

INTERNATIONAL PERSPECTIVES

Mass Gathering Preparedness: The Experience of the Athens 2004 Olympic and Para-Olympic Games

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Abstract

Planning for environmental health management of the Athens 2004 Olympic Games included assessment of the capacity and deficiencies of relevant public health agencies in Athens and the other four Olympic cities with 17 detailed questionnaires. Different estimates of the expected number of visitors were made on the basis of experience from previous Olympic Games. Potential public health risks were identified and prioritized. A number of deficiencies in personnel, resources, training, and coordination were identified in most agencies. One hundred and ninety-six environmental health inspectors were expected to work during the Olympic period. Around 18,000 athletes and escorts from 201 countries were expected to participate in the Olympic Games and 7,000 to participate in the Para-Olympic Games. Three different scenarios regarding the number of expected visitors were explored; the most probable estimate being 1,950,000 visitors. Foodborne diseases, waterborne diseases, and heat-related illnesses were considered of high priority during the Olympic period, as were traffic accidents. The Olympic Games are a difficult assignment that demands extensive planning, appropriate resources, and timely reporting and coordination among the various public health agencies.

Introduction

The Athens 2004 summer Olympic Games were expected to be the largest event in Greek and world sporting history and one of the greatest challenges the various public health agencies in Greece had faced. A large number of athletes from different countries and a multiplicative number of visitors were expected to gather in a relatively small geographic area. Planning for the Athens 2004

Olympic Games benefited from experience gained at previous Olympic Games in Atlanta and Sydney (Bennett, Bartlett, Burgess, & Spooner, 2000; Meehan et al., 1998) and at other mass gatherings (De Lorenzo, Boyle, & Garrison, 1992; Green & Burnham, 1998; Leonard, 1996).

The opening ceremony for the Olympic Games was scheduled for August 13 and the closing ceremony for August 29. The Para-

Olympic Games were scheduled two weeks later, starting on September 17 and continuing until September 28. The Olympic period was defined as the period between August 2 (opening day of the Olympic Athlete's Village) and September 30 (closing day of the Olympic Venues). During that time, the average daily temperature and humidity in Athens are significantly higher than in any other city that recently hosted Olympic Games. In addition, the event venues are scattered all over Attica and four other Olympic cities, whereas in Atlanta the majority of events occurred within a circle 8 kilometers in diameter known as the "Olympic Ring" (Meehan et al., 1998).

Early environmental health planning and extensive preparation were undertaken to meet these challenges. The National School of Public Health in Athens, in cooperation with the Greek Ministry of Health and Social Solidarity (MHSS), formed a multidisciplinary team of public health professionals, the Olympic Planning Unit (OPU), in order to document the needs and deficiencies of the local public health agencies, identify potential public health risks during the Olympic Games, and collaborate with different governmental agencies to enhance the capacity and preparedness of the County Departments of Public Health (CDPH).

In this paper the authors present the methodology used to implement a comprehensive

needs assessment process with respect to the public health infrastructure and to prioritize the potential public health risks during the Olympic period. The authors also describe the methodology used to estimate the number of visitors expected to attend the games. Finally, they present the actual results as were observed during the Olympic and Para-Olympic Games.

Methods

Needs Assessment Process

On September 18, 2001, the Olympic Planning Unit (OPU) was established by the National School of Public Health to plan the environmental health surveillance system for the Athens 2004 Olympic and Para-Olympic Games. To begin with, the existing environmental health legislation was identified, and a needs assessment process was organized on the basis of each agency's obligations as determined by the law. Seventeen questionnaires were administered through on-site visits to collect information on personnel, resources, and training for each public health agency. The needs assessment process continued until March 31, 2002.

County departments of public health were expected to play the most important role during the Olympic period. Each county department faced different challenges, depending on the presence of Olympic venues within its boundaries, the size of its population, the number of hotels, and the number of expected tourists. The county departments of public health were ranked according to a prioritization of their needs.

