal levels. In these cases, the body fails to

perspire as needed, resulting in elevated body temperature.

Individuals more likely to have ill health effects from high temperature and heat-waves are:

- infants and children;
- elderly people;
- people who are overweight;
- people on medication; and
- people exposed to sunlight for an extended period of time.

To address this potentially serious problem, a programme was developed.

First, a plan of action was developed in collaboration with all departments and agencies concerned emphasizing awareness and preventive activities. Special

collaborative actions involved the Ministry of Health and Social Solidarity, the General Secretariat for Civil Protection, the Prefecture and Municipality of Athens, the Hellenic National Meteorological Service, the Hellenic Civil Aviation Authority, the Ministry of Mercantile Marine, the Hellenic Chamber of Hotels and all officials of cities participating in the Athens 2004 Olympic Games.

Material was prepared in the three official languages of the Athens 2004 Olympic Games (Greek, English and French). The materials prepared were pamphlets, postcards and a poster (Box 15.1, Fig. 15.3). The main theme of each was to emphasize types of prevention. Presenting this knowledge so that lay-people could easily understand it was important. A plan for disseminating the material was developed to target groups at Olympic venues in each Olympic city.

Box 15.1

Advice given in the brochures distributed to the public for protection from high temperatures and heat-waves

Precautionary measures

- Wear light-coloured, lightweight, loose-fitting cotton or linen clothes.
- Wear wide-brimmed white hats.
- Wear sunglasses.
- Always use a sun-blocking lip balm; always apply sunscreen with at least an SPF (sun protection factor) 15 rating; always follow product directions.
- Reduce food intake and eat smaller meals – preferably fruits and vegetables – during the day.
- Avoid consuming alcoholic beverages.
- Drink plenty of cool water.
- Take frequent, cool showers.

Safety tips

- Never leave children or pets in parked cars, because the temperature inside (even with the windows rolled down) can exceed 50°C within seconds.
- Check with your doctor or pharmacist before making any changes in diet or medication.
- If you experience dizziness, nausea, an elevated heart rate or a slight fever, go immediately to a cool place, wet your face, arms and legs and then seek help from the health care services of the stadium.
- If you are outside the Athens 2004 Olympic Games venues and heat emergency symptoms persist, immediately dial 166.

Fig. 15.3. Examples of brochures for informing people about protection from high temperatures and heat-waves in connection with the Athens 2004 Olympic Games



The material was distributed during the Athens 2004 Olympic Games at the stadiums, the Metro and other means of mass transport, hospitals, public services, hotels, the special Olympic transit lines, the airports, ports, marinas, municipal offices, city squares, toll stations, mass-media services, international mass-media kiosks, embassies, International Broadcasting Centre, the Media Centre and the Olympic Village.

A special web site was designed on the effects of severe heat and heat-waves and methods of prevention, in simple and understandable language for the public and easily accessible to the public. Links and relevant information were placed on the web sites of the Ministry of Health and Social Solidarity and the National School of Public Health.

All official services involved in this initiative were or-

ganized and coordinated and available on call for providing expert advice and support in case of severe temperatures and/or heat-waves in the Olympic cities.

The brochures suggested precautionary measures and offered simple but effective safety tips (Box 15.1) and provided information about the symptoms and the treatment of heat strokes (Box 15.2).

The Athens 2004 Olympic Games Organizing Committee developed a similar programme to address concerns for incidents related to high temperature and heat stroke. The programme reflected the overall operations of the Athens 2004 Olympic Games Organizing Committee in coordination with state authorities for incidents outside the Olympic fence and intense preparations to address incidents within the Olympic fence, within Olympic and Paralympic venues.

Box 15.2**Advice given in the brochures distributed to the public for protection from heat strokes and heat exhaustion**

Heat exhaustion is caused by the body's inability to cool itself properly because body fluids are being lost due to heavy sweating. Common symptoms are dizziness, nausea, increased heart rate and headaches. First aid care includes: moving the person to a cool place, elevating the feet and applying cool, wet compresses to the body. It is also necessary to give plenty of fluids (a half glass of cool water every 15 minutes). If heat exhaustion is not treated immediately, it can lead to heat stroke.

Heat stroke is life threatening; the body temperature can reach 40°C or higher. This is a most severe medical emergency and can be fatal. Immediately dial 166 (emergency ambulance service). The symptoms of heat stroke are: confusion, abnormal behaviour, low blood pressure, vomiting, difficulty breathing or loss of consciousness. Until the ambulance arrives, move the person to a cool place, remove clothing and apply wet towels all over the body. If the person feels nauseated, do not give anything to eat or drink.

Actions within the fence

The Health Services Department coordinated a programme that combined three steps. Health promotion and disease prevention messages were developed that spectators and members of the Olympic Family could easily understand. These messages were included in the health care guide and were announced during the Games in venues from the public address systems when temperatures and humidity indexes exceeded a certain level. These messages were translated into all the official languages of the Games, and the graphic designs included the two mascots of the Games, Phoebus and Athena, advising the crowds on how to handle high temperatures. The Health Services Department coordinated this action both centrally and at the venue level, and the Sports Presentation Division assisted with the messages and the announcements. Venue operations also had to give approval. This is partly duplication of efforts by the state and the Organizing Committee, although the separation of responsibilities required that needs be addressed both within and outside the fence.

Contingency planning allowed for greater quantities of water provided to spectators during days that heat and humidity conditions were judged to be critical. The Catering Division in coordination with the Marketing Division had an agreement with the official sponsor of the Games for providing extra bottles of water in venues where demand rose due to high heat and humidity. When the Athens 2004 Olympic Games Organizing Committee Main Operations Centre gave an order for the plans to go into effect, more water was delivered to venues to address any issues of concern. A number of functional areas were involved in this process. Health services was one of the main ones. Venue operations, catering and spectator services were others.

The Health Services Department monitored the incidence of heat-related incidents in venues in real time and was ready to respond in terms of personnel but also supplies. All staff members were trained accordingly and a system of coordination with Olympic hospitals was in effect in case the need

arose. Special tents and areas with shadow were designated in each venue, and the Health Services Command Centre at the Athens 2004 Olympic Games Organizing Committee headquarters

produced a daily report highlighting such incidents. Further, the Command Centre obtained a daily weather forecast every morning to monitor weather developments.

Conclusions

Mass gathering such as the Olympic Games have an intrinsically huge and largely unexplored potential for disseminating health-promoting messages. They have a captive global audience for several days as well as the intense attention of the mass media. Moreover, they engage some of the most prominent and influential celebrities on the world stage. They provide the opportunity to address a wide range of lifestyle issues, including tobacco and drug use, alcohol abuse, safe sex, nutrition and physical activity. Organizers of mass gatherings should follow the example of the Smoke-free Olympics and smoke-free sports. At a time when obesity has reached epidemic levels on a global scale, the Olympic Games represent an excellent and obvious vehicle for conveying to young and adult audiences messages about healthy eating and active living. Nevertheless, fully exploiting the health-promoting potential of the Games requires identifying this as a strategic priority at the outset of the preparations. The recognition by the International Olympic Committee and other organizers of major sporting events that they can play a major role in promoting health could make a tremendous difference. The local organizing committee and the health ministry of the country hosting the Games must similarly recognize this. Addressing the health care and

public health preparedness needs of the Olympic Games or other mass gatherings should not compete either for resources or adequate political attention with health promotion activities. Implementation requires early planning and preparations (at least two years before the event) and tactically separating the health-promoting activities from the public health protection and activities preparing for potential incidents involving the deliberate use of biological and chemical agents or radionuclear material, which can easily divert the attention of politicians, professionals and organizers of the games, especially close to the time of the Games. An issue that could create conflicts of interest relates to the sponsorship of mass gatherings events by private industry that deals with potentially unhealthy products, such as foods with high sugar or fat content. Greece could have exploited much more the health-promoting potential of the Olympic Games. There was no lack of political will or lack of recognition that this aspect should be given priority. However, the need and efforts to deliver a safe Olympics in every sense and the context of the international threats to public health from natural or deliberate causes had a discouraging effect on the implementation of the health promotion agenda.

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PART 5

**Coordination, international cooperation
and overall conclusions and lessons
from the Athens 2004 Olympic Games**

CHAPTER 16

Health sector command, coordination and communication

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Introduction

The organization of a major public event, in which a large number of spectators and participants may be involved, such as for sports, political or religious gatherings, presents important security challenges for a state, especially following the attacks involving the deliberate use of explosives, biological and chemical agents or radionuclear material during recent years. Deliberate acts intended to harm involving the use of biological and chemical agents or radionuclear material and other materials at major public events could result in severe effects, depending on the nature and quantity of the involved material, the location used and the population affected.

For many years, these considerations have led several states hosting major events such the Olympic Games to implement arrangements to deal with the usual security concerns of attacks with explosives and the potential deliberate use of biological and chemical agents or radionuclear material. Since major public events are planned long in advance, groups who want to attack the Games have time to prepare action for such events. Public health functions can be highlighted as follows.

- Global surveillance systems must be sensitive to information detecting the use of biological and chemical agents or radionuclear material.
 - Global partnership is required to minimize the threat of deliberate attacks.
 - Techniques used to respond to disease outbreaks and natural disasters can also be used to deal with the health effects of such incidents.
 - The lessons learned from SARS and other disease outbreaks should be used to strengthen national and global preparedness for the next emergency caused by an infectious disease.
- Capacity-building in low-income countries must be practical, based on the needs of the country and collaborative.
 - The strength of multiple stakeholders – governments, international organizations, the private sector and civil society – must be leveraged to improve global response capacity.

One of the most challenging aspects of public health preparedness for the Athens 2004 Olympic Games was the need for coordination among several agencies with often overlapping remits under the jurisdiction of different ministries or subnational levels of government. Many stakeholders were determined to have a say and a visible and important role in this once-in-a-lifetime event. This meant that significant effort had to be invested in complex negotiations. One factor that added to the pressure to ensure synergy and coordination was the threat of the deliberate use of explosives, biological and chemical agents or radionuclear material. New legislation and ministerial directives and a series of memoranda of understanding and cooperation between various parties supported joint planning and cooperation between sectors and agencies. In many ways an “Olympic truce” was required for the various sectors and agencies to work together so well for a common cause.

A very significant decision in this context was the establishment of the Health Coordination Command Centre of the Ministry of Health and Social Solidarity as the central mechanism for coordinating the activities and response of the health sector during the Athens 2004 Olympic Games. The Health Coordination Command Centre was foreseen under axis 5 of the health planning framework of the Athens

2004 Olympic Games (see Chapter 2). The key mission of the Health Coordination Command Centre was to direct, decide and coordinate the overall health and medical response to public health crises during the Athens 2004 Olympic and Paralympic Games. The Health Coordination Command Centre comprises two integral parts:

- an Executive Committee, as outlined below; and
- the Operations Centre of the Health Coordination Command Centre, through which it represented the point of unified command of the entire health sector and an integral part of a network of collaborating command centres run by different ministries and agencies to ensure the

safety of all the people in Greece during the Athens 2004 Olympic and Paralympic Games.

Another key function was managing the communication of health issues to the public. The Olympic Games in general are particularly vulnerable to issues related to the health and safety of athletes and visitors. Moreover, the intense attention of the world mass media requires careful handling of all public health incidents no matter how routine or insignificant they may seem under everyday circumstances. The Health Coordination Command Centre closely cooperated with the Press Office of the Ministry of Health and Social Solidarity in coordinating all communication of health issues to the mass media.

The creation of the Health Coordination Command Centre

The overall goals of the Health Coordination Command Centre were:

- mapping out the remits and responsibilities of all agencies involved in the response to health emergency and crisis situations with a view of ensuring their immediate and adequate response; and
 - coordinating all stakeholders responsible for implementing activities related to public health during the pre-Olympic and the Olympic periods, both within and outside the Olympic venue areas.
- More specifically, the main functions of the Health Coordination Command Centre were:
- to receive relevant data and create health status reports and health system indicators to guide strategic and operational decisions;
 - to monitor events that have possible health implications;
 - to provide information to other command centres on the status of the health sector (such as the Civil Defence Crisis Command Centre);
 - to coordinate and manage health system resources;
 - to designate liaisons to the Olympic Security Command Centre and Civil Defence Crisis Command Centre to provide strategic and scientific input on health matters and maintain awareness of events and threats that may require health system response;
 - to communicate and coordinate with the Olympic Security Command Centre, Olympic Strategic Security Command Centre and the Civil Defence Crisis Command Centre (Fig. 6.1);
 - to communicate and coordinate with the Ministry of Health and Social Solidarity command

centres operated by the National Centre for Emergency Care and the Hellenic Centre for Infectious Diseases Control;

- to formulate health-specific risk communication guidance and press releases as needed to be forwarded to the Joint Information Centre and the Press Office of the Ministry of Health and Social Solidarity; and
- to directly implement health sector response activities after the Olympic Security Command Centre decides to activate the response plan for the potential use of biological and chemical agents or radionuclear material.

The Health Coordination Command Centre assumes different roles and responsibilities depending on whether the Ministry of Health and Social Solidarity is acting as the lead agency in the response to

a certain emergency or whether it is acting in support of a lead agency. The medical support operation plan for the potential use of biological and chemical agents or radionuclear material (Philotetes) delineated the roles and responsibilities of specific Ministry of Health and Social Solidarity directorates and agencies represented in the Health Coordination Command Centre. Nevertheless, whether or not the Ministry of Health and Social Solidarity is acting as a lead agency, response efforts require multi-agency collaboration and cooperation across ministries. The roles and responsibilities of each agency are delineated in reference to the legal framework and/or in formal memoranda of understanding or agreements. In addition, the Health Coordination Command Centre induced the issuing of specific protocols for intersectoral and interagency response.

Organization

As mentioned in the introduction, the Health Coordination Command Centre became a new department in the Ministry of Health and Social Solidarity and, for the Olympic period, comprised:

- an interagency and intersectoral Executive Committee involving the heads of relevant agencies and liaisons of collaborating operation centres; and
- the actual Operations Centre of the Ministry of Health and Social Solidarity.

The members of the Committee were as follows:

- Chair: Special Secretary, Ministry of Health and Social Solidarity;
- Associate Chair: Director of the Operations

Centre, Special Adviser to the Minister of Health and Social Solidarity;

- Secretary-General of Health, Ministry of Health and Social Solidarity;
- Director General of Administration, Ministry of Health and Social Solidarity;
- Director General of Social Work and Welfare, Ministry of Health and Social Solidarity;
- Director of Health Unit Deployment, Ministry of Health and Social Solidarity;
- Director of Public Hygiene, Ministry of Health and Social Solidarity;
- Director of Sanitary Engineering and Environmental Hygiene, Ministry of Health and Social Solidarity;
- Director of Mental Health, Ministry of Health and Social Solidarity;



Agis D. Tsouros (left) and Panos A. Efstathiou in the Health Coordination Command Centre located in the premises of the Ministry of Health and Social Solidarity.

- Director of Civil Protection, Ministry of Health and Social Solidarity;
- Chair, National Board of Public Health;
- Secretary-General of the Government of Greece for the Olympics;
- Health Services Director, Athens 2004 Olympic Games Organizing Committee;
- President, Hellenic Centre for Infectious Diseases Control;
- President, National Centre for Emergency Care;
- the Deputy Prefect of Attica;
- a representative of the Ministry of National Defence;
- a representative of National School of Public Health; and
- a representative of the Hellenic Food Authority.

The Operations Centre was the heart of all coordination and unified command activities. It operated in three eight-hour shifts daily with full administrative and scientific support from 30 July to 1 October. Support staff fulfilled the following functions: planning, logistics, information management and communication.

The shifts of the scientific staff of the Operations Centre consisted of a physician representing the Department of Public Hygiene of the Ministry of Health and Social Solidarity, who acted as shift coordinator; a physician from the Hellenic Centre for Infectious Diseases Control; and a physician from the National Centre for Emergency Care. The team was responsible for analysing all incoming information and communication and notifying the director of the Operations Centre of any potential problems. Additional specially trained health staff members were made available to provide liaison, on a 24-hour basis, with the Health Services Department of the Athens 2004 Olympic Games Organizing Committee; the Olympic Security Command Centre and the Civil Defence Crisis Command Centre.

An Executive Command Group (also known as immediate response group) supervised the day-to-day management of the Operations Centre. This was a shorter and more flexible form of the full committee described above that comprised five individuals: the Associate Chair of the Health Coordination Command Centre; the Chair of the National Board of

Public Health (Deputy); the President of the Hellenic Centre for Infectious Diseases Control, the Vice-President of the National Centre for Emergency Care and the Director of Public Hygiene of the Ministry of Health and Social Solidarity.

This Group was responsible for the day-to-day running of the Health Coordination Command Centre and the Operations Centre and was in continuous contact with the political hierarchy of the Ministry of Health and Social Solidarity and with all the relevant Olympic Games actors and structures.

The Executive Command Group was supported by the Operational Command Group, which comprised high-level staff from the Ministry of Health and Social Solidarity. The members of the Operational Command Group were Olga Daligarou, Konstantinos Gkogkosis, Marianna Pagjati, Vasiliki Rigatou, Anna Tsekoura and Marina Tsoumani.

The Operations Centre was created in the premises of the Ministry of Health and Social Solidarity and was equipped with state-of-the-art communication technology.

During the Athens 2004 Olympic Games, the Ministry of Health and Social Solidarity designated the following:

- 24 Olympic hospitals (18 in Attica (Athens), 1 Patras, 1 Heraklio and 1 Volos) (Table 16.1);
- 16 Olympic hospitals with 24-hour accident and emergency departments (10 in Attica, 3 Thessaloniki, 1 Patras, 1 Heraklio and 1 Volos) with availability at all times of an internal medicine specialist, cardiologist, surgeon, anaesthesiologist, radiologist and pathologist as well as the full operational capacity at hospital ward levels (Table 16.2); and
- 14 Olympic hospitals specially prepared to treat people exposed to biological and chemical agents or radionuclear material, including decon-

Table 16.1
The 21 Olympic hospitals

City	
Athens	<ul style="list-style-type: none"> ● Ag. Olga General Hospital ● Alexandra General Hospital ● G. Genimatas General Hospital ● Evangelismos General Hospital ● Sismanogleion General Hospital ● Hellenic Red Cross General Hospital ● KAT General Hospital ● Asklepieio Voulas General Hospital ● Thriasio General Hospital ● Ag. Panteleimon General Hospital ● Ag. Sofia Children's Hospital ● Tzaneio General Hospital ● A. Sygros Dermatological Hospital ● Athens Eye Hospital ● Onassis Cardiac Surgery Center
Thessaloniki	<ul style="list-style-type: none"> ● Ippokrateio General Hospital ● Ag. Pavlos General Hospital ● Papageorgiou General Hospital
Patras	<ul style="list-style-type: none"> ● University Hospital of Patras
Volos	<ul style="list-style-type: none"> ● Achillopouleio General Hospital
Heraklio (Crete)	<ul style="list-style-type: none"> ● University Hospital of Crete

tamination areas, personal protective equipment, isolation rooms, specialized equipment such as respirators, first aid facilities and an air-transport system (Table 16.3).

In the framework of the operational plan for the response to the potential use of biological and chemical agents or radionuclear material, the Health Coordination Command Centre prepared and implemented the detailed plan Philoctetes, which

Table I6.2**The 16 Olympic hospitals with 24-hour accident and emergency departments**

City	
Athens	<ul style="list-style-type: none"> • G. Genimatas General Hospital • Evangelismos General Hospital • Sismanogleion General Hospital • Hellenic Red Cross General Hospital • KAT General Hospital • Asklipieio Voulas General Hospital • Ag. Panteleimon General Hospital • Ag. Sofia Children's Hospital • Tzaneio General Hospital • Onassis Cardiac Surgery Center
Thessaloniki	<ul style="list-style-type: none"> • Ippokrateio General Hospital • Ag. Pavlos General Hospital • Papageorgiou General Hospital
Patras	<ul style="list-style-type: none"> • University Hospital of Patras
Volos	<ul style="list-style-type: none"> • Achillopouleio General Hospital
Heraklio (Crete)	<ul style="list-style-type: none"> • University Hospital of Crete

addressed all aspects of preparedness and response to the potential use of biological and chemical agents or radionuclear material. The Health Coordination Command Centre also described and established criteria for the alert levels of all Ministry of Health and Social Solidarity services. The Minister of Health and Social Solidarity was responsible for activating the different alert levels based on recommendations by the Health Coordination Command Centre. These levels were:

- white: normal function, administrative and scientific personnel are in place for their shift;
- green: as above, all Health Coordination Command Centre staff are summoned to the

Table I6.3**The 14 Olympic reference hospitals**

City	
Athens	<ul style="list-style-type: none"> • G. Genimatas General Hospital • Evangelismos General Hospital • Sismanogleion General Hospital • Hellenic Red Cross General Hospital • KAT General Hospital • Asklipieio Voulas General Hospital • Ag. Panteleimon General Hospital • Ag. Sofia Children's Hospital • Tzaneio General Hospital
Thessaloniki	<ul style="list-style-type: none"> • Ippokrateio General Hospital • Papageorgiou General Hospital
Patras	<ul style="list-style-type: none"> • University Hospital of Patras
Volos	<ul style="list-style-type: none"> • Achillopouleio General Hospital
Heraklio (Crete)	<ul style="list-style-type: none"> • University Hospital of Crete

- Operations Centre and the Executive Command Group meets to assess the situation;
- yellow: as above, but the Operations Centre is placed on full alert and the full Health Coordination Command Centre is convened; and
 - red: as above and all Ministry of Health and Social Solidarity staff, including general directors and directors, are in place.

The Health Coordination Command Centre prepared guidance and coordination with Ministry services for all Olympic hospitals to prepare effective disaster plans. It also coordinated the relevant parts played by all agencies under the jurisdiction of the

Ministry of Health and Social Solidarity in the response to the potential use of biological and chemical agents or radionuclear material.

The Health Coordination Command Centre coordinated and guided the preparations of two hospitals designated as quarantine hospitals for highly infectious diseases. Further, it coordinated the participation of the health sector and its agencies in the exercises related to response to the potential deliberate use of explosives, biological and chemical agents or radionuclear material organized before the Athens 2004 Olympic Games.

The Health Coordination Command Centre organized four major training events on epidemiological surveillance and response (based on the Philoctetes plan) in Athens (7–9 June 2004); Thessaloniki (16 July 2004); Patras (23 July 2004) and Heraklio, Crete (30 July 2004). Each of these training events involved officials of the Ministry of Health and Social Solidarity and prefectural departments of public health, hospital governors and administrative staff, health care personnel and representatives from the Hellenic Centre for Infectious Diseases Control, National Centre for Emergency Care, National School of Public Health, Central Public Health Laboratory and the National Organization for Medicines. Finally, the Health Coordination Command Centre organized daily consultations, briefings and training sessions with the support of experts from WHO, the United Kingdom and the United States of America.

During the Athens 2004 Olympic Games and on a daily basis at 12:00, the Health Coordination Command Centre issued a technical report (and advised the Press Office of the Ministry of Health and Social Solidarity on the preparation of press releases) on the health activities in cities with Olympic venues and the rest of Greece. The Operations Centre received activity reports daily (between 08:00 and 10:00) from:

- the National School of Public Health: the daily results of environmental hygiene inspections and laboratory tests by the prefectural department of public health officials relating to food and water safety and sanitation conditions of restaurants, hotels, swimming pools, cruise ships, etc. (see the sample daily report in Annex 3);
- the Hellenic Centre for Infectious Diseases Control, after the analysis of epidemiological surveillance data, as well as updates on any interventions for outbreak investigation or response to a suspicious incident (see sample in Annex 3);
- the Hellenic Food Agency: inspection results for food establishments within the Olympic venues (inside the fence);
- the National Centre for Emergency Care: activity reports describing all ambulance use and response to any incidents involving casualties;
- activity reports from the 24 designated Olympic hospitals: admissions and detailed reports on different categories of patients (athletes, spectators, journalists, volunteers, etc.);
- dynamic data on the daily availability of health sector assets such as hospital beds by type based on a hospital assets information system linked to a geographical information system; and
- any other report originating from WHO's JW Lee Centre for Strategic Health Operations (see Chapter 17) or any other international source.