Number of Expected Visitors

Knowing the number of people attending the games was a prerequisite for planning and implementing an environmental health surveillance system. Information on the number of delegations, athletes, officials, and media representatives was obtained from the Athens 2004 Olympic Games Organizing Committee. The number of visitors, however, was not known. An estimate was attempted on the basis of attendance at previous Olympic Games. The most probable sources of visitors during the Olympic Games were considered to be countries located within a circle that had a radius of four hours' travel by air from Athens. Data from previous years' most popular portals of entry during the month of August were obtained from the Greek National Tourism Organization (GNTO).

Public Health Risks

It is well known that international traveling involves risks to travelers and that mass gatherings are associated with increased numbers of accidents and higher population morbidity (De Lorenzo et al., 1992; Green & Burnham, 1998; Leonard, 1996). For example, a number of communicable diseases that are not endemic in Greece might possibly be imported. From a review of medical literature related to mass gatherings in general and Olympic Games in particular, the authors identified potential public health risks for the Athens 2004 Olympic and Para-Olympic Games. The potential risks were divided according to etiology (infectious and non-infectious) and were categorized in terms of likelihood of occurrence, as high or low priority.

Results

Needs Assessment

More than 100 on-site visits were conducted in Athens and the other Olympic cities (Thessalonica, Patra, Volos, and Iraklio), and a total of 170 questionnaires were completed. As a result, many deficiencies in personnel, resources, training, and coordination were identified in most county departments of environmental health. Environmental health inspections performed at the time of the assessment were deemed insufficient, and no effective penalty system was identified.

Therefore, a series of proposals were incorporated into the actual Olympic environmental health plan. The proposals were for the development and implementation of special regulations, to be specifically prepared prior to the Olympic Games, and the enhancement of county department of public health capacity. 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 inspections during the Pre-Olympic and Olympic periods, and special efforts were made to have personnel assigned accordingly. Specific training programs for the public health inspectors were developed, focused on the performance of standardized environmental health inspections that used specific checklists and on the documentation of the results on Epi Info electronic databases. A program of intense inspections during the Olympic period, modified for the inside and outside of the Olympic venues, was also considered. The safety and sanitation of food (preparation and service), drinking water,

pest control, waste management (solid and liquid), toilet sanitation, cooling towers, and swimming pools and other water-sport venues were determined to be the main inspection issues. In addition, it was recommended that a communication network be established among the county departments of public health, the Ministry of Health, and the Olympic venues, which would facilitate coordination of the response to public health emergencies. All findings and proposals were entered onto a multimedia compact disk. A large number of hyperlinks were inserted throughout the text so that readers would be able to refer easily to relevant legislation. The compact disks were submitted to the Ministry of Health for further consideration and dissemination.

The majority of the Olympic venues were slated for the four counties of Athens and east Attica. Thus, the five county departments of public health in Athens received the highest priority. The county department of public health in Piraeus was the next highest priority, because of the 10 cruise ships that were expected to be harbored there and used as floating hotels, followed by the county departments of public health in the other Olympic cities.

Number of Expected Visitors

It was expected that 18,000 athletes and escorts from 201 countries would participate in the Olympic Games and that 7,000 would participate in the Para-Olympic Games. The majority of the athletes were expected to come from Europe and North America. Specifically, 9,000 were expected from Europe, 5,300 from America, 2,500 from Asia, 1,400 from Africa, and 900 from Oceania. For the Para-Olympic Games, 95 percent of the athletes were expected to arrive from Europe, North America, and Oceania. It was estimated that around 23,000 media representatives would visit Athens to broadcast the games. According to the plan of the Organizing Committee, all athletes and reporters were to be accommodated in the specially constructed Olympic and Media Villages, respectively.