A daily meeting (at 12:00) was organized with the participation of the Executive Command Group (immediate response group) at the Operations Centre to assess the situation, finalize the technical report and take decisions or propose measures for various incidents. Invited officials or experts from other agencies could attend these meetings as needed depending on the agenda of the day.

Copies of the daily report of the Operations Centre were sent to:

- the Minister of Health and Social Solidarity;
- the Health Services Department of the Athens 2004 Olympic Games Organizing Committee;
- the Olympic Security Command Centre;
- the Civil Defence Crisis Management Centre; and
- the Secretary General for the Olympics of the Government of Greece.

The full Health Coordination Command Centre was convened 10 times during the Athens 2004 Olympic Games to discuss strategic issues and serious problems relating to the initial preparations, the coordination and cooperation with Ministry of Health and Social Solidarity departments and other agencies and specific health incidents.

Results and experience

From 30 July to 29 August 2004, 1133 individuals related to the Olympics attended the accident and emergency departments of the Olympic hospitals: 1054 in Athens, 18 in Thessaloniki, 38 in Patras, 8 in Volos and 15 in Heraklio. Of these patients, 173 were admitted to hospital: 166 in Athens, 1 in Thessaloniki, 4 in Patras, 1 in Volos and 1 in Heraklio, spending a total of 781 days in hospital (from 30 July to 9 September 2004).

During the actual Olympic Games (13–31 August 2004), 1022 people attended the accident and emergency departments; 972 of these were in Athens. During this period, 159 people were admitted and spent 634 days in hospital (Table 16.4). Fifty-one per cent were from Greece and 49% from elsewhere; 58% were 21–40 years old and 23% 41–60 years old. Forty-one per cent were women. The day with the highest number of hospital attendances and admissions was 22 August, the day with most athletic events. The vast majority of patients in Greater Athens originated from an athletic venue. A total of 324 patients went to accident and emergency departments using private transport and the National Centre for Emergency Care transported 239. The distribution of patients by admission diagnosis shows that orthopaedic problems were most common followed by patients with internal medicine, surgical and

cardiovascular problems. There were also several eye and dental problems. Two deaths were reported: a journalist had cardiac arrest and a spectator drowned.

The distribution of patients of Olympic interest by category in Greater Athens was:

- employees in Olympic venues: 369;
- spectators: 133;
- members of the Olympic Family: 132;
- journalists: 90; and
- athletes: 68.

During the Olympics, the Hellenic Centre for Infectious Diseases Control and the Health Coordination Command Centre dealt with five gastroenteritis outbreaks; a small number of isolated incidents involving two visitors from outside Greece, one with bacterial meningitis and the other with open tuberculosis, an Avian flu alert from Vietnam and South Africa and a potentially explosive propane leak at a hotel. Six cases of suspicious powders in parcels and envelopes resulted in the activation of the response plan for the potential use of biological and chemical agents or radionuclear material and were thoroughly investigated. They were all negative. Box 16.1 describes in detail the sequence of events in handling one of these five cases.

Table 16.4
Number of people hospitalized by hospital, 13–31 August 2004

Hospital	Number of people	Total days in hospital
Athens		
Ag. Olga General Hospital	4	32
Alexandra General Hospital	1	3
G. Genimatas General Hospital	38	144
Evangelismos General Hospital	25	149
Sismanogleion General Hospital	16	45
Hellenic Red Cross General Hospital	11	61
KAT General Hospital	25	74
Asklipieio Voulas General Hospital	15	59
Ag. Panteleimon General Hospital	5	17
Ag. Sofia Children's Hospital	4	10
Tzaneio General Hospital	8	27
Onassis Cardiac Surgery Center	1	1
Volos		
Achiloupoleio General Hospital	1	4
Patras		
University Hospital of Patras	3	15
Heraklio		
University Hospital of Crete	1	7
Thessaloniki		
Papageorgiou General Hospital	1	2
Total	159	634

Box 16.1
Example of a report of an investigation of a suspicious powder incident

An event was reported to have taken place at 05:08 this morning 48 km outside Athens in a large parcel and shipping deposit of a private company – a box labelled "medicine/drugs" addressed to athletes of the Cuban Olympic Team containing some vials and liquid got broken and was mixed with some powder of white crystals. The emergency plan for a potential incident involving the deliberate use of biological and chemical agents or radionuclear material [Philoctetes] was activated. The Hellenic Fire Brigade assessed the risk at the scene. No chemical screening was apparently conducted, and thus a physician from the Hellenic Centre for Infectious Diseases Control was sent on site (arrived at 08:00). The Hellenic Fire Brigade and Hellenic Police decontaminated the site at 09:00. The seven workers exposed to the event were hospitalized under order of the emergency medical services (jurisdiction) for precautionary purposes. The material was collected for further sampling. The material was about 250 grams of soaked crystal. The material was given to the Hellenic Centre for Infectious Diseases Control and samples were taken and sent to Thessaloniki for further analysis. The case was reported to the Health Coordination Command Centre, and the mass media were continually informed. The results from the Thessaloniki laboratory were negative for anthrax, tularaemia and *Yersinia pestis*. Electronic microscope analysis confirmed that no smallpox or other viruses were present.

Building on a success story

Based on the success of the Health Coordination Command Centre as an effective mechanism for coordination and unified command during the Olympic Games, the Minister of Health and Social Solidarity decided to maintain and transform it into a permanent structure of the Ministry after the Games. The Health Coordination Command Centre proved its value in handling several crises such as the discovery of avian influenza in migratory birds in Greece and the preparedness for an influenza pandemic. As a result, it has been upgraded into a stronger and more effective body and renamed the National Centre for Health Operations. The main goal of the National Centre for Health Operations is to build a national web of health safety and surveillance.

The National Centre for Health Operations comprises a Board, an Office and an Operations Centre. The Board comprises:

- the Secretary-General of the Ministry of Health and Social Solidarity;

- the President of the National Centre for Health Operations;
- three directors from the Ministry of Health and Social Solidarity;
- the President of the Hellenic Centre for Infectious Diseases Control; and
- the President of the National Centre for Emergency Care.

The Office comprises a Director and specifically trained personnel responsible for administrative issues. The Operations Centre functions 24 hours a day with the assistance of five coordinators and a number of physicians, on three eight-hour shifts per day. The Operations Centre has six major teams:

- Crisis Management Team;
- Hospital Management Team;
- Primary Health Care Coordination Team;
- Environmental Hygiene Surveillance Team;
- Health System Data Analysis Team; and
- Communication Management Team.

Team responsibilities

The Crisis Management Team:

- is responsible for handling mass-casualty incidents due to natural causes, accidents and any other human-made threat;
- coordinates all involved health-related agencies and departments in case of emergency;

- ensures the effective cooperation between the responsible bodies;
- organizes preparedness exercises;
- develops relevant guidance, plans and protocols for action during an emergency involving health casualties; and
- organizes training activities.

The Hospital Management Team:

- coordinates the daily roster of on-call hospitals in Greater Athens and the rest of the country;
- collects information daily from the hospitals on capacity and usage of hospital beds per specialty;
- focuses on the problems that arise during a hospital's general duty;
- cooperates with the National Centre for Emergency Care to provide the best medical triage, prehospital treatment and safe transport;
- communicates daily with the duty coordination team based in every hospital; and
- cooperates closely with the Crisis Management Team for coordinating the hospital response to a mass-casualty incident.

The Primary Health Care Coordination Team:

- coordinates the health care units and organizations that provide primary health care; and
- cooperates with the National Centre for Emergency Care.

The Environmental Hygiene Surveillance Team:

- analyses the risks for public health due to environmental factors;
- receives information about environmental problems or problems about flora and fauna that may be a threat to human health;
- takes responsibility for introducing the necessary measures to resolve these possible problems before they threaten human health; and
- cooperates with the Ministry of the Environment, Physical Planning and Public Works and other competent stakeholders in the area.

The Health System Data Analysis Team:

- supports the informatics system;
- takes responsibility for collecting and analysing all health system data on hospital capacity and usage;

- publishes annual reports; and
- suggests further improvements for the relevant procedures.

The Press Management Team:

- takes responsibility for dealing with the mass media and the public; and
- contacts the mass media to provide visibility for the National Centre for Health Operations.

The National Centre for Health Operations has developed several plans to improve health security, further improving the Philoctetes operational plan for the potential use of biological and chemical agents or radionuclear material; the Perseus operational plan for hospital emergency cases; the Artemis operational plan for avian influenza; and the Socrates operational plan for earthquakes and public health.

The National Centre for Health Operations cooperates with various Greek and international organizations:

- National Centre for Emergency Care;
- Hellenic Centre for Disease Control and Prevention;
- National School of Public Health;
- General Secretariat for Civil Protection;
- National Centre for Social Solidarity;
- Hellenic Police;
- Greek Army;
- Ministry of Mercantile Marine;
- World Health Organization;
- European Centre for Disease Prevention and Control;
- European Early Warning Response System; and
- Interpol (Standing Committee on Disaster Victim Identification).

The National Centre for Health Operations also operates four regional offices around Greece that support the efforts of the National Centre based in four cities (Thessaloniki, Larissa, Patras and Heraklio).

Managing mass-media communication

To effectively manage the communication to the public during the Athens 2004 Olympic Games, the Ministry of State established the Joint Information Centre, an expert communication team with representatives from all agencies involved in the organization of the Athens 2004 Olympic Games (ministries with joint responsibilities, public enterprises and organizations, the Municipality of Athens and other agencies) under the supervision of the Ministry of State and the Secretary General of Information and the Secretary General of Communication. The Joint Information Centre (or Zappeion team, as it was also called) was assigned to collect and process all facts and data from the aforementioned agencies to provide correct and accurate information.

The participation of the Ministry of Health and Social Solidarity in the communication plan of the government for the Athens 2004 Olympic Games was divided into two phases: the pre-Olympic period, from 1 June until 12 August 2004, and the Olympic period, from 13 until 29 August 2004.

The successful response of the Ministry of Health and Social Solidarity to the increased demands for communication of the specific period required the elaboration of a specific relevant plan, which was divided into three parts:

- safeguarding the correct flow of information;
- managing a possible crisis; and
- promoting positive messages.

Safeguarding the correct flow of information

The Health Coordination Command Centre was the central point of reference and was assigned the primary collection of all information on the status of the health sector.

For this purpose, the Joint Information Centre (the Zappeion team) was created in which the relevant appointed health sector representative was a journalist from the Press Office of the Ministry of Health and Social Solidarity. From the very beginning, the activities of the Health Coordination Command Centre for safeguarding information flow moved in two directions: informing all supervised health-related agencies about the need for central management of communication to the public and training the Health Coordination Command Centre staff on the protocols for notifying the Joint Information Centre so that they could assess the information and use it in the most timely, suitable and effective way.

To achieve these two targets, guidance was created for all agencies involved, and several tests were also organized, with the participation of staff from all health agencies plus law enforcement and several other agencies involved in preparing the Athens 2004 Olympic Games in experts from abroad. The results were quite satisfactory, especially during the Olympic period. During this period, the data the Health Coordination Command Centre collected

from various sources as well as the briefing of the Joint Information Centre were immediate and accurate.

Managing potential crises

Managing a potential health crisis on both the operational and communication level constituted one of the main concerns of the Health Coordination Command Centre from the beginning, since such a possibility could seriously hinder the carrying out of the Athens 2004 Olympic Games. Special importance was given to managing the potential deliberate use of biological and chemical agents or radionuclear material. All exercises for the Athens 2004 Olympic Games therefore included the management of such incidents as well as incidents with mass human casualties. The time of reaction and of informing the public plays a crucial role in managing the communication of such crises. The longer the time required, the greater the panic and the undesirable reactions that can be caused.

Promoting positive messages

The third part of the communication plan of the Ministry of Health and Social Solidarity allowed for promoting positive messages on health and health system preparedness. Such messages referred to the readiness of the health system to face health problems and crises during the crucial period of the Athens 2004 Olympic Games and to the general high standard of the health system and surveillance systems in Greece. However, because of the sensitivity that applies to the health sector in general, promoting positive messages required extra care and caution, since a potential epidemic or any other problem due to unforeseeable factors could reverse the atmosphere and exaggerate the problem.

The operation of the Joint Information Centre

The first meetings of the Joint Information Centre took place at the end of May 2004. The core team was constituted by representatives of the Ministries of Foreign Affairs, Health and Social Solidarity, Public Order, Justice, Development and Culture, the Municipality of Athens and the Athens 2004 Olympic Games Organizing Committee. By mid-June, the number of the participating agencies increased considerably, and the Joint Information Centre was installed in the Zappeion Media Centre in the historical centre of Athens, where all the necessary communication equipment was in place.

The operation of the Joint Information Centre was also divided in two phases: the period until 25 July, when its work was restricted to morning meetings and processing the existing information, and from 25 July until the end of the Olympic Games. The daily schedule of the management of communication from June to September 2004 included the following.

- All agencies participated in a morning meeting at 06:30 coordinated by the Secretary General of Information or the deputy government spokesperson. During the meeting all current issues were noted as well as those that might get publicity in the near future.
- A second meeting would follow that of the team of the Ministry of State, coordinated by the government spokesperson. In this meeting, the Government spokesperson would be briefed on all current developments, and the daily agenda was prepared about the issues that would be announced to journalists.
- From the beginning of August 2004, when the daily briefing of the Greek and international press started, the first official briefing would take place at the Main Olympic Media Centre at 10:30 and usually concerned the issues about the Olympic Games.

- For every other current issue, the Government spokesman would brief the Greek and international journalists assigned to the Zappeion Media Centre daily at 13:30.

From 25 July until 29 August, the Joint Information Centre operated on a 24-hour basis, since all agencies were in readiness at Zappeion in case an emergency needed to be dealt with.

The basic concern of the members of the Joint

Information Centre was their constant communication with the Health Coordination Command Centre to achieve a smooth flow of information to the Joint Information Centre.

The communication management of the health issues during the Athens 2004 Olympic Games represented an unprecedented experience based on both the sheer scale of the event and level of alertness and being under the constant scrutiny and attention of the national and international mass media.

CHAPTER 17

International cooperation for public health

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Introduction

The international community has long recognized that public health plays an important role in ensuring the safety and security of the global population. The meaning is clear: countries need an effective public health system to manage the risks to the health of the population and to manage emergencies of any nature, including those deriving from security threats.

The Olympic Games represent probably the largest and most complex international mass gathering event. Effective international cooperation at all levels can be an important contributor for achieving local organizational excellence and also a safety valve in political and diplomatic terms. This has significant implications for dealing with both the local and international public health consequences of natural and deliberate events.

Within the international security and public health context, there is common interest in preventing the international spread of disease. In recent decades, diseases have spread faster than ever before, aided by high-speed travel and the trade in goods and services between countries and continents. The rapid spread of disease can only be prevented if there is immediate alert and response to disease outbreaks and other incidents that could spark epidemics or spread globally. The threat of the deliberate use of biological and chemical agents, radionuclear material or explosives on the one hand and the increasing international concerns in relation to communicable

diseases (such as SARS and avian and pandemic influenza) on the other therefore create an imperative for cooperation with international agencies and bodies and countries. These needs led the World Health Assembly to adopt the revised International Health Regulations in 2005, which harmonize the various existing surveillance networks and provide an effective early warning and response system.

International cooperation for the Athens 2004 Olympic Games developed in many ways and forms and involved a wide range of formal and informal arrangements at all levels and across the spectrum of the agencies concerned. For example, there were several bilateral arrangements with reference laboratories in Europe for specific agents. Providing a detailed account of all such agreements is beyond the scope of this chapter. Here the emphasis is on the main strategic and technical aspects relating to preparedness in communicable diseases and environmental hygiene surveillance and response; the potential deliberate use of biological and chemical agents or radionuclear material; and coordinating capacity-building.

This chapter provides an overview of the context and content of the work with international partners, with a special focus on the collaboration with a public health perspective with WHO, the European Commission, NATO and a team of experts from the United States of America.

International cooperation perspectives and imperatives and the role of WHO

WHO and the International Olympic Committee signed their first collaborative agreement in May 1984 and renewed it in June 1993. The President of the International Olympic Committee addressed the Thirty-eighth and Forty-seventh World Health Assemblies as a Guest of Honour. The International Olympic Committee co-sponsored World Health Day in 1986 on the theme: Healthy Living: Everyone a Winner. The WHO and International Olympic Committee endorsement of smoke-free Olympic Games was introduced in the Calgary 1988 Winter Olympic Games and the Seoul 1988 Summer Olympic Games. Since then the Olympic Games in Barcelona (1992), Atlanta (1996), Sydney (2000) and Athens (2004) were declared Smoke-Free Summer Olympics. Nevertheless, the actual implementation of smoke-free policies ultimately concerns and depends on the host city organizing committee. Further, WHO has co-sponsored and contributed to numerous international meetings related to physical activity, sports for all and women and sport organized by the International Olympic Committee. The collaboration between WHO and the International Olympic Committee at the technical and operational level also aims at fostering effective cooperation between the public health, security and other relevant sectors in preparing and conducting the Olympic Games.

In the context of increasing global threats to health, including SARS, avian influenza and the influenza pandemic threat, travel medicine, HIV and humanitarian emergencies, the international community is considering the growing interdependence of health and security and the need to collaborate across sectors

and agencies in health to build a safer future. Threats to health security are many and varied. They include sudden shocks to health and economies from emerging diseases, humanitarian emergencies, effects of climate change or environmental degradation, the deliberate use of biological agents and other acute health risks. Tackling the health effects of these threats involves working collectively to improve preparedness and effective responses when they occur.

Eight months after the Athens 2004 Olympic Games, the international community adopted at the World Health Assembly the revised International Health Regulations, which provided an international legal framework for a global response to any public health emergency of international concern such as SARS, the threat of pandemic influenza and the deliberate use of biological and chemical agents or radionuclear material (Box 17.1). Greece's commitment to deliver safe Olympic Games became a pioneering ground for a wide range of capacities and procedures that were covered in the International Health Regulations.

In addition, through World Health Assembly resolution WHA55.16 of 18 May 2002, WHO's Member States requested the Director-General to strengthen activities on global public health preparedness and response to the deliberate use of biological and chemical agents or radionuclear material that affect health. WHO focuses exclusively on the public health aspects of preparedness and response in two main areas: (a) providing the global public health community with timely, verified information on public health emergencies of international concern and coordinating international responses and

Box 17.1**International Health Regulations**

The entry into force of the International Health Regulations (2005) on 15 June 2007 is a key milestone in public health. The International Health Regulations (2005) are the world's first legally binding agreement in the fight against public health emergencies of international concern such as those caused by new and re-emerging diseases with epidemic potential as well as those associated with incidents involving biological and chemical agents or radionuclear material.

The framework of collaboration laid out in the International Health Regulations (2005) and various existing national and international surveillance networks provides an effective early warning and response system. The timely and appropriate national alert and response to public health emergencies requires mobilizing national capacity: detecting early and unusual disease threats; to rapidly activate the verification process and technical investigation; providing timely information to everyone who needs to know, particularly for risk assessment; and setting up an appropriate and timely response. Implementing the International Health Regulations (2005) will strengthen national and collective defences coordinated by WHO against these serious risks that are increasingly transmitted internationally due to expanded global travel and commercial exchange. The main aims of the International Health Regulations (2005) are to prevent, protect against, control and respond to the international spread of disease while avoiding unnecessary interference with international traffic and trade.

The International Health Regulations work by requiring mandatory reporting by any country of a public health event of international concern identified within its national boundaries. When WHO receives an official report or rumour of an event, an investigation begins immediately and response teams are deployed as necessary through systems such as the Global Outbreak Alert and Response Network.

(b) providing technical advice and support to Member States on preparing their health systems for responding to the potential deliberate use of biological and chemical agents or radionuclear material (1,2).

The Organisation for the Prohibition of Chemical Weapons has primary responsibility for international preparedness for and response to the deliberate use of chemical agents and the International Atomic Energy Agency for radionuclear material. The international community looks to WHO for assistance and advice to mitigate the public health effects of the deliberate use of biological agents that affect health. Any of the security-related dimensions of the deliberate use of biological agents are plainly outside the public health mandate of WHO.

The Athens 2004 Olympic Games provided a unique large-scale example of a nation's efforts to deal with the political, resource, organizational, logistical and psychological implications of preparedness for and response to incidents involving the potential inadvertent release or deliberate use of biological and chemical agents or radionuclear material. This

combined with the challenging tasks of addressing the conventional aspects of public health preparedness for the Athens 2004 Olympic Games, such as communicable disease surveillance and environmental management provided the basis for partnership between the Ministry of Health and Social Solidarity in Greece and WHO, both the Regional Office for Europe and globally.

WHO, the European Commission, NATO and the Government of the United States of America all played key roles in the public health preparedness for the Athens 2004 Olympic Games. Several missions from the WHO Regional Office for Europe and WHO headquarters, the European Commission, the United States Centers for Disease Control and Prevention and the Office of the United States Secretary of Health and Human Services organized and participated in fact-finding, assessment exercises, official and unofficial consultations and extensive training events. Experts from outside Greece took part in exchange visits, drills and last but not least supported and advised in person during the Athens 2004 Olympic and Paralympic Games.

The international response to a potential disease outbreak (either natural or human-made) begins when the country verifies a public health emergency of international concern. The country and WHO usually conduct a joint risk assessment that helps to assess the humanitarian consequences, the potential impact on international travel and trade and the

need for international support within the framework of the revised International Health Regulations. The country may request GOARN through WHO to provide international technical expertise and capacity, support in risk communication and information management, diagnostic tests and reagents, other supplies and operational assistance.

Cooperation with WHO

In December 2003, the WHO Regional Office for Europe seconded a senior staff member to Greece's Ministry of Health and Social Solidarity for one year to support the public health preparations and to coordinate the international public health support to the Ministry of Health and Social Solidarity for the Athens 2004 Olympic Games. In addition, WHO headquarters provided technical support to the Ministry of Health and Social Solidarity and Hellenic Centre for Infectious Diseases Control. In order for the WHO staff member to be effective in his role, he assumed the roles of chair of the National Board of Public Health; associate deputy chair of the Health

Coordination Command Centre and coordinator of the WHO and United States advisers team. This was the first time that WHO provided staff and invested resources and energy to support the full range of the preparedness phase of a mass-gathering event such as the Olympic Games. Box 17.2 shows in chronological sequence the most important activities that were implemented in the context of the collaboration between WHO and the Ministry of Health and Social Solidarity. The cooperation included local technical support before and during the Athens 2004 Olympic and Paralympic Games (Box 17.3) and linking with WHO's JW Lee Centre for Strategic Health



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WHO's JW Lee Centre for Strategic Health Operations

Operations (Box 17.4), which began to operate in July 2004, as well as with the Global Outbreak Alert and Response Network (Box 17.5) mechanism (3–7).

During the Athens 2004 Olympic and Paralympic Games, the WHO team in Athens prepared a short confidential daily report (Annex 2 shows examples of these reports) that summarized the overall public health situation in Greece during the Athens 2004 Olympic Games, important events and action taken by Greece's authorities to address them. The report was sent to the WHO Regional Office for Europe

and WHO headquarters.

While memories and impressions were still fresh in everybody's head, the first scientific debriefing on the health sector experience was organized on 30 August 2004 (one day after the Olympic Games ended). This evaluation meeting was organized with the following three objectives: to discuss the health sector experience during the Athens 2004 Olympic Games; to offer recommendations and suggestions for future work (short and long-term) and to assist with priority-setting for the future.

Box 17.2

Overview of the activities of WHO and the Ministry of Health and Social Solidarity for the Athens 2004 Olympic Games

December 2003

The WHO Regional Office for Europe seconds Agis D. Tsouros to Greece's Ministry of Health and Social Solidarity for one year to advise on public health preparedness for the Athens 2004 Olympic Games and to coordinate international technical support for the Ministry of Health and Social Solidarity.

February 2004

The first WHO assessment mission to Athens takes place to review preparedness in surveillance and response as well as preparedness for natural and human-made events of public health interest. The mission included Bernadus Ganter (Communicable Diseases Unit, WHO Regional Office for Europe), Denis Coulombier (Communicable Diseases Unit, WHO Office for National Epidemic Preparedness and Response) and Maurizio Barbeschi and Ottorino Cosivi (Preparedness for Deliberate Epidemics Unit, WHO headquarters). Detailed recommendations were issued on the need for epidemic intelligence, standard operating procedures on most activities, the computerization and analysis of surveillance data, the automated detection of alerts and production of daily epidemiological bulletins during the Athens 2004 Olympic Games. The recommendations also identified weaknesses and gaps in specific areas of preparedness for incidents involving biological and chemical agents or radionuclear material, including the risk assessment processes, planning for mass casualties and mass prophylaxis delivery, sharing, communicating and understanding intelligence and working effectively with security, law enforcement and civil defence agencies. Annex 1 shows the standard operating procedures for signals and reports for verifying events used in Greece developed with the assistance of the WHO team.

March 2004

Maurizio Barbeschi and Ottorino Cosivi participated as advisers to the Health Coordination Command Centre in the major Hercules Shield exercise (see Chapter 6).

April 2004

Eleni Kalamara, a statistician from the Hellenic Centre for Infectious Diseases Control, visited the WHO Office for National Epidemic Preparedness and Response to develop a relational database with the support of the WHO Office.

May 2004

Johannes Schnitzler from the WHO Office for National Epidemic Preparedness and Response was assigned to Greece to assist in developing a computer application integrating data from the specific surveillance systems for the Athens 2004 Olympic Games, allowing automated analysis including signal generation, applying different algorithms for detection of outbreaks and automated report generation supporting decision-making and feedback.

Box 17.2 (cont.)**May 2004**

The Hellenic Centre for Infectious Diseases Control organized a meeting to review the progress in developing communicable diseases surveillance for the Athens 2004 Olympic Games. Participants included experts from other countries with experience in athletic mass gathering events (including the Atlanta (1996), Salt Lake City (2002) and Sydney (2000) Olympics, the 1998 FIFA World Cup in Paris), the European Commission and WHO. Invited were also public health representatives from European countries with upcoming events (Portugal (2004 UEFA European Football Championship), Torino (2006 Winter Olympics) and Germany (2006 FIFA World Cup)). The meeting was chaired by Christopher Bartlett, who was seconded from the Centre for Infectious Disease Epidemiology at University College London, United Kingdom to provide advice on surveillance and response matters to the Hellenic Centre for Infectious Diseases Control during the weeks leading up to and during the Olympic Games. He was the liaison with the United Kingdom Health Protection Agency.

July 2004

WHO and Greece's Ministry of Health and Social Solidarity signed a memorandum of understanding (Box 17.3) for support in an emergency situation and cooperation with the WHO Alert and Response Operations team.

August 2004

Johannes Schnitzler and Denis Coulombier were assigned as external experts to the Hellenic Centre for Infectious Diseases Control and Maurizio Barbeschi was assigned to the Health Coordination Command Centre during the period of the Athens 2004 Olympic Games.

First evaluation debriefing on the experience and response of the health sector during the Athens 2004 Olympic Games. This was a joint exercise between all the main health sector stakeholders in Greece and the experts from WHO and the United States.

Box 17.3**Content of the memorandum of understanding between Greece's Ministry of Health and Social Solidarity and WHO for the Athens 2004 Olympic Games**

WHO provided Greece's authorities relevant daily information through the Daily Global Outbreak List. WHO further provided a 24-hour contact system with access to WHO-wide expertise.

WHO would provide a field team of epidemiologists (if requested by the Ministry of Health and Social Solidarity) through the Global Outbreak Alert and Response Network (GOARN) to assist the Ministry in dealing with a natural accident. The experts would be selected from a list of experts (including their curricula vitae) made available to Greece's authorities, with the field team being deployed within 24 hours. The team would work under the command of the Health Coordination Command Centre for the Athens 2004 Olympic Games and in close cooperation with the Hellenic Centre for Infectious Diseases Control.

In parallel, the Government of Greece reserved the right to request assistance from other countries (on a bilateral basis) or international entities (such as the EU). Smallpox vaccines from WHO's strategic reserve could be made available to the Government of Greece on request.

WHO could set up a 24-hour telephone conferencing system with pin-code access to allow the Health Coordination Command Centre to organize telephone conferences with experts from around the world.

WHO could deploy to Greece within 24 hours, on request, risk communication experts on a risk communication team. The terms of selection and deployment would be similar to those relating to the field team.

The Ministry provided WHO with a list of contacts at the Health Coordination Command Centre and the Hellenic Centre for Infectious Diseases Control.

The agreement was operational from 7 to 30 August 2004 and from 10 to 30 September 2004.

Box 17.4**The WHO JW Lee Centre for Strategic Health Operations**

The JW Lee Centre for Strategic Health Operations is the nerve centre of WHO's global epidemic response, providing a single point of coordination for response to acute public health crises including infectious disease outbreaks, natural disasters and chemical emergencies. It is the hub of alert and response operations, combining the latest in information and communication technologies to support field operations and facilitate collaboration with Member States and technical partners in external networks such as the Global Outbreak Alert and Response Network.

The JW Lee Centre for Strategic Health Operations was commissioned in July 2004, and its first task was to be the operational interface of the Health Coordination Command Centre under the Ministry of Health and Social Solidarity at the international level. Later it was used to assist with emergency coordination during the tsunami disaster of December 2004. In March 2005, the JW Lee Centre for Strategic Health Operations was again deployed to support the coordination of WHO's response to an outbreak of Marburg haemorrhagic fever in Angola. In late 2005 the Centre coordinated the international medical response to Hurricane Katrina and to the earthquake in Pakistan. The JW Lee Centre for Strategic Health Operations also participates in global pandemic preparedness exercises and provides technical advice to WHO regional offices, specialized agencies of the United Nations and other international organizations in designing and constructing emergency operation centres.

Box 17.5**Global Outbreak Alert and Response Network (GOARN)**

WHO has a key role in rapidly identifying, confirming, assessing risks and responding effectively to outbreaks of international public health importance. WHO implemented this mandate in supporting the Ministry of Health and Social Solidarity (see Box 17.3) during the preparation and conduct of the Athens 2004 Olympic Games. During the period of the Athens 2004 Olympic Games, the GOARN (3–7) mechanism was put in pre-alert state to provide technical support or assist in other demands potentially coming from Greece's public health authorities.

International outbreak response teams – of experts from WHO and GOARN – are assembled and mobilized to assist countries where serious outbreaks are occurring and to support national health authorities in carrying out coordinated and effective outbreak control activities. WHO/GOARN teams provide multidisciplinary expertise in social mobilization, epidemiology, clinical diagnosis and management, infection control, laboratory work, veterinary public health, influenza virology, operational coordination and logistics, outbreak communication and field information management. The teams provided advice on field investigation kits, personal protective equipment, the use of antiviral agents and vaccines, stockpile management, laboratories science, supplies, reagents and diagnostic kits and protocols and equipment for international sample transport.

Since 2000, WHO/GOARN has responded to more than 150 outbreaks of international concern, including more than 36 outbreaks worldwide from 2000 to 2004. The SARS outbreak of 2003 was the first time GOARN teams responded to an outbreak of an unknown infectious disease. The first six months of 2006 witnessed the unprecedented spread of avian influenza, with heightened concern about the potential risk of a human influenza pandemic: the number of field missions exceeded the total of missions in 2005. WHO mobilized more than 70 operational interventions in response to avian influenza.

Cooperation with the European Commission

The Government of Greece sought assistance from the public health services of other EU countries in organizing a mass-gathering event of the magnitude of the summer Olympic Games. After the events of 11 September 2001 in the United States, the European Commission developed and tried to implement an EU programme on health security (8,9), which called for various activities to enhance preparedness against the deliberate use of biological or chemical agents in the EU (then 15 countries). A core component of this preparedness was the creation of the Health Security Committee, comprising high-level representatives from the health ministries nominated by the health ministers of the 15 EU countries. This Committee supervised a 15-member Task Force on Bioterrorism, which was created by using Commission personnel as well as seconding national experts from various EU countries to the Commission services (10,11).

The Hellenic Centre for Infectious Diseases Control seconded a member of its staff to the European Commission for 18 months to work for the EU programme on health security in the Task Force on Bioterrorism. This enabled Greece's public health services to take advantage of the various activities at the EU level and to participate actively in exchanging information and experience on planning, equipment and training at this level regarding the specific issues involved in managing incidents involving the potential deliberate use of biological and chemical agents or radionuclear material. One of the first activities that assisted Greece's planning significantly is the agreement on a list of very-high-threat biological agents, which the Task Force on Bioterrorism developed by using a matrix with multiple variables created and modified specifically for the EU countries (12).

The active participation of the Hellenic Centre for Infectious Diseases Control in the EU Health Security Committee meetings and European Commission intervention allowed for the formation of official collaborative agreements with the Governments of the United Kingdom and Germany on training and laboratory testing. Greece does not have a Biosafety Level 4 laboratory and therefore cannot culture certain Biosafety Level 4 pathogens (smallpox and certain viruses causing viral haemorrhagic fevers), which would be needed both as confirmation and to cover the forensic needs of the potential deliberate use of biological agents at the Athens 2004 Olympic Games. Thus, the Hellenic Centre for Infectious Diseases Control signed official bilateral contracts of collaboration with the United Kingdom Health Protection Agency and the Bernard Nocht Institute for Tropical Medicine in Germany, which, even if this was not unknown in Europe, was achieved for the first time for this type of mass-gathering event. These agreements were complemented with multiple training activities for the participating laboratory personnel as well as the development of specific memoranda of understanding for the testing and transport of the anticipated samples, the exchange of information, diagnostic methods and reference strains and the execution of a quality control exercise for Greece's laboratories and a specimen transport exercise from Athens to the United Kingdom in spring 2004. This official collaboration of microbiological laboratories followed the example of other EU countries (Scandinavian countries), but at the European level it was the first to happen for a fixed period of time around a mass-gathering event, with specific on-call clauses for the collaborating laboratory. Other EU countries organizing mass gatherings of various kinds have followed Greece's example, and the original contract

formats are available to EU countries via the European Commission as reference material. The laboratory collaboration is continuing at the EU level with common external quality assurance exercises.

Various members of the Hellenic Centre for Infectious Diseases Control staff participated in various meetings of various working groups under the Health Security Committee (Working Group on Smallpox Planning, Working Group on Chemical Threats, Working Group on Biological Incident Sampling and others) (13,14). These activities enabled the public health authorities in Greece to incorporate advice and material from other EU countries into their plans, such as the smallpox management plan. During the production of educational and information material for health professionals in Greece, the Hellenic Centre for Infectious Diseases Control

staff used the relevant material produced by the Task Force on Bioterrorism (15–24) as valuable reference material. The public health staff in Greece participated in many training activities at the European level, such as the European Programme for Intervention Epidemiology Training and the first forensic epidemiology course.

Lastly, during the Olympic period, the European Commission made available to Greece's public health services the Internet search engines that preceded the Medical Intelligence System (MedISys) and all the European Commission alert systems (Early Warning and Response System (EWRS) and rapid alert system for biological and chemical agent attacks (RAS-BICHAT)) (25). The search engines were loaded with relevant keywords, and multiple articles were forwarded daily to the Hellenic Centre for Infectious Diseases Control.

Support from the United States Government

The first mission from the United States Government took place in February 2003 where the United States Department of State sponsored a team to present lessons learned from the 2002 Salt Lake City Winter Olympics. During the next 18 months, the United States Government conducted five additional missions to Greece to support Greece's Olympic planning efforts. Table 17.1 shows the frequency and the extent of United States Government support to Greece.

In September 2003, at the request of the Government of Greece, a 23-member United States Government interagency consequence management capability survey team undertook a comprehensive survey of the preparations for responding to the potential deliberate use of biological and chemical

agents or radionuclear material at the Athens 2004 Olympic Games. The objectives were to identify gaps, make recommendations and determine what type of assistance the Government of Greece could request from the international community and how to integrate it. The 100-page report confidential from the mission found that the Government of Greece had a strategic plan for responding to an incident involving the potential inadvertent release or deliberate use of biological and chemical agents or radionuclear material during the Athens 2004 Olympic Games and that several supporting operational plans were in the process of being completed or disseminated. Most recommendations involved command, control and coordination; training and exercises; and operational response. The prevailing feeling among many Greek planners at the time was that an

Table 17.1

Timeline of consultation and training activities in Greece organized by United States Government interagency teams

When	Who and from where	Activities	Outcome
February 2003	United States Department of State Office of the Coordinator for Counterterrorism lead interagency team	Workshop I	Presented plan for Salt Lake City 2002 Olympics from a law enforcement perspective One small component was health and medical issues Planned Workshop II, where the Government of Greece would present its plan for potential incidents involving biological and chemical agents or radionuclear material
September 2003	United States Department of State Foreign Consequence Management lead interagency team	Reviewed the Government of Greece's plan for potential incidents involving biological and chemical agents or radionuclear material and assessed consequence management capability	A 100-page report with recommendations Greater focus on health and medical issues and involvement of the Ministry of Health and Social Solidarity Established informal collaboration and information-sharing
September 2003	United States Department of State Office of the Coordinator for Counterterrorism lead interagency team	Workshop II	Various agencies of the Government of Greece presented their role in the newly developed plan for potential incidents involving biological and chemical agents or radionuclear material Continued meetings regarding health and medical issues from a law enforcement or military perspective
March 2004	United States Department of Defense sponsored a field exercise called Silent Guide followed by a consequence management exercise Agile Response in collaboration with the Ministry of Public Order exercise called Hercules Shield	Consulted with newly developed Health Coordination Command Centre Collaboration regarding procedures and relationship with United States Embassy in Greece Collaboration with the Ministry of Public Order, Ministry of the Interior, Public Administration and Decentralization, General Secretariat for Civil Protection, etc.	Reports developed afterwards by the Government of Greece
April 2004	United States Department of Health and Human Services and Department of State Foreign Consequence Management lead interagency medical planning team	Conducted weeklong operational planning seminar Provided draft outlines in advance The team was divided into subgroups to work with Greek counterparts in developing five plans: concept of operations for the Health Coordination Command Centre; mass casualties; mass dispensing and prophylaxis; risk communication; and isolation and quarantine	Draft plans in both Greek and English Closing seminar outlining accomplishments and the next steps Charge for groups to continue to meet to complete plans

Table 17.1 (cont.)

When	Who and from where	Activities	Outcome
May 2004	Visit to United States by Agis D. Tsouros, WHO official seconded to the Ministry of Health and Social Solidarity as Public Health Policy Adviser and coordinator of the External Experts Team for the Athens 2004 Olympic Games	Met with representatives from the Greater New York Hospital Association Met with representatives from the United States Department of Health and Human Services, primarily from the Office of the Assistant Secretary for Public Health Emergency Preparedness (now Office of the Assistant Secretary for Preparedness and Response)	Greater New York Hospital Association: discussed lessons learned from the events of 11 September 2001 and participated in an exercise of the Health Emergency Response Data System (HERDS) United States Department of Health and Human Services: tour of the Operations Center; discussion of standard operating procedures, videoconference with the United States Centers for Disease Control and Prevention and WHO, meeting with operations staff, demonstration of the Hospital Asset Reporting and Tracking System (HARTS) and offer to share the HARTS system
June 2004	United States Department of State Office of the Coordinator for Counterterrorism lead interagency team	Workshop III	Tabletop exercise conducted by representatives from the Government of Greece United States team served as observers Greater participation of the Ministry of Health and Social Solidarity Demonstrated implementation of Greece's plan for potential incidents involving biological and chemical agents or radionuclear material
August 2004	United States Department of State Foreign Consequence Management lead Consequence Management Support team	Deployed to Athens throughout Athens 2004 Olympic Games	Participated in Hellenic Centre for Infectious Diseases Control meetings and provided consultation regarding surveillance activities and signals Assisted with developing standardized procedures for responding to signals Provided consultation regarding suspicious substances Provided consultation regarding laboratory issues Received briefings from Health Coordination Command Centre representative Saw demonstration of the newly developed HARTS Participated in inspections of cruise ships Provided liaison with United States Embassy in Greece Collaborated with colleagues from WHO and the United Kingdom



International cooperation made a significant difference in the public health preparations for the Athens 2004 Olympic Games. Front row (from left to right): Michalis Alevizos, Konstantinos Gkogkosis, Vasiliki Rigatou, Vana Tiraidi, Anna Tsekoura, Nicki Pesik, Johannes Schnitzler, Olga Daligarou, Marina Tsoumani and Anastasia Zigoura. Back row (from left to right): Athina Kirlessi, Panos A. Efstathiou, Dan Dodgen, Nikitas Kaklamanis (Minister of Health and Social Solidarity at that time), Ann Knebel, Tracee Treadwell, Christopher Bartlett, Agis D. Tsouros and George Saroglou.

incident involving the potential inadvertent release or deliberate use of biological and chemical agents or radionuclear material was unlikely and it therefore appeared there was no sense of urgency to complete preparedness in this area. The consequence management capability survey team felt that Greece's special operations security plan lacked adequate guidance for responding to events designed to cause mass casualties (more than 1000 victims) or massive damage that may exceed the capabilities of the response and support infrastructures.

In March 2004, the newly established Health Coordination Command Centre participated in a United States Department of Defense exercise known as Agile Response that was held in Greece to test the plans that had been developed. Representatives from the United States Department of State and Department of Health and Human Services served

as consultants during the exercise and participated in developing the recommendations for improvements.

To help address the recommendations of the initial survey team and the Agile Response exercise, in April 2004 the United States Department of Health and Human Services sent a team of public health and emergency response experts to Athens for a joint session on preparations for the Athens 2004 Olympic Games sponsored by the Ministry of Health and Social Solidarity and Ministry of Public Order. The week-long session was organized around a series of training and operational planning exercises on issues such as command and control for the health sector, mass casualties and prophylaxis, quarantine and crisis communication. Officials from Greece and the United States worked collaboratively to develop specific operational plans that drew on outlines provided by the United States officials. The

exchange of ideas and collaborative planning contributed to the emergency preparedness planning for the Athens 2004 Olympic Games (Annex 4).

Finally, the United States Centers for Disease Control and Prevention and the Office of Public Health Emergency Preparedness of the United States Department of Health and Human Services deployed a team of six professionals to Greece during the Athens 2004 Olympic Games, who acted as advisers to the Hellenic Centre for Infectious Diseases Control and the Health Coordination Command Centre. The team also included an expert from the

United States Centers for Disease Control and Prevention on vessel sanitation who worked closely with the sanitary engineering and environmental hygiene teams based at the National School of Public Health. The advisers from the United States worked very closely with the WHO experts and were fully involved in the first scientific debriefing on 30 August. The extensive cooperation between the Governments of the United States and Greece in preparing for the Athens 2004 Olympic Games demonstrates how governments can work together to share experiences when preparing for large international mass-gathering events.

The Olympic Advisory Group of countries and the role of NATO

The Government of Greece was responsible for the security of the Athens 2004 Olympic Games. The Government of Greece engaged several countries bilaterally for various types of assistance, based mainly on their former experience with the deliberate use of explosives, biological and chemical agents or radionuclear material. Thus the Olympic Advisory Group was created, which included Australia, France, Israel, the Russian Federation, Spain, the United Kingdom and the United States. One of the major activities of this Group was participating in the Olympic Guardian II exercise involving top-level politicians and officials (see Chapter 6).

Greece requested the support of NATO through the Euro-Atlantic Disaster Response Coordination Centre and the Division of Security Investment, Logistics and Civil Emergency Planning. In this context, Greece submitted an official request for assistance to NATO countries, with a table of require-

ments for international assistance related to crisis situations with mass casualties and/or deliberate events. The list included several items under the following headings: prevention, detection and early identification of biological and chemical agents or radionuclear material; incident response and decontamination; epidemiological surveillance; national stockpile (especially related to smallpox vaccine and vaccinia immunoglobulin); psychological support and communication in case of a crisis or mass-casualty incident; and rescue teams and specialized equipment to deal with natural and human-made hazards. Eventually NATO submitted to the Ministry of Health and Social Solidarity a list of resources countries made available. The NATO Multinational Chemical, Biological, Radiological and Nuclear Defence Battalion including trained teams from Belgium, the Czech Republic, Hungary, Poland and the United States was also deployed to Greece to support operations in case of an incident involving the potential deliberate use of

biological agents and to link up with the national laboratory network for the response to the potential

deliberate use of biological agents (ARES; see Chapter 6).

Conclusion

This chapter emphasized the imperative and the added value of international cooperation regarding the public health considerations of mass gatherings. Greece's experience in this respect was very positive. It was a learning experience and it was a giving and taking experience for all parties involved. The Athens 2004 Olympic Games provided the innovative testing ground and the opportunity to introduce and integrate advanced public health preparedness

and response processes and systems. International cooperation in this context often meant sharing sensitive and confidential strategic and technical information as well as being proactive but also fully respectful of the expectations and sensitivities of the host country. Finally, international cooperation prior to and during the Athens 2004 Olympic Games was a constant source of legitimacy for action and reassurance.

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CHAPTER 18

The Athens 2004 Olympic Games and public health: main conclusions and lessons learned

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The scientific literature on public health preparedness often reports on and makes recommendations from complex experiences and events and gives a skewed impression of reality that is almost too good to be true. Checklists and diagrams of planning and management and evaluation processes may not adequately capture the political and organizational context or explain the critical factors that influenced the course of events and outcomes in a given situation. The most precious knowledge may be hidden in stories that some people would rather not share publicly or may have difficulty in communicating. Nevertheless, depicting reality in detail may be too complicated and incomprehensible to the distant keen observer. To use an analogy, few people are interested in or can make sense of the complex electronic diagram of a recently purchased music amplifier, but they certainly want to learn how to regulate the knobs. Knowing the critical knobs in an action plan, understanding their relative importance and knowing how to use them to achieve the desired results are essential aspects of the preparedness process. This chapter identifies and discusses the critical factors, and preconditions for success, and the main lessons learned, drawing on the collective experience and insights of those responsible for addressing the public health and health care aspects of the Athens 2004 Olympic Games.

Critical factors include having a clear vision and a good strategic overview at the outset of what needs to be achieved and an understanding of the overall implications for policy, organization and capacity. One person is unlikely to have this broad overview; this should be the task of a working group of carefully selected senior officials from different disciplines and key sectors. Developing such a common vision and understanding can be difficult but extremely helpful before asking different agencies to produce detailed proposals and plans. At this stage, reviewing the scientific and grey literature on mass gatherings and public health is essential. Learning from other people's successes and mistakes is also important.