Using the assumption model described in the methods section above, the authors found that the circle of countries around Athens from which visitors were most expected (the Athens circle) included most of the European continent, part of Africa, and Western Asia (Figure 1). After the majority of the populations of the former Soviet Union, Eastern Europe, Africa, and Asia were excluded be-

cause of their poor financial resources, the population of the Athens circle comprised approximately 390 million people; by comparison, Atlanta's circle had comprised 250 million and Sydney's 30 million. The total number of visitors was about two million during the Olympic games in Atlanta and about 300,000 in Sydney. Those figures translate into a percentage of visitors to the total population of 0.8 percent for Atlanta and 1 percent for Sydney. Using Atlanta's percentage (0.8 percent), the authors calculated the expected number of visitors for the Athens 2004 Olympic Games (3,120,000) and added the usual number of tourists expected in August (450,000). Therefore, 3,570,000 visitors constituted the highest-expectation scenario, which assumed that the international political situation would be ideal during the Pre-Olympic period. Three different scenarios, presented in Table 1, were developed through consideration of factors that might affect the attendance of the games.

According to data from years 2000 and 2001, obtained from the Greek National Tourism Organization, 83.6 percent of the tourists arrived in Athens by air, 9.8 percent by car, 7.4 percent by sea, and only 0.2 percent by train. Therefore, the Eleftherios Venizelos airport in Athens and the harbor of Piraeus were expected to be the busiest ports of entry, followed by the airports of Thessalonica, Rhodes, and Iraklio and the ports of Crete and Cyclades islands.

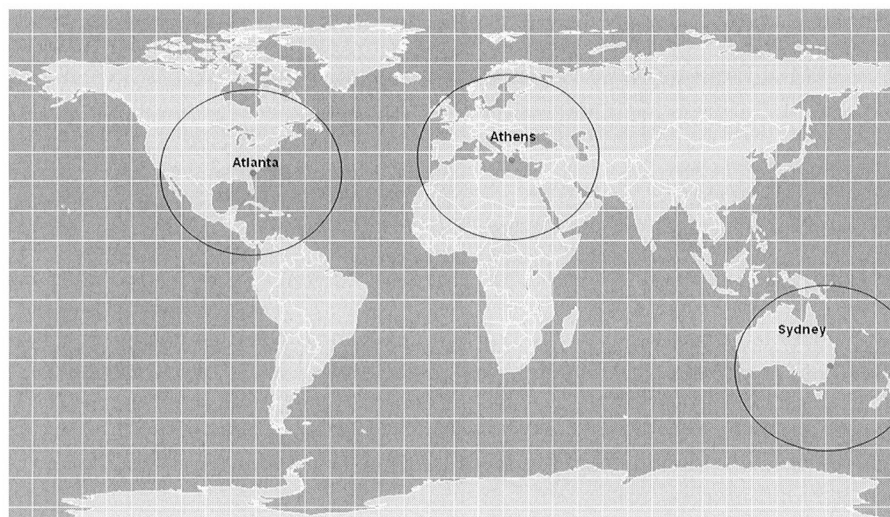
Public Health Risks

After classification and prioritization of the public health risks (Table 2), foodborne and waterborne diseases during the Pre-Olympic and Olympic periods, were considered to pose the highest risk because of the enhanced production and rushed transportation of large quantities of foods and bottled water to meet the increased demand from Olympic venues, hotels, restaurants, and food stores. For example, the Organising Committee for the Olympic Games 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 residents. In addition, a large number of canteens and outdoor vendors were expected to offer food around the venues, presenting a real challenge to the inspecting agencies and a greater risk to public health.

Second, other pathogens might cause outbreaks by airborne transmission, especially within the confines of indoor venues or cruise

FIGURE 1

Four-Hour Air-Distance Radii from the Olympic Cities of Atlanta, Sydney, and Athens



These distances were used to model the geographic area from which the majority of visitors for the Athens 2004 Olympic and Para-Olympic Games were expected to come (information from the Ministry of Health and Welfare and the Organising Committee for the Olympic Games "Athens 2004").

ships; examples might be influenza (given that a portion of the athletes and spectators would be coming from the Southern Hemisphere), tuberculosis, meningitis, pertussis, measles, and Legionnaires' disease (Jorm, Thackway, Churches, & Hills, 2003; Thackway, Delpech, Jorm, Mc Anulty, & Visotina, 2000). Infectious diseases that were considered to pose lower risk were several nonendemic diseases such as malaria, cholera, yellow fever, and hemorrhagic fevers. Hepatitis A and brucellosis, although endemic, were also considered to pose a lower risk. It was expected that environmental health inspections, especially inside the Olympic venues, would be effective in preventing the distribution of contaminated foods, since transmission occurs by consumption of specific items (seafood for hepatitis A and unpasteurized milk products for brucellosis). The previous year's epidemic of severe acute respiratory syndrome (SARS) also remained on the list of potential challenges for the public health infrastructure during the Olympic Games.

Moreover, potential risks from non-infectious etiologies such as heat-related illnesses, which constituted a real problem in the Centennial Olympic Games in Atlanta (Centers for Disease Control and Prevention [CDC], 1996), were of high priority in Athens because of the high temperatures and humidity in Au-

gust (Table 3). In addition, motor vehicle accidents, drowning, and other outside-home injuries were expected to increase during the Olympic and Para-Olympic Games (Thackway et al., 2000; Wetterhall, Coulombier, Herndon, Zaza, & Cantwell, 1998). On the other hand, since Greece was not implicated in situations that could make the Olympic Games a target of the international terrorist groups, terrorist attacks and incidents of biological or chemical terrorism were considered to pose a lower risk. High levels of preparedness were required, however, and strict security measures were taken, especially around Olympic venues, because of the major public health implications of such incidents (Janson & McKee, 2002; Tucker, 1997).

Post-event Assessment

In early 2004, 196 environmental health inspectors recommended by OPU were hired and, following intensive training, were assigned to the different county departments of public health according to the needs assessment evaluation. The program 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 to result during Olympic and Para-Olympic Games from consumption of food or water from an

TABLE 1**Alternative Scenarios for the Number of Expected Visitors During the Athens 2004 Olympic Games**

Time Period		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 2**Potential Public Health Risks During the Athens 2004 Olympic Games**

Risk Category	High Risk	Low Risk
Infectious disease	Traveler's diarrhea	Hepatitis A
	Foodborne/waterborne diseases	Brucellosis
	Airborne diseases	Non-endemic diseases
	Sexually transmitted diseases	SARS
Non-infectious etiology	Heat-related illness	Terrorist attacks
	Motor vehicle accidents	
	Drownings, other injuries	

TABLE 3**Statistics for the Athens 2004 Olympic Games***

Number of participating delegations	201
Number of accredited athletes and escorts	18,000
Attika population	3,523,407
Athens metropolitan population	3,072,922
Highest number of expected visitors in Athens	4,480,000
Historical average temperature in Athens during August	82.22°F (27.9°C)
Historical highest average temperature in Athens during August	88.52°F (31.4°C)
Highest expected temperature in Athens during August of 2004	111.56°F (44.2°C)
Rainfall	4 mm
Air humidity	46%

*Information from the Organising Committee for the Athens 2004 Olympic Games.

Olympic venue or cruise ship; only isolated cases of gastroenteritis in Athens and in Crete, which were not connected to the games, were observed. Likewise, August temperatures fortunately did not rise high enough to create a serious danger to the spectators attending outdoor events. In addition, the electronic

communication among environmental health agencies of all Olympic cities via a special network was quite successful in facilitating a timely surveillance. Daily reporting of the inspection results allowed the executives to be informed in real time and take decisions at short notice.

Information from the Athens 2004 Organizing Committee on attendance revealed that in the end, 11,099 athletes from 202 countries attended the Olympic Games, while 3,960 athletes from 136 countries attended the Para-Olympic Games. The number of official media representatives was estimated at 5,500 during the Olympic Games and 1,400 during the Para-Olympic Games. The number of visitors in Athens in August 2004 was approximately 500,000. This number approaches the third, lowest-expectation scenario given in Table 1.