Organizers of past mass gatherings should be invited for a group consultation.

Complexity and uncertainty are perhaps the two most constant elements underlying all aspects of preparedness work. Complexity in this context applies to the methods and techniques (such as surveillance systems and environmental management), systems and organizational context (such as competencies, capacity and coordination) and people and politics. Uncertainty results from national or international developments that can significantly influence the initial planning assumptions. The events of 11 September 2001, for example, changed dramatically the perception of the vulnerability of the Athens 2004 Olympic Games, as did the Madrid train bombings and consequent preparedness action to ensure safety. Further, a change of government in Greece in March 2004, five months before the Olympic Games and at the most intense stage of preparations also had major implications in terms of people in leading positions and approaches to important aspects of public health preparedness. The next key elements are related to getting things done: political will, leadership, partnerships and the ability to unify command.

The monumental task of preparing the health sector for a mass gathering of the scale and nature of the Olympic Games and looking at it from above or from below can produce an overwhelming or even numbing feeling. Strengthening existing processes to deal with increased demand, introducing new methods and procedures, ensuring synergy and coordinating within and between different agencies are more easily said than done. How can potentially competing agencies at different levels (and under the jurisdiction of different ministries and authorities) with overlapping remits and legal competencies be persuaded to work together and complement each other on routine tasks? How can they be coached to respond in a coherent and coordinated manner if there is a crisis? How can cynicism and inertia about the risk of incidents involving the potential deliberate use of

biological and chemical agents or radionuclear material be overcome and addressed with appropriate preparedness and response planning? How is it decided what is appropriate to do and when enough is done? What is the role of the international community in this context? These are not theoretical questions, nor are they purely technical, strategic or political questions. They combine all these elements.

Strong and consistent political leadership proved critical in addressing the above questions and giving the right signal to all the main actors in 2004. It helped to remove ambiguous and ambivalent feelings about what needed to be done, especially with regard to partnership-based work and preparedness for incidents involving the potential deliberate use of biological and chemical agents or radionuclear material. Moreover, in the months leading up to the Olympic Games, a growing sense of national pride and enthusiasm by administrators and professionals across sectors and agencies removed many obstacles and generated a strong spirit of cooperation. This was a true interagency "Olympic truce" that left behind a palpable sense of how much can be achieved when there is good will and an inspiring common cause in the aftermath of the Olympic Games.

But even in the most disciplined and coordinated systems, the public health planning and response demands of a mega-event such as the Olympic Games and the logistic and operational challenges of responding to a public health or health care emergency or an incident involving the potential deliberate use of biological and chemical agents or radionuclear material require an effective unified coordination and command mechanism. For events extending over many days and held in different locations, such as the Olympics, providing public health services and health care involves extensive coordination.

Establishing the Health Coordination Command Centre for the Athens 2004 Olympic Games involved strong leadership, courage and innovation.

The Health Coordination Command Centre directly linked to the authority of the Minister of Health and Social Solidarity became the central instrument for directing and coordinating the entire health sector before and during the Olympic Games. It was a concept and a function that challenged the status quo and introduced completely new ways of linking up to and working with health sector facilities and agencies. The Health Coordination Command Centre is without doubt one of the most successful and visible legacies of the Olympic Games in health and one that has proved crucial in responding to emergencies such as avian influenza and natural and human-made disasters in the country.

Within the international landscape surrounding the Olympic Games, outbreaks have become a much larger menace than they were just three decades ago, for two main reasons. First, new and re-emerging diseases are growing in unprecedented numbers. From 1973 to 2003, when SARS appeared, 39 new pathogens capable of causing human disease were identified: Ebola virus, HIV, the organisms responsible for toxic shock syndrome and Legionnaire's disease, new forms of epidemic cholera and meningitis, hantavirus, Hendra virus, Nipah virus and H5NI avian influenza are just a few examples. Second, the invasive and disruptive power of outbreaks is multiplying. An outbreak in any part of the world can quickly ricochet throughout the globe: Airlines now carry almost 2 billion passengers a year, and the SARS epidemic showed how quickly a new disease can spread along the routes of international air travel. Financial markets are closely entangled, and most assembly lines use global sourcing and just-in-time production. SARS clearly showed the serious economic effects of an international epidemic. Finally, communication and electronic interconnectedness spreads fear just as far and just as fast.

This book contains a wealth of technical and practical information on all public health and health care aspects of the Athens 2004 Olympic Games that can

be useful to organizers of mass gatherings. Mass gatherings differ. The literature suggests that variables associated with increased health service encounters at mass gatherings include weather conditions, type of event, duration, age of participants and spectators, national or international event, crowd mood and density, attendance, the threat of the deliberate use of explosives, biological and chemical agents or radionuclear material and alcohol and drug use.

For the Athens 2004 Olympic Games, the challenge was to ensure the provision of adequate and high-quality emergency, ambulatory and hospital care; high hygienic standards in food outlets, hotels, cruise ships and recreation areas; protection from heat-related problems; capacity to prevent, investigate and deal with communicable disease incidents; capacity to deal with natural catastrophes such as an earthquake; and the ability to prevent, detect and respond to incidents involving the potential deliberate use of biological and chemical agents or radionuclear material.

Even routine public health problems (such as a few cases of gastroenteritis) during mass gatherings such as the Olympic Games draw extraordinary international mass-media attention both in the days before and during the Olympic Games. This increases the vulnerability of the event, artificially increasing the size of the problem and exacerbating the efforts to control it.

For the agencies involved, preparing for the Athens 2004 Olympic Games meant enhancing existing systems as well as introducing new systems. One strong incentive for them was the opportunity to address longstanding needs and deficits and to introduce and test innovative mechanisms and practices. Despite the scientific and technical hurdles in developing new surveillance algorithms, standard operating procedures and protocols, systems for environmental management and for monitoring hospital assets, templates for responding to incidents involving the potential deliberate use of biological and chemical

agents or radionuclear material and plans for mass casualties and mass prophylaxis, the true challenge was putting all these mechanisms into practice. This required extensive sensitization and training of health professionals (physicians, nurses and administrators) and capacity-building work. This is where intersectoral partnerships proved valuable and important. Nevertheless, the vitally important factors in the good functioning of the public health system during the Olympic Games were discipline with systematic and regular reporting, compliance with agreed procedures and inspection recommendations, effective coordination and continuous testing and exercises.

The various chapters of this book describe the outcomes of the diverse and innovative work of the agencies involved in detail. These achievements include the following.

- Surveillance systems (including the creation of a new syndromic surveillance system) were enhanced. The Hellenic Centre for Infectious Diseases Control extensively validated data, daily analysis and report preparation was automated and the standard procedures were implemented for interpreting data and deciding on necessary measures. These measures allowed staff to have a timely, valid and meaningful picture of morbidity trends oriented towards public health action. The whole experience created significant expertise among the staff of the Hellenic Centre for Infectious Diseases Control.
- An active, integrated environmental health surveillance system was developed that was more comprehensive than systems applied during previous Olympic Games. The system monitored and prevented exposure to environmental hazards by standardizing, computerizing and electronically transmitting data on the environmental inspection of 17 site categories of public health interest, water quality monitoring and corrective actions.

- The entire emergency services system was extensively improved, not only for future mass gatherings that would be held in Greece but also other demanding and extreme events including situations involving mass casualties.
- The hospital preparedness work involved intensive training of various groups of staff for managing incidents involving the potential deliberate use of biological and chemical agents or radionuclear material and other public health emergencies. This led to learning new skills, team-building in hospitals and emergency medical services and operating at high alertness levels.
- The Health Coordination Command Centre was established to monitor the health situation in Greece and to coordinate health sector action and planning and preparedness for incidents involving the potential deliberate use of biological and chemical agents or radionuclear material. The Health Coordination Command Centre represents one of the most successful legacies of the Athens 2004 Olympic Games and was sustained and further developed.
- The Olympic Village Polyclinic was created with state-of-the-art diagnostic, treatment, physical therapy and rehabilitation services. After the Olympics, it became a model primary care centre.
- The Olympic Games were smoke-free.

All the agencies involved consistently indicated that planning and implementation should have started much earlier (one to two years at least) to allow enough time to test and refine systems and to systematically address the problems that hamper teamwork and cooperation between agencies at all levels.

Further, a long-term perspective is essential for the sustainability of this tremendous investment in time, energy and resources. Strengthening standard operating procedures and improving communication, coordination and the sharing of data across components of the health sector and other ministries require continuing effort and investment. The inten-

sive and advanced type of hospital preparedness undertaken for the Olympic Games will reap benefits for any type of disaster, including the deliberate use of explosives, biological and chemical agents or radionuclear material, an earthquake or an influenza pandemic. However, preparedness plans must be continuously updated and further developed and regular drills conducted to test preparedness.

One aspect of the Athens 2004 Olympic Games that was not fully developed is the health promotion potential of the games. Future mass gatherings should consider not only starting to address this aspect early but also assigning this task to a professional committee that will not have to deal with any other aspects of public health preparedness and dedicating adequate funding for this purpose.

Public health preparedness processes for the Olympic Games and other mass gatherings should be sensitive and conscious to issues of equity and the needs of vulnerable groups. This includes ensuring easy access for everyone to appropriate services, support and barrier-free physical environments. It also means addressing the special needs and expectations of people relating to gender, religion and dietary habits. In this regard, the Paralympic Games constitute a shining example of equal opportunity, and this has implications for every aspect of the organization of the Games, including access to public places, sports facilities, access to appropriate health care services and support for athletes and spectators with disabilities.

The experience of the Athens 2004 Olympic Games was perhaps unique in its wholeness and context. It integrated technical, managerial and policy information. In the strict sense of the term, the preparedness work and activities of the many actors involved in the public health aspects of the Athens 2004 Olympic Games have not been systematically evaluated. There is detailed evidence of what was done and information on what happened and how the



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Greece has been very active in sharing and passing on the experience of the Athens 2004 Olympic Games. The photo was taken when Greece's Minister of Health and Social Solidarity, Dimitris L. Avramopoulos, the Secretary-General of the Ministry of Health and Social Solidarity, Aristidis Kalogeropoulos-Stratis, and other officials from the Ministry of Health and Social Solidarity met members and staff of the Beijing Olympic Games Organizing Committee during their visit in Beijing in September 2006.

system responded. Systems functioned well and met their intended purpose. Some systems in place were not tested or proven enough given that, fortunately, no major public health or health care emergency occurred during the Olympic Games. The systems did function well in investigating several false alarms such as “suspicious powder” incidents. In general, the lack of rigorous risk assessment (most reports are descriptive and anecdotal) hampers the ability to make firm recommendations, and the knowledge base would benefit if future descriptions of mass gatherings used greater rigour and some uniformity in reporting format. There are very few scientific data to provide an evidence base for public health aspects of mass gatherings. However, this book has comprehensively described the public health work for the Athens Olympics and thereby provides a source of knowledge and insight that can be deconstructed and reconstructed to compare with other similar experiences and help in planning future mass gatherings.

Finally, based on the experience of the Athens 2004 Olympic Games, the following general remarks on strategy are relevant for the organization of other mass gatherings.

- Everybody's business: the Olympic Games represent a challenge for the entire system of a country. All sectors – sports, public works, environment, health, transport, tourism, mass media and other actors – to a greater or lesser extent will be called upon to perform to their best. Health and safety issues are cross-cutting.
- A key to success is an early start and parallel processes for public health preparedness work. It would be wise to introduce well-coordinated but parallel systems addressing the main public health issues of the Games, where preparedness for incidents involving the potential deliberate use of biological and chemical agents or radionuclear material will be one of many aspects and not the dominant one. Other issues include epidemiological surveillance, intervention and control of any epidemics, environmental health, prehospital care, hospital care, health promotion, disease prevention and coordination and command issues. An early start creates the necessary confidence to deal constructively with and respond to pressures, demands and unforeseen situations in the few months preceding the Games.
- Think long term: developing a long-term perspective would allow better and more sustainable use of the investments made and assets and infrastructure established for the Olympic Games. The same applies to partnerships, which need to be nurtured and supported politically.
- International cooperation can be a source of valuable knowledge, legitimacy, buffer for unfair criticisms and access to resources and capacity to deal with crises. The experience of the Athens 2004 Olympic Games was very positive, both in terms of support received from other countries, such as the Government of the United States of America, from the European Commission and from international organizations, especially WHO and NATO. The European Commission facilitated communication with the EU countries and the exchange of expertise. WHO had a strong presence in Greece during the preparedness

phases and during the Olympic Games and provided the testing ground for connecting with WHO's JW Lee Centre for Strategic Health

Operations, which began to operate in July 2004, and with the Global Outbreak Alert and Response Network (GOARN) mechanism.

ANNEX 1

Standard operating procedures for reviewing public health signals and reports during the Athens 2004 Olympic Games

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Introduction

In order to detect and react to public health threats as timely as possible, several systems were implemented or strengthened in the Athens 2004 Olympic Games:

- enhanced public health surveillance systems: mandatory surveillance, laboratory and sentinel physician;
- syndromic surveillance from Athens 2004 Olympic Games venues and hospitals;
- a hotline; and
- active scanning of mass-media reports.

Each of these systems captured information that requires verification and assessment. Fig. 1 and 2 show the assignment of tasks for verifying signals and reports and the sequence of assessment for verifying signals. In this context, the following definitions are used.

Signal

A signal is a notification obtained by analysing public health surveillance or syndromic surveillance systems of a health event flagged by statistical tests as departing from an expected baseline. A signal requires verification and assessment before being considered an alert.

Report

A report is information about a health event captured through calls to the hotline or any other source of information. Reports are not related to statistical flagging of data routinely collected as part of enhanced surveillance as described above. A report requires verification and assessment before being considered an alert.

Alert

An alert is a signal or a report that has been verified and that presents a threat to public health. The verification consists of ensuring that a signal is not an artefact or an error and that a report is not a hoax or a rumour. An alert requires investigation and implementation of control measures.

All alert investigations, regardless of the source of the alert, were coordinated by a physician from the Department of Epidemiological Surveillance and Response.

Signal

Signal detection

The enhanced surveillance systems associated with Olympic surveillance routinely generated data. Several algorithms were used to detect signals in these data:

- a single case or cluster of cases of specific diseases (class A agents, some mandatory notification diseases, syndromic surveillance and sentinel surveillance system);
- Poisson (comparing the daily counts with the previous seven-day average) and binomial (comparing the proportion of disease-specific cases with the previous seven-day average) tests on aggregated data from each system; and
- early aberration reporting system and other algorithms on syndromic surveillance data.

Signal assessment

Signals can be immediately recognized as public health alerts, such as the notification of a confirmed case of a class A agent. In this case, the Hellenic Centre for Infectious Diseases Control was to be immediately informed and should determine the nature of the response. However, most of the time, such a notification would be first reported by a clinician as a suspicion and not primarily detected by the analysis of syndromic surveillance data. In these instances, the procedures for reports would be followed.

The team in charge of analysis would assess the signal upon detection. If the signal was obvious and

required immediate verification, the team in charge of the analysis would inform the epidemiologists in charge of other surveillance systems and conduct immediate verification. A signal perceived as not requiring immediate notification but potentially of interest would be notified and discussed during the 15:00 surveillance meeting.

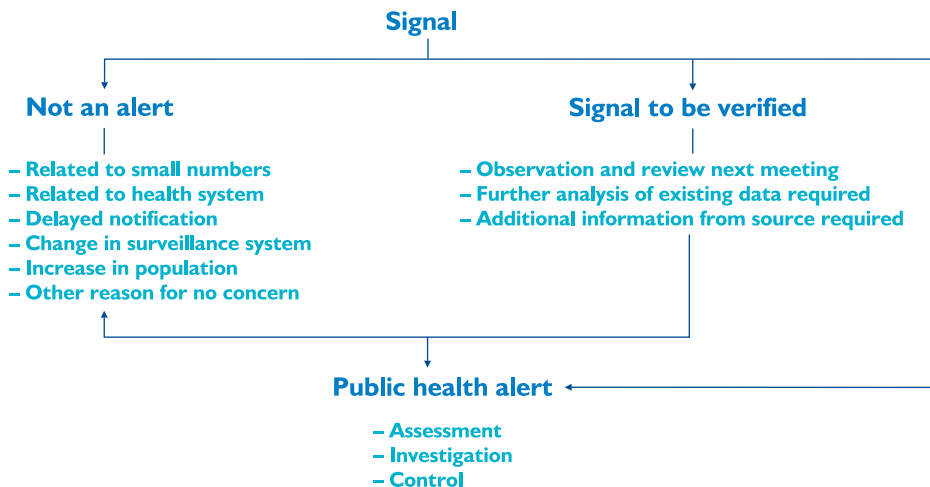
Signal classification

Whenever a signal was detected in the surveillance data, it was reported to the 15:00 surveillance meeting, which classified it, collectively, in several categories (Fig. 1).

A signal is not an alert if it meets the following criteria:

- related to small numbers: such as two cases of a common disease representing a two-fold increase if one case was observed on average in the previous seven days;
- related to health system characteristics, such as a statistical flag for a hospital having a pattern of notification related to its days of activity;
- delayed reporting, such as batch reporting of cases from previous days giving an artificial increase for the reporting day;
- a change in surveillance system, such as activation of mandatory surveillance with an increase in sensitivity;
- an increase in population, such as an increase in the number of notifications for a common illness in relation to an increase in attendance at the health unit due to an increase of the population;

Fig. 1. Flow chart for processing signals



- a signal after data are aggregated at the global level that is known to be related to a signal at a smaller geographical level; and
- other reason for no concern, such as an artefact in the data.

A signal requires verification (potential alert) if it meets the following criteria:

- observation and review during the next meeting: signals that do not represent an alert unless they continue over a certain number of days and generate an increasing or continuing pattern in the notification;
- further analysis of existing data required: signals requiring further analysis of existing data to better characterize them, such as examining the comment field of individual records for additional clinical information or exploring their relationship with an increase or a decrease in attendance; and
- additional information from source required: signals requiring contact with the reporting source to gather further information useful in deciding its significance, such as laboratory confirmation.

A public health alert:

- requires assessment, investigation and control.

All signals requiring verification and alerts were included in the action tracking database for follow-up.

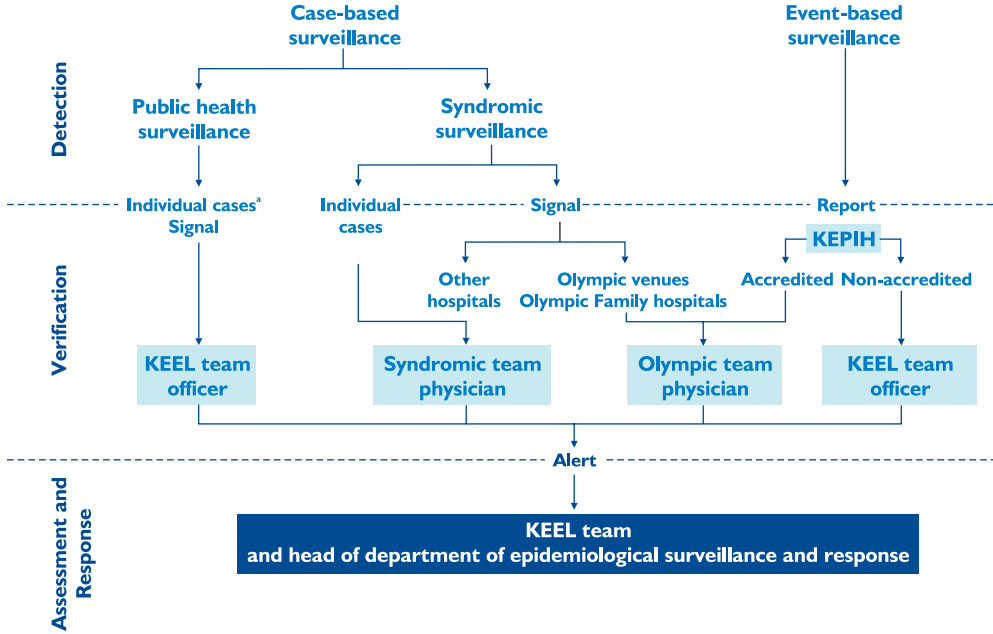
Signal verification

The verification process included three levels (Fig. 2) and would be completed within 24 hours and reported to the next surveillance meeting.

1. Observation and review for next meeting

This was related to an increase in notifications that would require further verification if the pattern persisted for several subsequent days. A daily list produced by the signal tracking database ensured that signals would be reviewed during the subsequent meetings.

Fig. 2. Algorithm for assigning tasks for verifying signals and reports



* If accredited for the Olympic Games, communicate with the Olympic team physician.

KEEL: Hellenic Centre for Infectious Diseases Control
KEPIH: Coordination Centre of the Hellenic Centre for Infectious Diseases Control.

2. Further analysis of existing data required (internal verification)

This internal verification process refers primarily to all surveillance data available on an individual basis in the database, including reviewing cases to get additional information on their clinical presentation, age and sex distribution to detect a potential epidemiological link between the cases and could involve:

- further analysis of existing data (such as by age, sex or geographical distribution or additional statistical algorithms);
- reviewing clinical and epidemiological data available in the database; and
- cross-matching data with data from other surveillance systems.

This process would be attributed using the algorithm presented in the next section.

3. Additional information from source required (external verification)

When additional information was required from a signal originating from surveillance (beyond what is available in the database and requiring telephone contact with the source of notification), the verification would be attributed using the algorithm presented in the next section.

The verification process would be attributed to the various surveillance systems, during the 15:00 meeting, according to the following algorithm:

Syndromic surveillance signal

- From Olympic venues or hospitals for the Olympic Family: a physician from the Surveillance Office of the Hellenic Centre for Infectious Diseases Control verified the signal. This comprised pulling information on people accredited at the Athens 2004 Olympic Games from their accreditation number to detect a potential epidemiological link between people, such as the same team, country and residence location. For non-accredited patients, a physician from the Surveillance Office of the Hellenic Centre for Infectious Diseases Control could call the medical officer in charge of the venue. From all other venues: a physician from the sentinel surveillance group conducted the required verification process.

All other surveillance signals

- A physician from the Department of Epidemiological Surveillance and Response verified the signal.

Verification of individual case signals

Notification of individual cases could originate from any surveillance notification (such as syndromes related to class A agents) or direct reports

through a hotline. In this case, procedures for report verification would be followed (see report section).

Signal originating from the syndromic surveillance system

When a syndrome related to class A agents originated from syndromic surveillance notification, it would be considered a signal requiring immediate verification because of the high sensitivity and low positive predictive value of the case definitions used. A physician from the syndromic surveillance group would verify the information with the notifying hospital. If the event were confirmed and became an alert, a physician from the department of epidemiological surveillance and response would conduct the investigation.

Signal originating from other surveillance systems

Signals originating from other surveillance systems would be verified by a physician from the department of epidemiological surveillance and response.

Follow-up of signals

All signals originating from the data would be registered in a signal tracking database. Whenever a signal required verification, it was included in an action tracking database managed by the head of the Surveillance Office of the Hellenic Centre for Infectious Diseases Control. Signals were followed up during the daily 15:00 surveillance meeting.