Discussion

The Athens 2004 Olympic Games and Para-Olympic Games had certain characteristics that created complex demands on environmental health planning. The large number of expected athletes and visitors, concentrated in a small geographic area that was already densely populated, and the long duration of the games were some of the challenges facing the public health infrastructure of Greece. The key public health issues of concern comprised food safety (Holroyd, Shields, & Waples, 2000) and the other environmental health issues mentioned above, as well as heat-related illnesses (CDC, 1996; Thackway et al., 2000), Legionnaires' disease (Banwell, 2000), sanitation on cruise ships (Banwell, Butler, Ferson, Hatzi, & Paraskevopoulos, 2000), and emergency management (with respect to possible terrorist activity) (Brennan et al., 1997). Thus, early planning and effective cooperation among the county departments of public health and the OPU aimed to secure a comprehensive environmental health inspection program during the Olympic and Para-Olympic Games.

Increased public health surveillance was first described for the Los Angeles 1984 summer Olympic Games (Weiss, Mascola, & Fannin, 1988). Since then, many modifications and improvements have been imple-

mented by the various host cities that followed. Information from the Atlanta 1996 Centennial Olympic Games (Meehan et al., 1998) described a systematic, coordinated process of planning for public health response. More than 10,000 athletes from 197 countries and about two million visitors were gathered to watch the games. Atlanta's state health agency established a central Public Health Command Center and response teams for environmental health emergencies (Brennan et al., 1997; Green & Burnham, 1998; Wetterhall et al., 1998). Likewise, the Sydney 2000 Olympic Games attracted over 10,000 athletes, about 5,100 officials, 15,000 media people, and around 300,000 domestic and international visitors. The New South Wales Health Department established the Olympic Planning Unit in 1996 for the Olympic environmental health surveillance system (Bennett et al., 2000; Jorm et al., 2003; Jorm & Visotina, 2000).

In Greece, planners followed a similar approach in order to enhance the human resources and overall preparedness of the county departments of public health involved. Because of a lack of standards and adequate funding, the different agencies were not uniformly prepared, and there was a broad range of capabilities in terms of personnel, resources, and training. Therefore, efforts to increase the capacity of and coordination among the various county departments of public health were a particular challenge and continued to be an ongoing task until the beginning of the Olympic period. On every kind of occasion, such efforts remain central to the preparedness of public health agencies for mass gatherings. One of the most important paramete-

ters was additional budgeting for personnel, equipment, and training for every agency involved in the environmental health surveillance system during the Olympic and Para-Olympic Games (Roth & Gaffney, 1996).

Following the needs assessment process and the development of a comprehensive plan with respect to the public health risks, OPU was involved in a continuous effort to support the county departments of environmental health in Athens and the other Olympic cities. OPU had played an important role in empowering the different public health agencies with personnel and equipment. In addition, it had organized a series of different training programs for the environmental health inspectors working at various county departments of public health. Likewise, all Olympic venues, hotels, swimming pools, restaurants, and public toilets had been registered and were inspected on a regular basis. Environmental health inspections were initiated in June 2002 and were scheduled to continue, on a more intensive basis, until the end of the Para-Olympic Games (September 28, 2004). In addition, a communication network among the county departments of public health, the OPU, and the Ministry of Health, which was finished and tested during January of 2004, provided the opportunity to share, review, and analyze the results of the environmental health inspections in real time.

A post-event assessment of the effectiveness of the described environmental health surveillance system showed that, overall, the recommendations made by the Olympic Planning Unit and implemented in cooperation with the county departments of public health and the Ministry of Health were suc-

cessful. The relative low number of visitors may be explained partly by the international political situation.

Nevertheless, the possibility of major environmental health emergencies at mass gatherings cannot be discounted. The authors' experience, like the experiences of Atlanta and Sydney, underscores the paramount importance of developing environmental health systems that are adapted to local circumstances and that take advantage of modern technology (communication networks and current software). The implementation of the environmental health surveillance system described in this paper, which aimed to minimize the possibility of an environmental health incident during the Olympic and Para-Olympic Games in Athens, proved successful. The potential danger should never be underestimated, however. The authors hope that their experience may contribute to environmental health planning for future Olympic Games and other mass gatherings.

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