Reports

Report detection

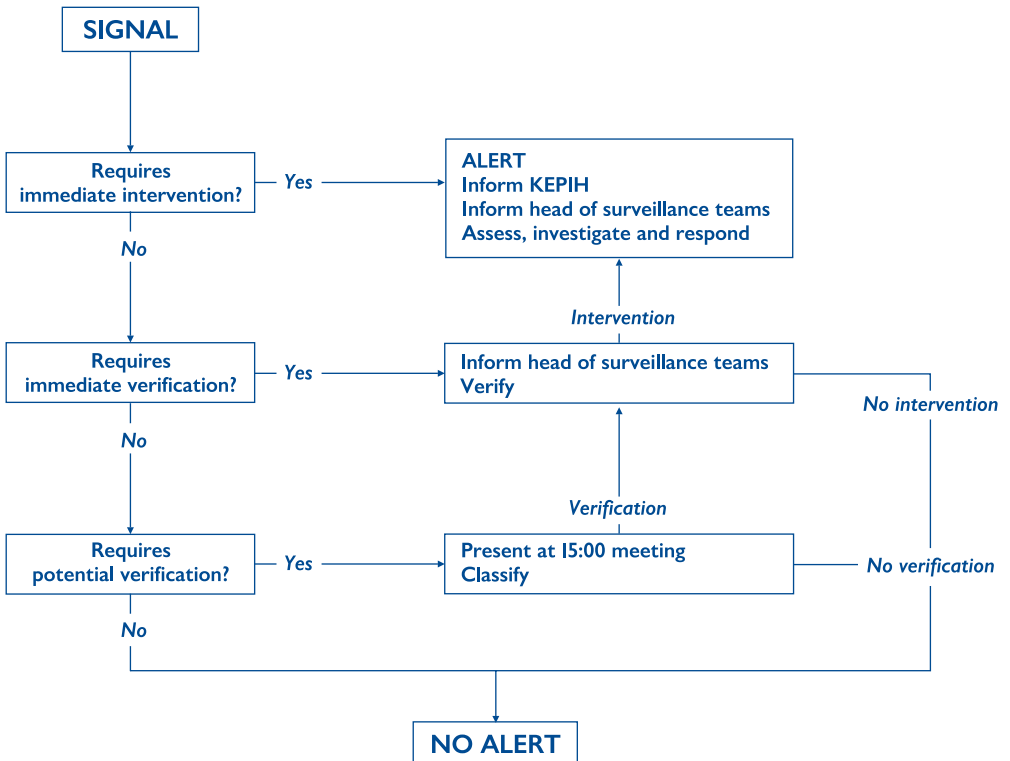
In contrast with signals that originated by analysing surveillance databases, reports originated from information received or retrieved from various sources:

- a hotline;
- mass-media screening;
- a phone call from a health professional;

- a list of cases from the Health Coordination Command Centre with Athens 2004 Olympic Games credentials admitted to hospital; and
- any other source of information.

Any Hellenic Centre for Infectious Diseases Control officers associated with surveillance activities could receive reports of events requiring verification or intervention. Good coordination was thus essential in

Fig. 3. Sequence of assessments for verifying signals



KEPIH: Coordination Centre of the Hellenic Centre for Infectious Diseases Control.

ensuring an effective process and avoiding duplication of work.

The Operations Centre of the Hellenic Centre for Infectious Diseases Control would be informed of all reports received.

Report assessment

Upon receipt, reports would be assessed to check whether immediate intervention or immediate verification was required. Fig. 3 shows how this assessment was carried out, similar to signals.

Report verification

The medical officer of the Operations Centre of the Hellenic Centre for Infectious Diseases Control coordinated the verification process for reports related to the Athens 2004 Olympic Games. Any report concerning a person accredited for the Olympic Games would be verified by the medical officer of the Athens 2004 Olympic Games surveillance team. Any report concerning a person not accredited for

the Athens 2004 Olympic Games would be verified by an epidemiologist of the Hellenic Centre for Infectious Diseases Control surveillance team.

A notification of a health event related to a Class 4 agent notified through a hotline or other means (call from a physician) would be considered an alert. The Hellenic Centre for Infectious Diseases Control Operations Centre would be immediately informed. A physician from the epidemiological surveillance and response would conduct the investigation in close relation with the officer responsible for the office for responding to incidents potentially involving the deliberate use of biological and chemical agents or radionuclear material.

In some instances, an individual case report not related to Class 4 agents such as gastroenteritis could have required verification based on:

- specific clinical presentation such as unusual presentation, severity or dehydration;
- potential further distribution from this person (such as work related);
- potentially related to food items that are distributed further;
- affecting a VIP; and
- attracting mass-media attention.

ANNEX 2

**Examples of daily situation reports
for the Athens 2004 Olympic Games**

The WHO team in Athens compiled daily situation reports throughout the Athens 2004 Olympic Games in August 2004. These reports covered information on epidemiological surveillance; outbreak investigations; preparedness for and response to incidents potentially involving the deliberate use of

biological and chemical agents or radionuclear material; and other relevant information. They were sent at the end of each day to the WHO Regional Office for Europe and WHO headquarters. This annex shows four of these reports, starting with the report for 13 August (the first day of the Olympic Games).

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without authorization from the Health Coordination Command Centre
of the Ministry of Health and Social Solidarity in Greece

Situation report for the Athens 2004 Olympic Games – 13 August 2004

WHO team in Athens



1. Epidemiological surveillance

Nine cruise ships are now in Piræus accommodating more than 8000 passengers. Six cases of gastroenteritis were reported through the surveillance system. All cases originated from [cruise ship X] and involved two crew members, one of whom is a food handler. Cases were mild, without fever or vomiting.

The laboratory surveillance reported 12 samples positive for *Salmonella* and 5 for *Campylobacter* (3 from Attica).

An additional five cases of meningitis were reported from Attica today. The hospital will be contacted to verify diagnosis and potential epidemiological links.

The five cases of septic shock reported yesterday were investigated. Two related to urinary tract infection were people older than 80 years of age. The last case was sampled for blood culture. The results are pending. The alert for this event was discarded.

2. Ongoing outbreak investigations

A team of epidemiologists from the Hellenic Centre for Infectious Diseases Control will depart for Eretria

(not Evia, as reported yesterday) to assess the magnitude of the outbreak. No environmental samples have been collected yet.

A case of meningitis was reported from a person who had travelled from Germany while symptomatic. Follow-up for flight number and notification through the EU early warning and response system is being conducted.

3. Preparedness for and response to incidents potentially involving the deliberate use of biological and chemical agents or radionuclear material

An alert procedure was initiated for two suitcases and some people feeling dizziness in the same station of the subway towards Athens International Airport today. The response and investigation was intense. The case was closed just before the beginning of the Athens 2004 Olympic Games and was concluded to be a false alert.

No new information concerning the "powder" events. For the Athens International Airport event, samples sent to Thessaloniki for chemical analysis

mentioned the presence of "fatty acids" and tested negative for chemical agents.

4. Other business and attachments

Following the avian influenza deaths reported yesterday by WHO, the Coordination Centre of the Hellenic Centre for Infectious Diseases Control sent a reminder to the Olympic Village Polyclinic and staff of the Olympic hospitals of the symptoms of avian influenza for visitors from South-East Asia and pro-

vided means of transport for sample collection as well as personal protective equipment.

One athlete from [country A] was admitted to Evangelismos General Hospital for suspicion of Dengue fever. One family contact was previously diagnosed for Dengue fever in [country A]. A survey conducted by the National School of Public Health confirmed the absence of dengue fever vectors in the Attica area.

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Situation report for the Athens 2004 Olympic Games – 23 August 2004

WHO team in Athens



1. Epidemiological surveillance

Cruise ship surveillance is reporting 9584 passengers on board and 63 visits, 4 of which for gastroenteritis (on three different ships).

The Olympic venues noted one case of meningitis, three cases of gastroenteritis and four respiratory infections with fever. Syndromic surveillance is reporting 136 respiratory infections, 3 cases of bloody diarrhoea and 133 cases of gastroenteritis.

2. Ongoing outbreak investigations

The airline passengers who travelled with the person admitted to [hospital A] for smear-positive tubercu-

losis will be contacted. The airline company has been informed as well as the European early warning and response system. A coach from [country B] has been admitted for suspected tuberculosis. This contact will be followed up.

3. Preparedness for and response to incidents potentially involving the deliberate use of biological and chemical agents or radionuclear material

No new information or incident today.

4. Other business and attachments

None.

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of the Ministry of Health and Social Solidarity in Greece

Situation report for the Athens 2004 Olympic Games – 26 August 2004

WHO team in Athens



1. Epidemiological surveillance

No alerts in the various surveillance systems today. Notifications of gastroenteritis are decreasing today compared with previous days.

The cruise ship surveillance system notified four cases of gastroenteritis.

One case of Legionnaire's disease in a foreigner who travelled to Greece was reported through the European Surveillance Scheme for Travel Associated Legionnaire's disease. Two cases exposed in the same hotel in the past two years had already been reported. A thorough environmental investigation of the hotel will be carried out.

2. Ongoing outbreak investigations

A meeting was held with representatives of all surveillance systems and the Hellenic Food Authority this morning to review in-depth data from all systems relating to gastroenteritis. The slowly increasing pattern reported in the previous days was already noticed in previous years, to a greater extent, and can be attributed to an increase in the population of Athens, as residents are coming back from

their vacation. It was unanimously decided to keep gastroenteritis notification under close scrutiny in the coming days but not to embark to an outbreak investigation since no hypothesis could be formulated.

The European early warning and response system sent a warning concerning a cluster of more than 100 cases of hepatitis A cases reported from [country C] among people having travelled to [country D].

3. Preparedness for and response to incidents potentially involving the deliberate use of biological and chemical agents or radionuclear material

A debriefing organized by the Olympic Security Command Centre will take place in the coming days to review how the system reacted to the various powder incidents.

4. Other business and attachments

A general debriefing of the surveillance and response activities in relation with the Athens 2004 Olympic Games will take place Monday, 30 August, with all international experts involved as well as key representatives of the various institutions.

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of the Ministry of Health and Social Solidarity in Greece

Situation report for the Athens 2004 Olympic Games – 29 August 2004

WHO team in Athens



This is the last day of the Athens 2004 Olympic Games. Everything has gone very well. This afternoon there will be a debriefing with all the members of the external resource team from WHO, the United States Centres for Disease Control and Prevention and the United Kingdom. The Athens 2004 Paralympic Games will start on 17 September and will end on 28 September.

1. Epidemiological surveillance

Syndromic surveillance reported a slight increase in respiratory tract infection today. Gastroenteritis remains below the average of the past seven days, with three cases reported from the venues and one from the cruise ships.

2. Ongoing outbreak investigations

No new outbreaks reported today.

3. Preparedness for and response to incidents potentially involving the deliberate use of biological and chemical agents or radionuclear material

No new information.

4. Other business and attachments

This is the last situation report for the period of the Olympic Games.

ANNEX 3

**Sample daily reports on the results of
environmental health inspections
and laboratory tests
and of epidemiological surveillance
at the Athens 2004 Olympic Games**

National School of Public Health, Ministry of Health and Social Solidarity

The National School of Public Health under the Ministry of Health and Social Solidarity gives scientific support to agencies involved in implementing environmental health and public health aspects of the Athens 2004 Olympic Games.

Daily report on the results of environmental health inspections and laboratory tests

17 August 2004

Contents

Overview

Inspections conducted inside the Olympic venues

Items of environmental health interest rated as unsatisfactory

Results of laboratory tests exceeding the authorized limits

Timetable of inspections

Highlights

Action undertaken by the prefectural departments of public health

Problems

Inspections conducted outside the Olympic venues

Items of environmental health interest rated as unsatisfactory

Results of laboratory tests exceeding the authorized limits

Timetable of inspections

Highlights

Action undertaken by the prefectural departments of public health

Problems

Notes

Overview

On 16 August 2004, the prefectural departments of public health registered 196 environmental health inspections; 8 had unsatisfactory results. The departments ordered 178 rectification actions. The results of 46 laboratory tests were registered; 14 were rated as unsatisfactory. Inside the Olympic venues, 142 environmental health inspections were conducted; 3 were rated as unsatisfactory. The prefectural departments of public health ordered 101 rectification actions. Moreover, the results of 25 laboratory controls were registered; 6 were rated as unsatisfactory. The unsatisfactory results of inspections conducted inside the Olympic venues concern:

- the cisterns of drinking-water and ice on [cruise ships A, B and C]; and
- the hosting areas of [cruise ships X and Y], where three drinking-water samples from cooling towers did not comply with hygiene standards.

Outside the Olympic venues, 53 environmental inspections were conducted, and 5 were rated as unsatisfactory. The prefectural departments of public health ordered 77 rectification actions. Moreover, the results of 21 laboratory inspections were registered, and 8 results were rated as unsatisfactory.

Among the results of inspections conducted outside the Olympic venues, the unsatisfactory ratings concern:

- the hotels that had signed contracts with the Athens 2004 Olympic Games Organizing Committee: [hotels Z and U] (swimming pools and cooling towers).

In total, the laboratory results from inspections conducted until 16 August 2004 in 16 hotels have been

rated as unsatisfactory. Counterchecks and sampling will be resumed.

This report presents the results of environmental health inspections and laboratory tests conducted by the competent prefectural departments of public health as well as the rectification actions that had been ordered. These are the results from inspections concluded the day before the publication of this report (16 August 2004).

The report comprises tables presenting the total number of inspections conducted inside and outside the Olympic venues.

Inspections conducted inside the Olympic venues

Up to 16 August 2004, 2667 environmental health inspections and 498 laboratory tests have been conducted on items of environmental health interest, and 3422 rectification actions were ordered.

Items of environmental health interest rated as unsatisfactory

Up to 16 August 2004, 56 items of environmental health interest have been rated as unsatisfactory.

Results of laboratory tests exceeding the authorized limits

Up to 16 August 2004, 13 items of environmental health interest did not comply with the authorized limits.

Timetable of inspections

As indicated in Tables I2 and I3 [not shown], during the past 20 days, 119 environmental health inspections have been conducted and 43 results were rated as unsatisfactory. During the same period, 184 laboratory tests have been conducted and 17 results were rated as unsatisfactory.

Highlights

- The inspections conducted on drinking-water samples from the cistern of [cruise ship A] revealed unsatisfactory results (date of sampling 13 August 2004). Due to the unsatisfactory results of the on-site measurements (chloride and pH) conducted during the previous days, rectification actions have been already implemented (cleaning and decontamination of the cistern). A new sampling took place on 16 August 2004.
 - The laboratory tests conducted on drinking-water samples from cistern no. 5112 of [cruise ship B] revealed suspended particles and an increased number of aerobic bacteria. Moreover, an ice sample from an ice machine did not comply with hygiene standards (*Enterococcus*). Rectification actions were ordered and counterchecks will be resumed.
 - The laboratory tests conducted on drinking-water samples from the cistern no. 5 of [cruise ship C] revealed an increased number of common aerobic bacteria (the cistern complies with the authorized limits but under certain conditions). Rectification actions were ordered and counterchecks will be resumed.
 - In the hosting areas of [cruise ships X and Y], three samples of drinking-water taken from cooling towers did not comply with the authorized limits or complied under certain conditions.
- Rectification actions were ordered and counterchecks will be resumed.
- Several environmental health inspections conducted in the Olympic Stadium revealed the poor hygiene conditions of public toilets.
 - Inspections conducted inside the Olympic venues in Goudi revealed major hygiene problems.
 - [Cruise ships A and D] were connected to the central waste management pipeline of the Piraeus port.
 - After contacting the managers of the venues where *Legionella* was detected, we were informed that all necessary measures had been taken. Counterchecks will be resumed on 18 August 2004.

Action undertaken by the prefectural departments of public health

- –

Problems

- Problems in complying with the sampling hours permitted in the swimming complex of the Olympic Stadium (from 23:30 to 06:00).
- Problems in reaching the Olympic venues: non-accredited drivers or non-accredited vehicles.

Inspections conducted outside the Olympic venues

Up to 16 August 2004, 3672 environmental health inspections and 1381 laboratory tests have been conducted, and 11 687 rectification actions have been ordered.

Items of environmental health interest rated as unsatisfactory

Up to 16 August 2004, 578 items of environmental health interest have been rated as unsatisfactory.

Results of laboratory tests exceeding the authorized limits

Up to 16 August 2004, 73 items of environmental health interest have exceeded the authorized limits.

Timetable of inspections

During the last 20 days, 335 environmental health inspections have been conducted and 33 have been rated as unsatisfactory. During the same period, 211 laboratory tests have been conducted and 23 items did not comply with the authorized limits.

Highlights

- According to laboratory tests, three swimming pools of [hotel Z] failed to comply with the authorized limits.

Notes

The National School of Public Health assists the prefectural departments of public health in conducting the environmental health inspections and laboratory tests both inside and outside the Olympic venues.

The above tables [not included in this Annex] present the results of inspections up to the day before this report was published as well as the rectification actions, measures and sanctions imposed.

- In [hotel Z], laboratory tests on samples of drinking-water taken from cooling towers had unsatisfactory results.
- In [hotel U], laboratory tests on samples of drinking-water taken from cooling towers had unsatisfactory results.
- Inspections conducted in 200 hotels revealed that 16 hotels did not comply with the authorized limits. Rectification actions were ordered and sampling will be resumed.

Action undertaken by the prefectural departments of public health

- –

Problems:

- –

Special checklists were used during the inspections, indicating the items under inspection and the negative ratings. All inspected items are rated according to the total number of negative scores: A = satisfactory, B = relatively satisfactory and C = unsatisfactory.

For all items that received unsatisfactory (C) or relatively satisfactory (B) ratings, a list of rectification actions is issued. A copy of this list is given to the

venue manager or the venue owner so that all problems are rectified in accordance with the legislation in force. In some cases, lists of rectification actions are issued for items rated as A (satisfactory).

Inspections are divided into the following categories.

1. **Environmental health inspections:** carried out by public health inspectors in all premises of environmental health interest based on checklists.
2. **Partial counterchecks:** follow-up inspections for ensuring that the recommendations issued by the public health inspectors are applied and problems are rectified.
3. **On-site measurements:** of the temperature, pH and chlorine content of the water. The public health inspectors perform these measurements by using an electronic thermometer and a Hanna mobile laboratory.
4. **Laboratory tests:** public health inspectors sample water and other material. All samples are put in special containers and sent to the Central Laboratory of Public Health or other public laboratories for microbiological examination. The microbiological examination is carried out according to the origin of each sample and the purpose of the examination (coliform organisms, *Escherichia coli*, *Staphylococcus*, *Enterococcus*, *Legionella*, cryptosporidiosis, giardiasis, noroviruses, salmonellosis, listeriosis etc.).

Standardized sampling forms are used.

The prefectural departments of public health in charge of the environmental health inspections are presented below:

1. Greater Athens
2. Eastern Attica

3. Southern section of Athens
4. Western section of Athens
5. Eastern section of Athens
6. Western Attica
7. Piraeus
8. Thessaloniki
9. Magnesia
10. Achaia
11. Heraklio (Crete)
12. Korinthia
13. Evia
14. Greater Attica (Athens International Airport).

The inspections inside the Olympic venues are carried out by 120 accredited public health inspectors in all Olympic cities. The scientific staff members (public health inspectors, physicians and analysts of information systems) provided by the Department of Scientific Support of the Ministry of Health and Social Solidarity assist the prefectural departments of public health. Moreover, the Department of Scientific Support has rented two vehicles for transporting samples.

The prefectural departments of public health register the results of environmental health inspections and send all data in an electronic format to the Central Laboratory of Public Health. The Department of Scientific Support processes the data for the implementation of the operational programme Athens 2004 Olympic Games.

The Central Laboratory of Public Health and the National School of Public Health register the results of laboratory tests and send them electronically to the competent prefectural departments of public health and to the Department of Scientific Support for further evaluation and analysis. For every positive result, the Department of Scientific Support sends to the prefectural departments of public health recommendations for implementing rectification actions.

Hellenic Centre for Infectious Diseases Control



Ministry of Health and Social Solidarity
Hellenic Centre for Infectious Diseases Control
Daily report of epidemiological surveillance
Athens 2004 Olympic Games
23 August 2004

This report briefly describes the notifications for selected diseases in Greece's Olympic districts based on several enhanced surveillance systems in operation. The reports of 23 August 2004 include those received at the Hellenic Centre for Infectious Diseases Control between 13:00 on 22 August 2004 and 13:00 on 23 August 2004.

In summary, on this day, the occurrence of all reported diseases in the Olympic districts is within the expected range. One foodborne outbreak was reported in three members of the same family without identifying any suspected source of infection.

1. Respiratory infections

Table I

Notifications for respiratory infections by surveillance system

Surveillance system		23 August 2004		Previous 7 days		Cumulative since 19 July 2004	
		n	% ^a	Mean	% ^a	n	% ^a
Respiratory infection	Primary care sentinel ^b	NA ^c	NA ^c	9.2	6.2	202	6.4
Respiratory infection	Syndromic – Olympic Games hospitals	136	3.7	166.7	3.9	6414	4.5
Respiratory infection	Syndromic – Olympic Games venues	4	0.7	2.9	0.5	34	0.6
Pneumonia-like illness	Syndromic – cruise ships	0	0.0	0.0	0.0	0	0.0
Influenza-like illness	Primary care sentinel	NA ^c	NA ^c	1.0	0.7	15	0.5
Influenza-like illness	Syndromic – cruise ships	0	0.0	0.0	0.0	0	0.0

^a Percentage of all visits.

^b The sentinel physician system refers to Attica, and no data is provided during weekends.

^c NA: not available.

- Influenza activity is low in Greece at this time, as confirmed by the surveillance systems in operation.
- Respiratory infections have a low incidence at this time of the year. On this reporting day, they represented 3.7% of the visits of Olympic hospital outpatients.
- No significant change has been observed in the time trend of respiratory infections since mid-July.

2. Gastroenteritis

Table 2

Notifications for gastroenteritis by reporting system

Surveillance system		23 August 2004		Previous 7 days		Cumulative since 19 July 2004	
		n	% ^a	Mean	% ^a	n	%
Gastroenteritis	Primary care sentinel ^b	NA ^c	NA ^c	6.0	4.0	109	3.4
Gastroenteritis	Syndromic – Olympic Games hospitals	133	3.6	156.6	3.6	4832	3.4
Gastroenteritis	Syndromic – Olympic Games venues	3	0.5	7.9	1.5	85	1.4
Gastroenteritis	Syndromic – cruise ships	4	6.3	1.1	1.5	24	2.7
Bloody diarrhoea	Syndromic – Olympic Games hospitals	3	0.1	5.4	0.1	158	0.1
Bloody diarrhoea	Syndromic – Olympic Games venues	0	0.0	0.0	0.0	0	0.0
Bloody diarrhoea	Syndromic – cruise ships	0	0.0	0.0	0.0	0	0.0
Foodborne outbreaks	Mandatory notification	1	5.9	0.7	4.0	21	3.6
Salmonellosis	Mandatory notification	9	52.9	8.0	45.2	261	44.9

^a Percentage of all visits.

^b The sentinel physician system refers to Attica, and no data is provided during weekends.

^c NA: not available.

- On this reporting day, gastroenteritis comprised 3.6% of the visits of Olympic hospital outpatients.
- No significant change has been observed in the time trend of gastroenteritis since mid-July.
- One foodborne outbreak was reported in three members of the same family without identifying any suspected source of infection.

3. Meningitis

Table 3

Notifications for meningitis by reporting system

Surveillance system		23 August 2004		Previous 7 days		Cumulative since 19 July 2004	
		n	% ^a	Mean	% ^a	n	% ^a
Meningitis (syndrome) ^b	Syndromic – Olympic Games hospitals	3	0.1	4.6	0.1	170	0.1
Meningitis ^b	Syndromic – Olympic Games venues	1	0.2	0.0	0.0	1	0.0
Meningitis ^b	Syndromic – cruise ships	0	0.0	0.0	0.0	0	0.0
Meningitis – total	Mandatory notification	0	0.0	1.4	8.1	64	11.0
Meningitis – bacterial ^c	Mandatory notification	0	0.0	0.6	3.2	31	5.3
Meningitis – aseptic	Mandatory notification	0	0.0	0.7	4.0	30	5.2
Influenza-like illness	Syndromic – cruise ships	0	0.0	0.0	0.0	0	0.0

^a Percentage of all visits.

^b Syndrome compatible with meningitis, encephalitis or unexplained acute encephalopathy or delirium.

^c Includes meningococcal disease and other bacterial meningitis.

- No cases of meningitis were reported.

4. Vaccine-preventable diseases

- No cases of measles, rubella, mumps or pertussis were reported.

5. Hepatitis A

Table 4
Notifications for hepatitis by reporting system

Surveillance system		23 August 2004		Previous 7 days		Cumulative since 19 July 2004	
		<i>n</i>	% ^a	Mean	% ^a	<i>n</i>	% ^a
Acute hepatitis (syndrome) ^b	Syndromic – Olympic Games hospitals	3	0.1	2.6	0.1	88	0.1
Acute hepatitis (syndrome) ^b	Syndromic – Olympic Games venues	0	0.0	0.0	0.0	0	0.0
Acute hepatitis (syndrome) ^b	Syndromic – cruise ships	0	0.0	0.0	0.0	0	0.0
Hepatitis A	Mandatory notification	0	0.0	0.1	0.8	4	0.7

^a Percentage of all visits.

^b Syndrome compatible with acute hepatitis A.

- No cases of hepatitis A were reported.

6. Diseases potentially related to the deliberate use of biological agents

- No cases of anthrax, smallpox, botulism, plague, cholera, tularaemia, arboviral encephalitis, viral haemorrhagic fever or melioidosis/glanders were reported.

7. Other diseases

- No cases of brucellosis, legionellosis, malaria, SARS or diphtheria were reported.

8. Disclaimer

This report is based on notifications received by the Hellenic Centre for Infectious Diseases Control from 10 health units participating in the enhanced daily reporting system (of 69: 14%) and from the outpatient departments of 14 hospitals participating in the syndromic surveillance system (of 14: 100%). The picture of morbidity might be different if coverage were more complete.

ANNEX 4

**Outlines of five key operational plans
for the Athens 2004 Olympic Games:
health sector coordination;
quarantine measures; mass-casualty
management; mass prophylaxis planning;
and crisis communication**

Panos A. Efstathiou, Ann Knebel

and Agis D. Tsouros

Introduction

As part of ongoing collaboration between United States Department of Health and Human Services and Greece's Ministry of Health and Social Solidarity, the United States Department of Health and Human Services sent a team to Athens in spring 2004. The team consisted of experts in public health; epidemiology; medical logistics; mental health; health aspects of weapons of mass destruction; and emergency planning and response. The purpose of the team was to assist the Government of Greece with developing five operational plans. The topics of the plans were agreed on in advance based on an assessment of the status of Olympic preparations. The plans included: a concept of operations for the Health Coordination Command Centre, legal considerations for isolation and quarantine, mass prophylaxis planning, mass-casualty management and crisis communication.

The United States team members drafted outlines for the plans before the meeting. The outlines were based on multiple sources, including published litera-

ture, prior plans developed by individual states in the United States and the extensive experience with the subject matter among experts engaged in the process. The outlines for the plans were translated into Greek.

The Government of Greece identified experts in each of the content areas and provided meeting space for the experts from Greece and the United States to meet in Athens in April 2004 to develop the plans based on the provided outlines (Box 1). Transcribers recorded the discussions in both Greek and English and wrote draft plans at the end of the week. A closing workshop outlined the progress accomplished during the workshop and the steps necessary to complete the plans. The United States team provided ongoing consultation in the months following the visit. What follows are outlines of the five plans as adopted by the Government of Greece, based in part on the products of the joint meetings.

An operational plan for the Health Coordination Command Centre

Mission statement

The mission of the Health Coordination Command Centre of the Ministry of Health and Social Solidarity is to direct, decide and coordinate the overall public health and health care response to public

health crises during the Athens 2004 Olympic and Paralympic Games. The Health Coordination Command Centre functions as an integral part of a network of collaborating command centres run by different ministries and agencies to ensure the safety of the Athens 2004 Olympic and Paralympic Games.

Box I.

Members of the expert teams from Greece and the United States

Greece

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Departments of ^aMedicines and Pharmacies, ^bHealth Unit Deployment, ^cPublic Hygiene, ^dCivil Protection, ^ePrimary Health Care, ^fSanitary Engineering and Environmental Hygiene, ^gMental Health and ^hHealth Education; ⁱCoordinator, ^jVice President and ^kSecretariat, Health Coordination Command Centre; ^lPress Office; and ^mNational Board of Public Health and Health Coordination Command Centre, Ministry of Health and Social Solidarity, Athens, Greece

ⁿDepartment of the Prevention of Biological and Toxic Hazards, ^oDepartment of Olympic Games and Travel Medicine, ^pDepartment of Surveillance and Intervention, ^qPresident, ^rDepartment of Education and ^sPress Office, Hellenic Centre for Infectious Diseases Control, Athens, Greece

^tAttica Regional Health Authority, Athens, Greece

^uKAT General Hospital, Athens, Greece

^vVice President and ^wChief Medical Officer of Health Services, National Centre for Emergency Care, Athens, Greece

^xEvangelismos General Hospital, Athens, Greece

^yNational Organization for Medicines, Athens, Greece

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United States

Michael Basso^{bb}, Pete Brewster^{cc}, Sherrie Bruce^{bb}, Lisa Dillard^{bb}, Dan Dodgen^{dd}, Jeffrey S. Duchin^{ee}, Casey Emmer^{ff}, John Hick^{gg}, Sandra Huang^{hh}, Ann Knebel^{ff}, Ram Koppaka^{bb}, Rich Nickle^{bb}, Ann Norwood^{ff}, Nicki Pesik^{bb}, Melissa Sandersⁱⁱ, Arjun Srinivasan^{bb}, Andy Stergachis^{jj}, Jana Telfer^{bb}, Tracee Treadwell^{bb}, Laura Walker^{kk} and Donald Ward^{ll}

Box I. (cont.)

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Coordinators and rapporteurs (United States): Michael Basso, Dan Dodgen, Ann Knebel, Ram Koppaka, Nicki Pesik, Tracee Treadwell

Principal functions

The principal functions of the Health Coordination Command Centre are:

- to receive and synthesize health status reports and health system indicator data to guide strategic and operational decisions;
- to monitor events that have possible health implications;
- to provide credible information to other command centres regarding health sector status

(such as the the Civil Defence Crisis Command Centre);

- to coordinate and manage health system resources;
- to designate liaisons to the Olympic Security Command Centre and Civil Defence Crisis Command Centre to provide strategic and scientific input on health matters and maintain awareness of events and threats that may require a health system response;
- to communicate and coordinate with Olympic Security Command Centre, Olympic Strategic

Security Command Centre and Civil Defence Crisis Command Centre;

- to communicate and coordinate with the Ministry of Health and Social Solidarity command centres operated by the National Centre for Emergency Care and Hellenic Centre for Infectious Diseases Control;
- to clear health-specific risk communication for release through the Joint Information Centre for use by the Centre and the Press Office of the Ministry of Health and Social Solidarity; and
- to direct implementation of health sector response activities upon a decision by the Olympic Security Command Centre to execute the plan for responding to the potential deliberate use of biological and chemical agents or radioactive material.

Membership and roles of members

The members of the Health Coordination Command Centre are specified in a ministerial directive; as of 15 April 2004, they include representatives from the following Ministry of Health and Social Solidarity directorates and agencies and other entities.

- Ministry of Health and Social Solidarity departments (in alphabetical order)
 - Civil protection
 - General Directorates of Health, Public Health and Administration
 - Health Unit Deployment
 - Mental Health
 - Personnel
 - Medicines and Pharmacies
 - Public Hygiene
 - Sanitary Engineering and Environmental Hygiene
 - Social Work and Welfare
 - Supplies

- Other agencies and entities (in alphabetical order)
 - Athens 2004 Olympic Games Organizing Committee
 - Hellenic Centre for Infectious Diseases Control
 - Hellenic Food Authority
 - Ministry of the Interior, Public Administration and Decentralization and prefectural departments of public health
 - National Board of Public Health
 - National Centre for Emergency Care
 - National School of Public Health
 - regional health authorities

Roles and responsibilities of the Health Coordination Command Centre

The Health Coordination Command Centre will have different roles and responsibilities depending on whether the Ministry of Health and Social Solidarity is acting as the lead agency for response to an emergency or whether it is acting in support of a lead agency.

1. The Ministry of Health and Social Solidarity is designated as the lead response agency by legislation and other formal government agreements in specific types of events.

As the lead response agency in these events, the Ministry of Health and Social Solidarity will coordinate and direct its activities through the Health Coordination Command Centre to fulfil specific roles and responsibilities.

2. The Ministry of Health and Social Solidarity is designated as a support agency in specific types of events.

As a support agency in these events, the Ministry of Health and Social Solidarity will coordinate and direct its activities through the Health Coordination Command Centre to fulfill specific roles and responsibilities.

The response roles and responsibilities of specific Ministry of Health and Social Solidarity departments and agencies that are represented in the Health Coordination Command Centre are delineated in the medical support operation plan for incidents involving the potential use of biological and chemical agents or radionuclear material (Philoctetes).

Interagency partnerships

Whether the Ministry of Health and Social Solidarity is acting as a lead or supporting agency, response efforts will require multi-agency collaboration and cooperation across ministries. Wherever possible, the roles and responsibilities of each agency should be delineated in reference to legal authorities and/or in formal memoranda of understanding or agreement. Further, issue-specific protocols for multi-departmental and multi-agency response will be developed.

Information management

Information sources

The following types of information will be at the disposal of and regularly reported to the Health Coordination Command Centre. The mechanism for collecting and transmitting this information will be organized mainly via regular fax communication with specific contact points at the Olympic hospitals and the collaborating coordination centres of other health agencies.

- Inventory of health system resources, such as numbers of hospital beds, number of critical care beds, critical durable medical equipment, pharmaceuticals including vaccines and antitoxins in both the public and private health sector
- Dynamic data such as the daily availability of health sector assets and possibly health care utilization indicators such as numbers of hospital admissions or emergency department visits
- Daily health surveillance and public health interventions reporting
 - Inspection reports from the prefecture level of water sources and food establishments
 - Inspection reports from the Hellenic Food Authority
 - Hellenic Centre for Infectious Diseases Control data from:
 1. Inpatient and outpatient surveillance of specific (notifiable) diseases
 2. Olympic syndromic surveillance organized in a network of emergency departments at designated Olympic hospitals

Reporting protocols

The Health Coordination Command Centre will determine the format and content of the health sector information reports that will be compiled and disseminated at fixed times, at least daily. Information from Ministry of Health and Social Solidarity directorates and health agencies and entities under the Health Coordination Command Centre's leadership will be transmitted to the Centre at a scheduled hour, where it will be synthesized and compiled into the daily report. The daily report will be disseminated to key response partners and to collaborating command centres.

Notification protocols

In addition to routine, scheduled information transmission to response partners and collaborating command centres, the Health Coordination Command

Centre will immediately notify the appropriate parties of health events or emerging health status information that could result in activation of the plan for responding to the potential deliberate use of biological and chemical agents or radionuclear material or that is likely to result in significant and rapid change in response strategy, operations or tactics.

These noteworthy health status indicators could be seen in either naturally occurring events or a covert, deliberate use of a biological agent. Examples of health events that may result in urgent notifications could include but are not limited to:

- a confirmed report of a large or multi-site illness outbreak;
- water quality indicators exceed the accepted action threshold; and
- critical shortage of bed availability at Olympic hospitals.

Health Coordination Command Centre personnel and organizational structure

Health Coordination Command Centre personnel roles will be filled 24 hours a day, seven days a week, during the Olympic period covering the Athens 2004 Olympic and Paralympic Games. Each shift will last eight hours; thus, for each role, at least four people will be identified to staff it, to allow for periodic days off and for surge capacity.

Command management structure

An Executive Committee of the full Health Coordination Command Centre will be a standing decision-making group for all hazards and will be convened whenever the Centre is activated. The Executive Committee will advise the Secretary-General of the Ministry of Health and Social Solidarity on

decisions and actions to be taken to respond to a potential health crisis. The Secretary-General of the Ministry of Health and Social Solidarity or designee will actively involve other members of the Health Coordination Command Centre based on the situation. The General Secretary of the Ministry of Health and Social Solidarity or designee is the incident commander. The Chief Executive of the Health Coordination Command Centre is responsible for day-to-day operation, chairs the Executive Committee and, in consultation with the Secretary-General, convenes the meetings of specific Health Coordination Command Centre members according to need.

Members of the Executive Committee of the Health Coordination Command Centre will be the representatives of:

- the National Centre for Emergency Care;
- the General Directorates of Health, Public Health, and Administration;
- the Department of Health Unit Deployment of the Ministry of Health and Social Solidarity;
- the Hellenic Centre for Infectious Diseases Control;
- the Ministry of the Interior, Public Administration and Decentralization and the prefectural departments of public health;
- the National Board of Public Health;
- the National School of Public Health;
- regional health authorities; and
- a representative from the Press Office of the Ministry of Health and Social Solidarity.

Day-to-day staff for baseline operations includes support staff and a coordinator who will be working on a 24-hour shift basis. Support staff should cover the following functions: planning, logistics, information management and communication. The coordinator is an individual who can analyse the incoming information and notify the Chief Executive of the Health Coordination Command Centre of potential public

health problems. It is envisaged that the Health Coordination Command Centre secretariat staff will consist of five health professionals, two secretaries and a translator. Additional staff assigned from Health Coordination Command Centre member directorates and agencies will be available to provide liaison with their agency of origin and to support the overall work of the Health Coordination Command Centre. The following agencies are expected to be represented at the Health Coordination Command Centre daily: the Hellenic Centre for Infectious Diseases Control, the National Centre for Emergency Care, the regional health authorities, prefectures, the Hellenic Food Authority and the National School of Public Health.

When crises occur, several additional support staff will be mobilized to perform the following functions:

- logistical support: resource procurement, personnel recruitment and orientation, transport and information technology support;
- planning and intelligence: situation analysis, documentation, advance planning and expert support;
- communication: formulation of risk communication messages, dissemination of daily report information, development of fact sheets and communication support for operations;
- safety of personnel: protective equipment, prophylaxis and vaccines and mental health; and
- finance and administration: cost tracking, contracts, fast-track procurement, regulatory issues and legal issues, especially in cases of quarantine or isolation.

Resources of the Operations Centre of the Health Coordination Command Centre

To fulfil its information gathering, analysis, coordination, communication and direction responsibilities,

the Health Coordination Command Centre will require the following equipment:

- four external telephone lines;
- three fax machines;
- eight computers;
- one television with satellite reception;
- a telephone conferencing facility with speakers;
- a photocopying machine;
- printers for computers;
- a secure telephone line;
- a shredder;
- maps of different operational areas;
- whiteboards;
- a computer projector and overhead projector and screen;
- C4I/TETRA (terrestrial trunked radio: professional mobile radio and walkie-talkies) connections to other centres and radio link to the National Centre for Emergency Care, Hellenic Police and Ministry of Public Order; and
- appropriate software.

Additional equipment, in particular, phone lines and computers, will be made available to support emergency response operations and as a back-up function.

Operational aspects of the Health Coordination Command Centre

Activation and deactivation levels for the Health Coordination Command Centre will be based on a commonly agreed code system. The Secretary-General of the Ministry of Health and Social Solidarity or designee will determine the activation level in consultation with the Executive Committee of the Health Coordination Command Centre. In addition, criteria will be defined for activating different health sector response plans.

The following events will be scheduled daily:

- meeting of the full Health Coordination Command Centre or Executive Committee thereof;
- receiving reports from other agencies, such as the Hellenic Centre for Infectious Diseases Control and National Centre for Emergency Care; and
- disseminating reports through the Joint Information Centre.

Communication protocols: although most communication will flow through the chain of command, the communication flow may be altered at the discretion of the Health Coordination Command Centre leadership to meet incident response needs.

Plan for implementing quarantine in the community and at the borders, ports and airports

Legal framework – cooperation with law enforcement authorities

Enabling the Ministry of Health and Social Solidarity, the prefectural departments of public health and the regional public health authorities to enforce quarantine and/or isolation of exposed or infectious people requires addressing the following issues.

- Implementing regulations need to be issued for the new quarantine laws enacted in August 2003.
 - Authorities should be familiar with the legal requirements for isolating people who may have infectious diseases and for quarantining exposed people, including the implications of isolating and quarantining citizens of other countries. Key people, such as legal counsel, judges and policy-makers, should be identified and included in planning.
 - Due process must be planned for, including determining the necessary procedures when the government seeks to deprive an individual of liberty in the context of isolation and quarantine. In the United States, the basic elements of due process include adequate notice; right to be heard; access to legal counsel; and a final administrative decision that is subject to review in a court of law. This due process protection should not impede an individual from being immediately isolated or quarantined for valid public health reasons in an emergency situation.
- Key documents need to be drafted before an emergency, including:
 - draft quarantine and isolation orders;
 - supporting declarations or affidavits by public health and health care personnel; and
 - explanation of the jurisdiction’s due process procedures for people subject to an isolation or quarantine order.
 - Ensure that judges and attorneys in the area, through professional organizations or other entities, have received educational materials, training or information related to communicable diseases of concern and the potential use of isolation or quarantine to interrupt disease transmission.
 - Anticipate practical problems that may arise in affording adequate due process protection to people subject to isolation and/or quarantine orders, including:
 - how to arrange for the appearance and representation of people in quarantine (such as videoconferencing or other remote means);
 - how to serve an isolation or quarantine order (likely through law enforcement) and other procedures to advise people of their legal rights; and
 - isolation arrangements for transient or homeless populations.
 - Agreements should be drafted to allow for borrowing facilities or other services necessary to

implement quarantine (such as hotels, schools or other buildings) and/or isolation orders for people who cannot be isolated or quarantined at home (such as travellers or homeless people).

Health care facilities

Standard criteria for choosing the referral hospital

Structure for planning and decision-making

- Identify candidate facilities to meet anticipated need and obtain necessary permissions.
- Designate a planning and response committee with representatives from a variety of departments in the designated facilities (such as administration, infection control, internal medicine, surgery and emergency department).
- Identify health authorities and government contacts who will serve as liaison for preparedness planning and response.
- Identify a coordinator to serve as the facility's point of contact for communication of information internally and externally.

Organizational plan of the hospital for incidents involving the potential deliberate use of biological and chemical agents or radionuclear material

Written preparedness and response plan

- Develop a written preparedness and response plan that outlines roles and responsibilities for the facility, the health authorities and relevant agencies, including the Hellenic (national) Olympic Committee as applicable.

- Develop written policies and work practices that minimize potential risks of disease transmission.

Response capacity and functions

- Test the facility's response capabilities through tabletop exercises or drills.
- Identify criteria and methods for measuring compliance with infection-control procedures.

Screening, triage and evaluation in health care facilities

- Establish a system for centralized triage to available health care facilities for people exposed to biological and chemical agents or radionuclear material.
- Ensure that clinicians can recognize the common symptoms of exposure to biological and chemical agents or radionuclear material and can promptly manage such exposed people.
- Ensure that clinicians know whom and how to notify if they suspect exposure to biological and chemical agents or radionuclear material.
- In case of an incident potentially involving biological agents, have a system in place to monitor exposure and symptoms.

Infection control, isolation and cohorting measures and environmental controls

- Develop comprehensive isolation and infection control guidelines and strategies for patient-related activities to ensure the safety of staff, patients and visitors.
- Develop a patient placement and transport plan that ensures isolation and infection control strategies to minimize the risk of transmission.

- Develop a plan to monitor and reinforce compliance with infection control measures.
- Develop optimal patient placement strategies, accounting for the availability of negative-pressure rooms and personal protective equipment.
- Review and ensure that negative-pressure rooms are functioning properly.
- Determine the capacity for isolating patients in both intensive care units and other settings.

Exposure reporting and evaluation of risk

Educate facility and event staff regarding:

- modes of transmission of infectious agents of concern in case of the deliberate use of biological agents;
- the risks associated with different patient-care procedures;
- the risks to health care workers, patients and visitors;
- the importance of reporting exposures and illness;
- how and to whom to report exposure and illness in the facility and among the health authorities; and
- establishing a system for receiving, investigating and tracking reports from health care facilities.

Communication and reporting

- Establish a command and control system for communication with health care facilities and local health departments (including telephone, radio, Internet and fax).
- Designate adequate numbers of expert health department staff to provide technical support to health care facilities and clinicians for infection

control and clinical management 24 hours a day, seven days a week.

- Develop a resource list and/or database with contact information for key response agencies and personnel.
- Develop a plan for discharging patients who may still be infectious and for follow-up and case management in the community.
- Establish a central authoritative source of information for the mass media and public enquiries.

Expansion of the referral hospital

- Identify additional staff and resources required if the referral hospital must be expanded.
- Define the appropriate method for triage of patients for admission to referral hospital.
- Establish procedures for transfer of people from smaller hospitals to the designated referral hospital if required.

Equipment – supplies of the referral hospital

Administrative and organizational activities

- Determine the minimum number and categories of personnel needed to care for a single patient or group of patients on a given day.
- Develop a strategy to meet staffing needs as the number of patients increases or personnel become ill or are quarantined.
- Ensure the availability of a sufficient number of infection-control staff to allow for daily monitoring and assessment of all patient-care areas.

- Develop a plan for health care workers that include criteria for furloughs, work restrictions and follow-up after exposure to infectious patients.
- Establish criteria and protocols for controlling access to hospitals, including admission, transfer, discharge and visitors.
- Anticipate needs for consumable and durable resources for various numbers of patients.
- Establish and maintain microbiological laboratory capacity.

Quarantine or isolation in the community

Definitions: community containment strategies, including isolation, contact tracing and monitoring, and quarantine, are basic measures for controlling infectious diseases. Isolating ill patients separates them from healthy people and restricts their movement to prevent transmission to healthy people. It also allows for the focused delivery of specialized health care to ill people. Quarantining people who have been exposed to a communicable disease but are not ill is intended to prevent further transmission by reducing the interval between the onset of symptoms and the institution of appropriate precautions. Isolation and quarantine are optimally performed voluntarily, but basic legal authority should be in place for mandatory isolation and quarantine of people and communities when necessary to protect public health.

Existing and standardized criteria for the implementation and enforcement of quarantine (diseases and degree of risk exposure and transmission)

- Establish an incident command structure for response.

- Establish criteria for implementing isolation and quarantine measures.
- Establish the means to communicate with people for whom isolation and quarantine is recommended to request their compliance with recommendations and to inform them about the reasons for isolation and quarantine.
- Establish relationships with partners, such as law enforcement, first-responders, health care facilities and the legal community.
- Identify facilities and necessary staff according to the numbers projected to be isolated and/or quarantined.
- Establish a system and the necessary protocols for monitoring people under isolation and quarantine.
- Plan to monitor and assess the factors that will determine the types and levels of response, including the epidemiological profile of the outbreak or attack, available local resources and level of public acceptance and participation.

Tracing contacts, communication and information management: predetermined competence of various agencies and people

Management of cases and contacts (including people in quarantine)

- Develop protocols, tools and databases for case surveillance, clinical evaluation and management and contact tracing, monitoring and management.
- Establish supplies for non-hospital management of cases and contacts.

- Establish criteria for separating and medically evaluating quarantined people developing symptoms.

Communication – informing people who have to be placed in quarantine and public announcements

- Establish a telecommunication plan for hotlines or other services for case and contact monitoring and response, symptom evaluation, public information and health care provider information.

Covering basic needs depending on the incident: accommodation, food, counselling and communication with family and agencies

- Plan to ensure essential services and supplies for people in isolation and quarantine, including food and water, shelter, medicines and health care consultation, mental health and psychological support services, other supportive services (such as child care) and transport to health care, if required.

Anticipation of provisions for travellers in quarantine

Movement restrictions and enforcement

- Ensure that legal authorities and procedures are in place to enforce movement restrictions as necessary.
- Develop criteria to trigger implementation of movement restrictions.
- Identify key partners and personnel for the implementation of movement restrictions, including quarantine, and the provision of essential services and supplies: law enforcement, first-responders, other government service workers, utilities, transport industry, local businesses and schools.

- Develop training programmes and drills.
- Ensure an adequate supply of personal protective equipment and ensure that responders and providers are fit-tested and trained in its use.
- Develop plans for mobilizing and deploying public health and other community service personnel.

Ports of entry: measures for preventing infection spread across borders

Key issues for planning border responses include:

- legal authority;
- response protocols;
- facilities (space for quarantine and isolation);
- equipment, including personal protective equipment;
- staffing – both standing and reserve;
- transport; and
- funding for response, including quarantine and isolation.

Legal authority for restricting movement

In advance of any outbreak or biological emergency, officials should:

- work closely with their legal counterparts to ensure that the legal authority for movement restrictions at all levels is known and understood and to establish boundaries of authority and processes to address multi-jurisdictional issues;
- develop plans for making decisions on movement restrictions, such as: 1) requirements for pre-departure screening, 2) requirements for arrival screening and/or quarantine, 3) travel prohibitions on cases and contacts, 4) restrictions related to use of mass transit systems and 5) cancelling non-essential travel; and

- work closely with local, state, and federal law enforcement to develop plans for enforcing these restrictions.

Engagement of key partners

Identify key partners representing:

- law enforcement (local and national);
- the legal community;
- emergency medical services (for evaluating ill arriving passengers and transport to hospital);
- clinicians, including specialists in diseases related to exposure to biological and chemical agents or radionuclear material, and hospital personnel;
- transport industry personnel; and
- other emergency management personnel.

All partners should be involved in the planning process.

- Develop plans for training, mobilizing and deploying pertinent public health, hospital and other staff.
- Conduct training programmes and drills.
- Provide respirator fit-testing and training in the use of personal protective equipment for people at risk for exposure.
- Plan for diverting conveyances carrying supplies for maintaining critical infrastructure around key transport hubs that may be affected by the outbreak.

Protocols for managing ill arriving passengers

In collaboration with legal and law enforcement authorities, develop protocols for the management of ill arriving passengers at ports of entry, including provisions for:

- meeting flights with a reported ill passenger;
- establishing notification procedures and communication links;
- separating the ill passenger during assessment;
- assessing the ill passenger and referring for evaluation and care;
- transporting the ill passenger to a designated health care facility;
- collecting location information on other passengers and crew;
- collecting the flight manifest, customs declarations and other information for contact tracing;
- identifying any other ill passengers and separating them from healthy passengers;
- quarantining contacts if necessary, including transport to a quarantine facility; and
- providing enforcement for uncooperative ill passengers or contacts.

Arrangements with health care facilities, transport services, emergency medical systems and physicians

- Work with health authorities to develop agreements with hospitals near ports of entry; these facilities must be equipped to isolate, evaluate and manage affected patients.
- Establish agreements with a designated emergency medical service for on-site assessment of ill passengers and transport to a hospital for evaluation.

Provision for compensating people absent from work due to quarantine measures

Monitoring and predetermined consequent actions to remove suspected patients' noncompliance with isolation and quarantine measures

Response plan for mass-casualty incidents

Planning

Purpose

Planning should be a cooperative effort between the prehospital, National Centre for Emergency Care hospital and health system administration components of health care services. The plan addressing the health system response to a mass-casualty incident should be written to establish the emergency organization, basic policies, responsibilities and action required for supporting local operations of emergency health care plans. The plan should be designed to extend day-to-day services, facilities and resources.

Scope

A mass-casualty incident is any large number of casualties produced in a relatively short period of time, usually as the result of a single incident that exceeds local logistical support capability.

Goal

The response plan for mass-casualty incidents ensures adequate and coordinated efforts that will minimize loss of life, disabling injuries and human suffering by providing effective health care assistance through efficient use of health care and other resources in the event of emergencies resulting in multiple casualties.

Objectives

The primary objectives of the plan are to describe the prehospital and hospital responses to a disaster and include a process in which:

- the National Centre for Emergency Care, hospitals and institutions have a plan to meet their own needs within their own capabilities;
- the National Centre for Emergency Care, hospitals and each institution should enter into mutual aid agreements with other local and regional institutions that can be invoked when local resources have been exceeded;
- the National Centre for Emergency Care and hospitals should define training requirements and develop and implement a training programme based on the needs assessment of the community, event and venues to be covered;
- the plan is a coordinated interagency effort and all responsible agencies and their agents interact regularly to facilitate working relationships during an incident; and
- plans and procedures are reviewed and revised regularly based on tabletop exercises, simulated incidents and drills and/or actual events.

Assessing and analysing needs and analysing risk

Needs assessment shows or allows a survey of real or potential hazards in a specific geographical area and prepares institutions on what to expect. Basic to the planning process is an understanding of the problems that should be anticipated in the specific areas to be covered.

- Needs assessment informs the jurisdiction and all involved stakeholders about what to expect.
- Risk analysis is done to prevent planning for unnecessary events.

- Needs assessment and risk analysis:
 - provide incentives for the political hierarchy to establish an operational plan;
 - might indicate appropriate preventive measures; and
 - create awareness of new hazards.

Plan components

The operational plan should define an overall approach to incidents based on a strategy for the efficient and effective use of resources. The plan should also address the appropriate chain of command, span of control and coordination, including the transfer of authority of any officer or position.

Compliance with laws and regulations

Ensure that the plan is supported by and in compliance with the laws and regulations that exist in the general plans for mass-casualty and disaster response within Greece. In addition, ensure that the plan is in compliance with any specific regulations issued by the Athens 2004 Olympic Games Organizing Committee.

Psychosocial services

Psychosocial service arrangements must be an integral part of the planning processes. This is important so that the psychosocial processes needed are defined. Clinicians must be solicited to become involved in the process. It is necessary to define critical incident stress teams for continued psychosocial support of victims, their families and first-responders.

Mutual aid and international assistance

There must be a plan for activating mutual aid when the system exceeds its own capability. It is important to address who is going to respond, where it will happen when the response will happen and which skills will be needed.

Prehospital

Incident management duties

The function of incident management is the overall management and coordination of all responding health care personnel and resources. The person assuming the overall command will be identified primarily by the type of incident, fire, traffic, etc., and the National Centre for Emergency Care provides the health care commander at the scene.

Health care commander at the scene

The National Centre for Emergency Care medical supervisor would undertake the role of the health care commander at the scene and is responsible for the overall emergency health care service operations at an incident, designating emergency medical service functions, as appropriate, managing prehospital emergency resources and forwarding recommendations to the incident commander. The function of the National Centre for Emergency Care medical supervisor is to ensure appropriate triage, transport, treatment and fatality management and to manage all the necessary emergency medical service personnel involved in the incident. As mentioned above, the type of event will define the incident commander. The National Centre for Emergency Care local operational plan should ensure for the changeover from a single individual managing the entire incident to a delegation of authority. In either case, the tasks to be accomplished under emergency medical services remain the same.

Extrication

The extrication function reports to and is designated by the incident commander. The Hellenic Fire Brigade is responsible for the extrication function in Greece:

- determining whether primary assessment and primary treatment are to be conducted on site,

keeping in mind the continued threats to safety for the responding personnel at the scene;

- evaluating the resources needed for the extrication of trapped patients and their removal to the treatment area;
- assessing possible safety hazards in the environment and ensuring that they have been neutralized prior to initiating extrication activities;
- requesting additional equipment and personnel, as needed, from incident management;
- supervising all personnel assigned to the extrication function;
- sending progress reports to the incident manager;
- reporting to the incident management when all patients have been extricated and delivered to the treatment area; and
- coordinating activities with triage, treatment and fatality management.

Decontamination

- The Hellenic Fire Brigade has primary responsibility for prehospital patient decontamination.
- The National Centre for Emergency Care will designate a special team to provide health care in the warm zone and to decontaminate non-ambulatory patients.
- The National Centre for Emergency Care is responsible for cold-zone activities that include patient care.

Triage

The triage function is a responsibility of National Centre for Emergency Care personnel at the scene, who are responsible for the following:

- sorting patients to establish priorities for extrication, treatment and transport;
- ensuring that all patients are triaged according to a pre-agreed protocol or system;

- directing and supervising the teams that perform triage and transport;
- ensuring that all patients are transferred to the appropriate treatment areas;
- maintaining communication and coordinating activities between the different teams: treatment, extrication and fatality management;
- requesting additional personnel and equipment if needed;
- coordinating the activities of all prehospital personnel assigned to triage; and
- managing all triage activities at the scene and providing regular updates to the health care commander at the scene.

Treatment

The treatment supervisor at the site of a mass-casualty incident aims to provide the best possible on-site treatment of patients and is responsible for the following:

- determining the number and type of possible injured people;
- establishing priority areas for treatment at the site by the triage system (red, yellow and green);
- inventorying the equipment and personnel necessary for supervising care in their area and deploying them properly;
- providing for the proper deployment and use of personnel;
- receiving patients as they are transferred from the triage area to the treatment area;
- ensuring that patients are regularly reassessed and re-triaged;
- ensuring that patients within the treatment area get appropriate treatment;
- providing guidance and direction to treatment team personnel;
- maintaining continual communication with transport to ensure coordinated transfer of patients to patient loading areas;

- coordinating activities with extrication, triage, transport and fatality management; and
- providing regular updates to the National Centre for Emergency Care supervisor.

Health care transport

The transport supervisor is responsible for managing the safe transport of patients requiring health care from the incident scene to the appropriate receiving health care facility and is responsible for:

- establishing a patient loading area;
- establishing or designating a mass-media communication function;
- arranging appropriate vehicles and methods of patient transport (ground or water vehicle or aircraft);
- maintaining a log of vehicle and patient destinations;
- coordinating patient allocation and transport with the treatment team;
- determining the capability and capacity of receiving hospitals and specialty referral centres;
- assigning patients to be transported to each facility in accordance with pre-determined plans and policies or consultations with health care facilities or the Health Coordination Command Centre;
- communicating with the receiving facilities on patients' condition and status;
- providing regular progress reports to the health care commander at the scene;
- reporting to the health care commander when the last patient has been transported; and
- supervising ambulance, paramedic and other transport crews and all other personnel assigned to the transport area.

Health care communication

The health care communication function is responsible for establishing, maintaining and

coordinating health care communication at the incident site between the operations centre of the National Centre for Emergency Care, the receiving hospitals and the incident commander as well as between treatment and transport teams as needed.

Fatality management

The function of fatality management is to identify, protect and maintain the human bodies as well as supervise all personnel assigned to the on-site morgue or temporary holding area for deceased individuals. This is an area at the incident scene where bodies are kept until they can be moved to a permanent morgue. Fatality management controls access to the area and organizes, coordinates and manages these functions.

Support functions

Staging, logistics, resources, safety, public information and critical incident stress teams are support functions to incident management.

Communication

Requirements

Emergency medical service communication is essential during a mass-casualty incident to ensure that the emergency medical service communication system can meet the needs of the incident and not become disabled by the mass-casualty incident. Methods of communication include:

- land lines;
- mobile telephones;
- radios and citizens' band (CB) radios;
- TETRA (terrestrial trunked radio: professional mobile radio and walkie-talkies).

Support functions

A communication system must provide the means by which the emergency resources provided by National Centre for Emergency Care can be accessed, mobilized, managed and coordinated.

Hospitals

Hospitals and health care

The following are basic components of hospital planning:

- integrating response functions within their facilities and coordinating efforts with outside agencies;
- logistics, including a supply management system, planning for facilities use and a system for transporting patients, providers and materials;
- security, which is critical to enabling the other components to operate as intended;
- clinical care, which includes all clinical services whether or not the facility would normally provide these services;
- human resources; and
- public relations and public information as defined by the overall emergency plan.

Information on the capacity of the health care system

Patient distribution and resource requests during a mass-casualty incident depend on knowledge of the capacity of hospitals and health care facilities. Awareness of facility resources, particularly staff and bed capacity resources, is important in determining ability to manage victims. Available bed capacity alone does not determine the ability to take care of patients but may be used as a benchmark for the ability of a system to accommodate an incident in progress with-

out outside assistance. Intensive care units, specialty units, same-day clinics, decontamination units and general hospital beds should be included.

The National Centre for Emergency Care should understand the capacity of the hospital system and specific hospital capabilities, and the operations centre of the National Centre for Emergency Care should be able to communicate with the hospitals in real time to allow victims to be directed to an appropriate facility.

Command and control within the hospital

The incident management system is a system that is consistent with and used by the public health entity coordinating hospital response in a disaster. The hospital should designate an appropriate area for coordinating the hospital response. This will serve as the institutional command centre for the incident and also the contact point for outside agencies working with the hospital.

Notification

- Hospitals should receive immediate notification of a mass-casualty incident via radio or other pre-designated means, with a back-up method available in case of radio failure. TETRA or mobile telephones may be used as a suitable communication system, if available.
- Hospitals should have a method to notify their staff within the facility of a mass-casualty incident such as an overhead speaker.
- Hospitals should have a method to call in staff not within the facility during a mass-casualty incident, such as paging or call-in lists.
- The Hellenic Police, Hellenic Fire Brigade and National Centre for Emergency Care should

provide hospitals the following information immediately after the incident is recognized:

- location and type of incident;
- estimated number of casualties, severity and types of injuries;
- special resources needed;
- decontamination need; and
- need for fatality management.

Communication for the hospital

- Internal – including telephone, mobile telephone, Internet, fax, paging, radio, TETRA and courier.
- External – all the above, possibly including satellite phone. The operator should have means to divert large incoming call volumes or have a pre-recorded greeting.
- Telephone, radio, and other contact information with outside agencies and within the facility should be easily available and protocols for calling in and notification established (such as whether to call surgeons in before dermatologists).

Facility security

- Each facility should have a lockdown plan in place to include select entrances and exits to be used during a mass-casualty incident. For the rest of the hospital's entrances and exits, locking devices, staff assignment or security at entrances and exits should be foreseen.
- Staff should have appropriate photographic identification.
- Security plans for the facility should be in place, and Hellenic Police support may be needed to provide support if private security at the hospital is overwhelmed or unable to handle the situation.

- Security personnel should be trained to operate while using personal protective equipment if needed for an incident involving the potential deliberate use of biological and chemical agents or radionuclear material.

Protecting hospital infrastructure

- The hospital infrastructure plan should include denying entrance and exit and shutting down the ventilation system if the facility is within a chemical plume zone or threatened by civil unrest.
- Air intakes for the facility should be monitored and/or protected from possible tampering.
- Redundant computer and communication systems should be in place.
- The facility disaster plan should include interruptions in electricity, water, gases used in health care and other interruptions of critical functions.

Staffing

- Determination of key staffing resources
- Determination of staffing patterns (shifts) in case of emergency
- Protocols for the use of students (medical, nursing, pharmacy, etc.) and volunteers
- Staff psychological support

Supplies

- Patient care supplies (including bandaging, splinting, intravenous sets and surgical supplies)
- Laboratory and blood-banking supplies
- Linens (and linen services)
- Pharmaceuticals and medication administration
- All other medical and hospital goods: beds, ventilators, intravenous pumps and poles, monitors including oximetry, wheelchairs and carts

- Predictions of the quantities of personal protective equipment for personnel (respiratory protection, suits etc.) according to the incident, with personal protective equipment consistent with international guidelines and Hellenic Centre for Infectious Diseases Control guidelines
- Radiation and/or chemical detectors

Patient care

Triage – all patients arriving at the facility should be evaluated by personnel of the emergency department either adjacent to the facility or just inside the emergency department and assigned a triage category. If the hospital physicians are overwhelmed by the emergency, other health care personnel may assist in the triage process.

- Inpatient triage – based upon the situation, triage of inpatients may be required if resources are exceeded. Internal and preferably system policies should govern such decisions.
- General patient care – life-saving care is provided first. Definitive care for more minor injuries as well as non-life-threatening laboratory and radiological testing is deferred until adequate resources are available.
- Special and vulnerable populations – health care protocols should be developed to address the needs of children and other vulnerable populations in relation to a mass-casualty incident.

Special situations

Resources are needed for incidents involving biological and chemical agents or radionuclear material, crush, blast and burn.

- A decontamination area is needed for contaminated patients, preferably away from the entrance to the emergency department.

- Hospitals should be able to detect radionuclear material on arriving patients and to decontaminate contaminated patients that may arrive at their facility.
- Hospitals should have the resources to treat victims of incidents involving biological and chemical agents or radionuclear material, crush, blast and burn.

Surge capacity

Within the hospital, some or all of the following means may generate additional capacity for overall patient care:

- use of specialties (such as obstetrics and gynaecology, ophthalmology and dermatology);
- use of students; and
- use of volunteers.

If the mass-casualty incident surpasses the capacity of a single hospital designated to respond to the incident, then the following may be additional options.

Regional hospital coordination

Hospitals within the area affected by the mass-casualty incident must be able to communicate and redistribute patients and resources across the hospital system. Examples include arranging buses to transport patients with minor injuries from hospitals that are overwhelmed to those with capacity and moving staff, supplies and patients within the system to better match resources to demand. Hospitals should have an organizational system in place for coordinating a mass-casualty incident. If regional resources clearly will be inadequate, this same system should seek outside resources and plan triage strategies to best match resources to demand.

Public health authorities or a ministry may act as the central coordination point for these activities. The

communication and resource movement process must be understood and practised prior to the event. Regional coordination is especially important for specialty patient care (paediatrics, burns and infectious disease patients).

Community-based patient care

For a large group of patients with minor injuries present at a site or that can be transported to a central location, triage and treatment should be provided in the perimeter of the accident. The National Centre for Emergency Care and public health services should initiate this, with hospitals providing staff and supplies. These sites will address minor injuries only. National Centre for Emergency Care and hospitals should determine before an event the record-keeping, staffing and supply requirements for these sites. Prepackaged trailers or boxes of supplies may facilitate setting up these sites. The location of these sites should be pre-planned and may include tents or other facilities, particularly in proximity to high-risk sites of a mass-casualty incident. Hospital overflow (off-site hospital) – if the inpatient capacity of the health care system is inadequate to cope with the demands of a mass-casualty incident, other facilities may be utilized as austere hospitals pending patient evacuation or the arrival of additional resources.

National and international response

When an event is recognized that exceeds the capacity or specialized capability of the health care system of a single local authority or even a single country, early request for both patient evacuation resources and specialized resources (such as collapse rescue teams, ventilators and burn intensive care) should be made to appropriate governments and nongovernmental organizations.

Moving casualties within the country and internationally

If the capacity of the regional hospital system is anticipated to be exceeded, casualties should be moved early out of the area to other hospitals in the country. Airlifting casualties to other countries, if required, would demand close coordination and patient tracking. Planning for a mass-casualty incident response should take into consideration the time frame for such efforts.

Incorporating outside assets

The command and control structure within the regional health authorities should be prepared to accommodate the requested outside assets and assistance. Housing, feeding, credentialling, orientation, translation and other issues may need to be addressed for the incoming teams to become functional.

Information and communication

- Hospitals should provide their staff and patients with ongoing information regarding the event.
- Hospitals should be able to easily communicate with other hospitals in the area (at minimum), as well as with National Centre for Emergency Care and the Health Coordination Command Centre during an event.
- Hospitals should have a mass-media plan to account for staging, briefing and restricting mass-media access to the facility.

Patient location and tracking

- Hospitals should work with the National Centre for Emergency Care to ensure that patients' pos-

sessions and paperwork continuity are maintained.

- Hospitals should provide patient information to a coordinating agency to allow families to locate their relatives after a mass-casualty incident.
- Hospitals should carefully track any transferred patients. A master patient movement list must be coordinated with a central health authority to assure that patients are accounted for.

Mental health

Each agency, especially the ones involved in first response, should provide psychosocial support for their staff, patients, patient families and other vulnerable populations during and after a disaster.

This process should include immediate psychological and spiritual support as well as planning for long-term post-event mental health interventions and recognition of post-event stress syndromes in staff members, victims or members of their families.

Training

Levels of training

Four levels of training are recommended for the staff that may be involved in responding to a mass-casualty incident:

- basic mass-casualty incident training – recommended for all field responders who need to recognize a mass-casualty incident, report it and respond appropriately;
- intermediate mass-casualty incident training – recommended for the responders in a position to respond initially and needing to assume roles within the incident management system:

- mid-level mass-casualty incident training – recommended for National Centre for Emergency Care staff who will assume senior incident management responsibility and interface with other elements of the emergency response system; and
- senior management mass-casualty incident training – recommended for senior National Centre for Emergency Care leaders, managers and directors, who will need to interface with the mass media, coordinate with government officials and mobilize resources from beyond local jurisdictions.

Curriculum

The mass-casualty incident training curriculum should address at the minimum the following:

- overview of incident response planning;
- developing the mass-casualty incident response plan;
- principles and practices of prehospital mass-casualty incident preparedness;
- principles and practices of in-hospital mass-casualty incident preparedness;
- field management of the mass-casualty incident;
- triage techniques;
- incident management system;
- drills and exercises;
- communication;
- coordination with other agencies, jurisdictions and services;
- incident-specific guidelines, such as dependent on size, incendiary, hazardous materials, collapse, environmental and the deliberate use of explosives, biological and chemical agents or radio-nuclear material;
- psychosocial effects of mass-casualty incidents on responders, victims, families and the community; and
- evaluating and applying lessons learned from actual mass-casualty incident responses, drills and exercises.

Objectives of training

At the end of the training session(s), trainees should be familiar with:

- incident types;
- communication systems;
- pre-planning phase functions;
- site command functions;
- site triage;
- special resources;
- staging management;
- patient identification and tracking systems;
- medical control;
- transfer of command procedures;
- patient care capacity inventory;
- surge capacity;
- patient transport decision procedures;
- prehospital and hospital decontamination;
- inter-hospital coordination;
- security; and
- the role of the Health Coordination Command Centre in joint information release.

Training drills and exercises

The purpose of a drill is to test the prepared plan, evaluate personnel performance, strengths and weaknesses, provide experience and training and draw attention to any further areas of improvement.

Mass prophylaxis planning¹

Introduction

This is an outline of the recommendations for the creation of a mass prophylaxis plan in Greece during the Athens 2004 Olympic Games.

Purpose

The plan is intended for use during the Athens 2004 Olympic Games period but should be flexible enough to be used under other circumstances. The plan involves distributing pharmaceuticals, vaccines and bandages but not personal protective equipment.

Scope

The plan is intended for use when the event exceeds the capability of the national health system (such as more than 300 casualties).

Situations

The plan is to be used for a suspected or actual deliberate use of biological and chemical agents or radionuclear material.

Assumptions

There is a centralized or decentralized stockpile of pharmaceuticals, vaccines and medical supplies.

The situation immediately overwhelms the regular health care or public health system or is anticipated to do so quickly.

Multiple incident locations may be involved.

There may be parallel requests for health care assets.

There may be shortfalls in local capacity to distribute or dispense health care assets.

There may be a request for international assistance.

Officials may need to determine priorities for or triage health care resources.

Local jurisdictions may request help with dispensing responsibilities.

The mass prophylaxis plan is one component of a larger emergency response effort.

The event could be caused by an organism for which no chemotherapeutic prophylaxis measures or health care, besides supportive care, is available.

There may not be sufficient personnel available.

¹ For additional information on the approach outlined here, see: *Receiving, distributing and dispensing strategic national stockpile assets: a guide for preparedness*. Version 10.02. Atlanta, United States Centers for Disease Control and Prevention, August 2006.

No central logistical or patient database system may be in place.

Responsibilities

National level

The Health Coordination Command Centre will be responsible for initiating the mass prophylaxis plan. The decision to initiate the plan may be based on many factors, including:

- data from epidemiological analysis;
- the estimated number of exposed or ill people (immediate and projected over a 24-hour period);
- hospital bed availability; and
- needs assessment to determine the quantities of drugs required to support the plan.

Some factors to consider for mass prophylaxis include determining the following information:

- current quantities of resources on hand at Olympic hospitals, pharmacies and in the national stockpile;
- how many people are expected to be treated: assessments indicate that, during the Athens 2004 Olympic Games, there will be about 9 million people in the Athens area;
- how many people are involved in the event of the incident;
- duration of prophylaxis – based on the disease: for example, anthrax, plague and tularaemia all have different courses of disease and treatment;
- packaging formulations – based on how the drugs are packaged: for example, in Greece, ciprofloxacin is packaged in boxes of 10 pills (five-day course) and doxycycline is packaged as 8 pills (four-day course);

- the amount of time required to obtain and transport additional stock from suppliers or international support; and
- size of the child population to assess the need for suspension forms of medication.

The Health Coordination Command Centre will make the requests for international assistance to the Olympic Security Coordinating Council, which will then request assistance from the Olympic Advisory Group of countries (Australia, France, Israel, Russian Federation, Spain, United Kingdom and United States of America).

Identifying sufficient health care professionals and volunteers may be a critical element of this plan. Multiple agencies could be called upon to provide staff for support in a disaster. In addition to the Ministry of Health and Social Solidarity, with proper coordination, health care professionals could be recruited from the Ministry of the Interior, Public Administration and Decentralization, which has authority at the prefecture level, and the Ministry of Employment and Social Protection, which also supervises health care professionals at the Social Insurance Institute. If the need for volunteers (international) developed to assist with the staffing requirements to support this plan, the Ministry of Health and Social Solidarity would determine these needs and the Ministry of Foreign Affairs would request them.

The Health Coordination Command Centre will work with the Olympic Security Coordinating Council to develop guidance or a policy of setting priorities for the use of scarce resources.

Greece has limited stockpiles of pharmaceutical and other health care assets in specified locations.

Vaccines issues include the following.

- Vaccines to be used in case of the potential deliberate use of biological and chemical agents

or radionuclear material are determined by the Hellenic Centre for Infectious Diseases Control, the National Vaccine Committee and by the Department of Public Hygiene of the Ministry of Health and Social Solidarity.

- Vaccine supplies and vaccine stocks are determined by the Health Coordination Command Centre, in collaboration with the Department of Medicines and Pharmacies and the Department of Public Hygiene of the Ministry of Health and Social Solidarity and the National Organization for Medicines.
- Vaccination and mass prophylaxis clinics are determined by the Department of Primary Care of the Ministry of Health and Social Solidarity on the advice of the Hellenic Centre for Infectious Diseases Control.

The Department of Public Hygiene of the Ministry of Health and Social Solidarity in collaboration with the prefectures will determine the locations of the dispensing sites to be used for the mass prophylaxis plan. These sites will be selected according to the specific criteria detailed in the dispensing section of this plan.

Regulatory issues that deal with drug-dispensing operations must be considered, and possible modifications for emergency situations also need to be considered in collaboration with the appropriate government agencies.

Possible responsibilities of local jurisdictions or hospitals in the plan

Many aspects of this plan involve the use of information and resources at the prefecture level of government. Some coordinating issues that involve the prefectures include:

- selecting dispensing sites within the community;

- selection of storage facilities for large quantities of drugs in the community;
- use of staffing resources to assist in dispensing operations;
- obtaining quantities of local health care assets; and
- possible use of local police for security.

Security

The hospital administration is responsible for hospital and clinic security. If more security assets are required at hospitals or clinics, the Olympic Games Security Commission will provide those extra resources.

The Ministry of Health and Social Solidarity will coordinate with the Ministry of Public Order and possibly the Municipal Police to provide security at warehouses that store medical supplies to support this plan.

The Ministry of Health and Social Solidarity is responsible for security at selected dispensing sites.

The Olympic Games Security Commission is responsible for security at the Olympic venues.

Multi-agency coordination between the following ministries and agencies should occur to ensure proper security for vehicles transporting medical supplies between storage sites and points of distribution, dispensing clinics or hospitals:

- Ministry of Health and Social Solidarity;
- prefectures;
- Ministry of Transport and Communications;
- Ministry of Public Order; and
- perhaps the Ministry of National Defence.

The Athens 2004 Olympic Games Organizing Committee is responsible for credentialling within the venue.

Crowd control will be a major function of all security forces at dispensing sites, hospitals, clinics and storage sites.

Hellenic Armed Forces

The role of the Hellenic Armed Forces in this plan is still under discussion between the Armed Forces and the Ministry of Health and Social Solidarity. If assistance is approved, once properly coordinated, the Armed Forces may be used in the following ways to support a mass prophylaxis response for the Olympic Games:

- route security;
- crowd control;
- site security;
- vehicles to transport assets and people;
- health care personnel to support the response effort; and
- enforce quarantine procedures.

Transport

Sufficient quantities of trucks and other transport assets will be required to move health care assets to support this plan. Trucks may have to move health care assets between storage facilities and dispensing sites, hospitals or clinics. Buses may be required to move citizens and visitors to area dispensing sites. To ensure the availability of these transport assets, the Ministry of Health and Social Solidarity (more specifically the department responsible for logistical support) will coordinate with the Ministry of Transport and Communications through the General Secretariat for Civil Protection.

The Armed Forces and Red Cross could also play a role in providing transport assets, but these potential sources must be coordinated to ensure timely support.

Communication

Access to effective communication infrastructure is important to the mass prophylaxis plan. This issue was discussed in various sections throughout the plan. It is critical to ensure that redundant communication means are established to support the following activities:

- activation of the plan;
- recall of staff;
- movement of supplies from storage sites to hospitals and clinics;
- communication capability at warehouses and dispensing sites;
- health communication;
- communication with the Health Coordination Command Centre; and
- other considerations.

Logistics and storage facilities

Many factors should be considered when identifying storage sites for health care assets. The storage sites should have adequate space, sufficient power and electrical back-up systems, communication capability to include data and voice phone lines, climate control to ensure the efficacy of the drugs, material handling equipment (pallet jacks and forklifts), an inventory control system, refrigeration for vaccines and security.

Warehouses must be prepared to operate 24 hours per day if required. Warehouse space to support this plan must still be determined.

The Ministry of Health and Social Solidarity must coordinate staffing resources (logistics staff) to support the warehouse operations.

Mobilization of assets from storage facilities to dispensing sites

The Ministry of Health and Social Solidarity is responsible for managing the warehouse operations where health care assets are stored. If large quantities of supplies must be moved, the Ministry of Health and Social Solidarity must coordinate with the Ministry of Transport and Communications for additional support.

The Ministry of Health and Social Solidarity is responsible for ensuring that the proper type and quantity of health care assets are delivered to the appropriate dispensing site, clinic or hospital.

Points of distribution or dispensing sites, including selection criteria

Establishing timely dispensing operations requires preselecting dispensing sites to be used instead of selecting them at the time of the potential deliberate use of biological and chemical agents or radionuclear material.

Dispensing sites have not yet been selected to support this plan. The Department of Public Hygiene of the Ministry of Health and Social Solidarity will work with the prefectural departments of public health to determine the dispensing sites to support this plan.

- Once the sites are selected, a list of site addresses should be added as an annex to this plan. Maps to the location must also be provided.
- Sites will be selected based on specific criteria as determined by the Department of Public Hygiene of the Ministry of Health and Social Solidarity, and these criteria will be provided to

the prefectures to assist them in identifying dispensing sites. Some physical characteristics to consider when selecting a site include:

- sites should provide protection from harsh weather conditions and should be temperature controlled;
 - sites should have adequate restrooms, running water and electricity;
 - sites should have a loading area for receipt of additional pharmaceuticals;
 - sites should have adequate space for parking or should be easily accessible via mass transport; and
 - sites should be near or should be well-known landmarks (church, school, stadiums or an auditorium) that are easily identified within the community and capable of holding large numbers of people.
- It is recommended that the dispensing sites not be located at hospitals. This may further complicate the issue:
 - if the incident involves biological agents, since this could further contaminate critical facilities; and
 - it would definitely impair the function of hospitals, as they should deal with people who already are ill.

Consideration and appropriate plans for home access must be organized for those who cannot physically go to dispensing sites.

Photographic identification or passports should be required to receive medication at dispensing sites, but based on the availability of resources, people can pick up to additional prophylaxis regimens for extended family members.

The number of dispensing sites selected will also impact the staffing requirements.

Dispensing staffing requirements

The plan must identify how staffing resources will be selected to staff the dispensing sites. Dispensing sites require many types of specialties that include:

- dispensing site coordinator (administrator);
- physicians;
- nurses;
- pharmacists;
- translators;
- volunteers;
- supply and logisticians;
- technicians;
- administrative personnel; and
- police and security.

These staff could potentially come from a variety of sources including hospitals or local health centres, prefectures and municipalities, nongovernmental organizations approved by the Ministry of Health and Social Solidarity, local medical and pharmaceutical professional associations, medical and nursing students, the Ministry of Employment and Social Protection (Social Insurance Institute) and/or the Hellenic Armed Forces and the Hellenic Police. Obtaining the appropriate staff requires proper coordination or memoranda of understanding with the relevant agencies.

- Once dispensing site staff members are determined, the plan will identify how these staff members will be notified and a detailed list of important contact information for each staff member will be developed for each dispensing site selected and added to the plan.
- The plan should include job descriptions, and training should be provided for selected staff.
- The plan should include procedures to provide prophylaxis to staff members and volunteers before expecting them to work.

A sufficient number of dispensing site staff members

must be available to support the following processes at the dispensing sites:

- registration and greeting;
- triage;
- counselling and education;
- dispensing of pharmaceuticals, with multiple dispensing stations within each dispensing site to maximize the number of people receiving prophylaxis; and
- checkout or exit.

According to dispensing site modelling available through the United States Agency for Healthcare Research and Quality, about 40 health care and other professionals may be needed to staff one dispensing site to treat approximately 150–200 people per hour. This model assumes four dispensing stations within the dispensing site. According to this model, in an eight-hour period about 1200–1800 people could be treated. If the situation requires more treatment capacity, adjustments could be made by adding more staff, adding more dispensing stations within the site and other variables.

A coordinator is necessary to supervise the operations and staff at each dispensing site.

All staff should have special credentials and possibly a specific uniform to identify them to the public.

Coordinating the mass prophylaxis plan with health communication plan

To minimize panic during an incident, the public health communication plan must contain comprehensive, accurate and reassuring information about treatment and prophylaxis for the public.

The public information campaign must inform the public, including:

- specific drug information on the drugs being distributed and the possible side effects, which are these are provided on patient information sheets;
- where the dispensing sites are located and the hours of operation;
- who should report to dispensing sites and what type of information, credentials etc. they should bring with them;
- information on vulnerable populations, especially those who cannot get to dispensing sites: children, elderly people, disabled people, nursing home residents, people in jail etc.;
- for the Olympic period, this message must be in various languages; and
- how they can get further information (telephone numbers and e-mail addresses).

Because more than one drug may be available to treat an illness, a public health message must ensure that the public is aware that the drugs delivered are of equivalent efficacy and they will be given based on the availability.

Finances and budget

The outline lists considerations for inclusion in the plan.

International assistance

The Health Coordination Command Centre will request international assistance from the Olympic Security Coordinating Council, which will then request assistance from the Olympic Advisory Group of countries (Australia, France, Israel, Russian Federation, Spain, United Kingdom and United States of America).

Recovery of health care resources

The outline lists considerations for inclusion in the plan.

Crisis communication plan

Introduction

The main objective of this action plan is to minimize the negative impact on public health that might occur due to a natural or human-made disaster before or during the Athens 2004 Olympic Games. Communication is a critical area demanding not only detailed planning but ongoing awareness because it is the link that facilitates coordination and serves as the bridge between the government, the mass media and the public. This plan includes four phases:

- the period before the Athens 2004 Olympic Games;
- the Olympic period;
- the period during an emergency; and
- the period after the emergency.

The pre-Olympic period

The pre-event phase of a crisis is the most important phase. Each day spent preparing is a valuable investment that will yield successful communication during the confusion following a critical event. All the planning and most of the work should be done during this phase, including anticipating potential events the Athens 2004 Olympic Games may face.

Action steps

- Every agency involved in organizing the Athens 2004 Olympic Games should designate a spokesperson and an alternate for all four phases of the action plan.

- In addition to the spokesperson, agencies should designate a pool of specialists who would help the spokesperson provide accurate information.
- All spokespeople of the agencies involved in organizing the Athens 2004 Olympic Games should be part of a crisis management communication team. The responsible ministries will decide the coordination and function of this team.
- During the pre-Olympic period, the Ministry of Health and Social Solidarity should train all spokespeople on working effectively with the mass media and managing communication during a crisis.
- All four phases assume that there is a Joint Information Centre, with representatives present from the Athens 2004 Olympic Games Organizing Committee Press Centre, Zappeion Media Centre and other relevant agencies.
- Greek journalists accredited by the Ministry of Health and Social Solidarity should get information and training. The appropriate communication team of the Ministry of Health and Social Solidarity will conduct the training, which will address the procedures to be used before and during the Athens 2004 Olympic Games and especially during a crisis.
- The possible public health threats for which messages should be communicated to the public in the form of an information campaign should be defined. The political leadership of the Ministry

of Health and Social Solidarity should decide what should be communicated in the messages.

- The Ministry of Health and Social Solidarity should ask for contact information for all accredited mass-media representatives, from both Greece and elsewhere, at the Athens 2004 Olympic Games as well as their delegates from the Athens 2004 Olympic Games Organizing Committee to establish a direct line of communication in case of an emergency.
- The Ministry of Health and Social Solidarity should establish teams for web site management and hotline (or health line) management.
- The web site of the Hellenic Centre for Infectious Diseases Control should be linked with that of the Ministry of Health and Social Solidarity.
- The Ministry of Health and Social Solidarity telephone centre should be staffed with employees who speak English or other languages and are trained to handle telephone calls.
- Enhance the function of the Press Office of the Ministry of Health and Social Solidarity with employees from the Ministry of Health and Social Solidarity agencies to organize technical and administrative support and subject matter experts.
- Convene a regular meeting (such as weekly) of all involved agencies and teams under the supervision of the Secretary-General of the Ministry of Health and Social Solidarity.
- A system should be developed to distribute daily bulletins through an international or multilingual broadcast network.
- Rotation schedules should be developed for public information officers staffing any incident to prevent burnout.
- Secure staging areas should be identified for the mass media at or near each venue.
- Redundancy should be built into the system (non-electronic communication back-up).
- The Health Coordination Command Centre should establish an interministerial emergency communication council for health issues.
- A communication and message clearance process should be identified for each agency, as provided by legislation or as defined by the hierarchy, to minimize delays for releasing communication in an emergency.
- A circular should be issued for all involved health agencies of the Ministry of Health and Social Solidarity that clearly defines their role in information management.
- The point of contact or spokesperson should be identified for each government of the countries attending the Athens 2004 Olympic Games. The Ministry of Health and Social Solidarity should verify that such a list exists.
- Key audiences should be identified for a crisis event (first-responders, hospitals, primary care providers and government officials) as well as strategies for communicating with them during an emergency.
- Public information officers should be identified and trained in Olympic cities, prefectures and all agencies and organizations involved in the Athens 2004 Olympic Games. This might include hospitals, transport, public works, law enforcement and other emergency responders.
- A protocol should be established for how the mass media will be informed during an incident.

- A list of embassies and health ministries in other countries should be compiled, including contact information for the point of contact. This list will be used to share information for dissemination in other countries during an incident involving the deliberate use of biological agents or other public health emergency.
- Core messages should be established for the most likely incidents (earthquake, anthrax, conventional bombs, etc.). Messages should include action and advice for the public (shelter in place, avoiding the site with radionuclear material, etc.)
- A drill should be conducted to test the communication system and all its components.

During the Athens 2004 Olympic Games

Even in the absence of a crisis, continuing regular communication is important. This will ensure that systems are ready for an emergency.

- A daily briefing should be conducted at the Health Coordination Command Centre. This will ensure that everyone is informed about operational issues that arise and how they are being addressed.
- "Good news" stories with a positive message should be released in a coordinated way to avoid excessive focus on potential problems.
- News coverage should be monitored so that erroneous messages can be corrected and trends can be identified and followed.
- A daily report should be provided at the end of each day to all participants in the communication plan identified above.

During an emergency incident

The incident phase of an emergency is often characterized by uncertainty, rapid rate of change and intense mass-media interest. Disseminated information and facts are usually incomplete. Information coming from the mass media or other sources may not be accurate. Simplicity, credibility, verifiability and speed count when communicating with the public and the mass media during this phase.

- A 24-hour hotline should be established within the Ministry of Health and Social Solidarity as soon as possible after the incident.
- The Ministry of Health and Social Solidarity call centre should be staffed with trained employees who know at least English as well as Greek, as mentioned in the pre-Games section.
- The Hellenic Centre for Infectious Diseases Control web site should include instructions for handling acute incidents.
- Staffing and scheduling should be ensured to support a 24-hour presence of the employees of the Press Office of the Ministry of Health and Social Solidarity, enhancing the shifts from 09:00 to 21:00.
- An ongoing flow of bulletins and messages (instructions for protection, for public actions seeking help, etc.) should be provided based on the established dissemination mechanism.
- A government-wide Joint Information Centre should be created for operation during the period of the Olympic Games in the same location as the government-wide Joint Operation Centre.
 - In the event of an emergency, the Joint Information Centre should be given a lead

role in talking to the mass media and providing a single point of contact.

- The mass media should be directed to the Joint Information Centre for all emergency-related enquiries, and supporting agencies should be aware that all enquiries should be directed to the Joint Information Centre.
- Messages should be coordinated with all agencies and ministries involved to ensure accurate information on response operations.
- Since there will already be a well-equipped and staffed media centre for Olympic events, the Joint Information Centre should use their cooperation for distributing information and assistance in regulating mass-media enquiries.
- Have a Joint Information Centre representative at the Joint Operation Centre and vice versa.
- During the initial 12–24 hours of the emergency incident, the following steps must be taken:
 - verify the situation;
 - conduct notification;
 - assess the level of crisis;
 - organize and delegate assignments;
 - prepare information and obtain approvals and clearance for messages or information; and
 - release information to the public.
- Risk communication components in the first 12 hours should:
 - acknowledge the event with empathy;
 - explain and inform the public in the simplest terms;
 - establish the credibility of organizations and spokespeople;
- provide emergency courses of action (including how and where to get more information);
- commit to the stakeholders and public your continued communication;
- identify what key messages should be sent immediately, explaining (to the extent possible): what happened; how; where; to whom; with what consequences; what is being done to resolve the situation, mitigate harm, locate people who might have been at the scene and protect others; what people should do to protect themselves; and if these answers are not known, tell people what is being done to find the answers and when or where they can get more information; and
- set up a hotline where people can call with questions – even if it is just to have someone to connect with.
- Throughout the event, there must be an established schedule of press briefings.
 - The operational leadership should make themselves available at least once or twice a day, and the Joint Information Centre staff should be prepared to provide more frequent updates.
 - In the initial hours during or after an incident, the updates should be hourly – even to tell the press there is nothing new to report. If the mass media know that there will be regular briefings at a given location, it will focus their coverage.
 - Make sure to advertise the times at the end of every communication so that the mass media and the public know when and where to get further information.
- Civil Defence Crisis Command Centre staff should be worked with to provide limited mass media access to impacted areas by escorting a

small media pool into the area or ensure the government provides appropriate video and still photography of impacted areas.

- The mass media should continue to be monitored. All questions from and answers given to the mass media should be kept in a searchable document that the Joint Information Centre and its liaisons can search to ensure consistency of messages.
- Contact health ministries in other countries, the European Commission and possibly WHO to provide updates in the case of a public health emergency.
- Public information officers should be trained and always remember that their role is:
 - to assess the situation;
 - to determine that communication is based on verified facts;
 - to verify the true magnitude of the event as quickly as possible;
 - to determine response strategies;
 - to disseminate the most accurate information possible as soon as possible after the event; and
 - to speak with empathy and acknowledge the possible insecurities that exist, especially during the beginning of the response phase.

Following an emergency incident

The post-incident phase is a time of retrospection and critical assessment for organizations involved in a crisis. Research has shown that a community is most responsive to risk avoidance and mitigation education directly after a disaster has occurred because they have been sensitized. As a crisis subsides from its volatile peak, public enquiries and calls generally

decrease; however, although questions are fewer in number, they may be more complex and difficult to answer. The public wants to hear about the lessons learned and steps that will be taken to prevent the situation from recurring. People want to be reassured of their safety, and they are in search of resolution. Care should be taken during the crisis or incident period to frame messages with the long-term view in mind. Interim recommendations and new information identified that changes as an investigation proceeds should be woven into messages during the unfolding crisis.

- During this phase, public information officers should take the lead in:
 - expressing relief and thanks to all involved;
 - settling internal and external concerns about the crisis;
 - addressing potential aftershocks;
 - planning for future crises; and
 - helping key stakeholders (such as employees and their families, the public and the mass media) to move from the emergency situation to resolution and recovery.
- Communication objectives for the resolution phase include:
 - persuading the public to support public policy and resource allocation to the problem;
 - promoting the activities and capabilities of the agencies involved in the response;
 - improving appropriate public response in future similar emergencies through education; and
 - honestly examining the problems and mishaps and reinforcing what worked in recovery and response efforts.
- Throughout this phase, information should be provided about health risks and action the public should take as part of the recovery process.

- Periods of increased mass-media attention following the event should be anticipated, such as during anniversaries or other related news events.
- In the final stages of the response, focus on maintenance and evaluation. Maintenance steps include:
 - expressing relief, celebration and thanks for getting through the incident;
 - providing for the well-being and recovery of the crisis communication team;
 - analysing what went wrong and what caused problems; and
 - conducting relevant public education activities.
- During the evaluation stage:
 - monitor messages and events (including the mass media, the public, partners and stakeholders);
 - debrief crisis communication response (early);
 - review data on messages, delivery and effects;
 - compile and analyse a comprehensive set of data;
 - develop results and lessons learned and report measures of success; and
 - establish a new stage of readiness to implement changes to the emergency response communication plan.

Mass gatherings represent significant challenges for health systems and increasingly so in the light of emerging global threats to public health such as communicable diseases, environmental disasters and the potential deliberate use of biological and chemical agents or radioactive material. This book gives a comprehensive account of the experience and lessons learned from the public health aspects of the Athens 2004 Olympic Games. The book comprises an important resource for public health professionals in preparing large-scale events and in assisting in building capacity to deal with public health emergencies.

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