



ENVIRONMENTAL HEALTH SURVEILLANCE PROGRAMME FOR THE PREVENTION OF LEGIONNAIRES' DISEASE DURING THE ATHENS 2004 OLYMPICS

Organisations involved

The Olympic Planning Unit,

The Central Public Health Laboratory, National School of Public Health

Description of the case

3.1. Introduction

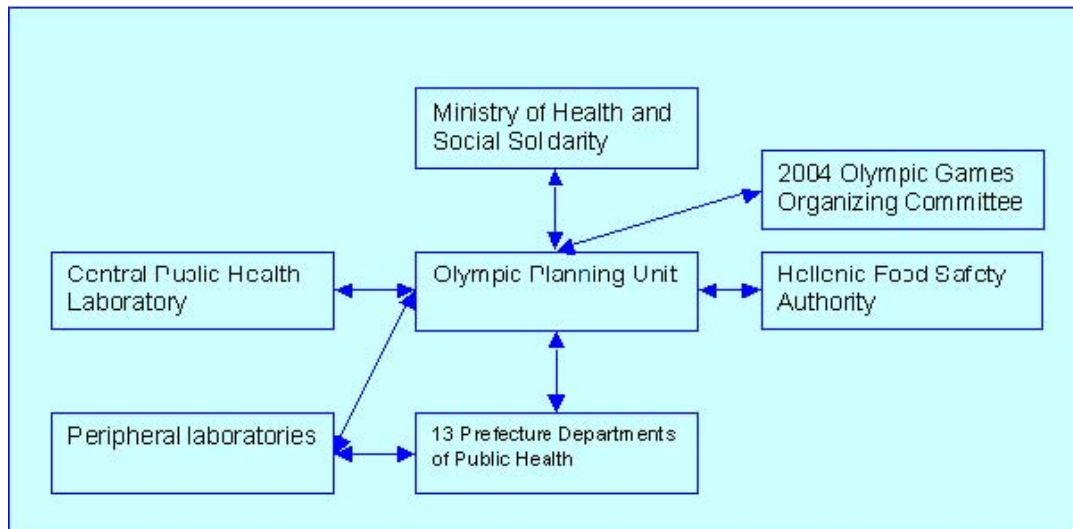
The Athens 2004 Organising Committee of the Olympic and Para-Olympic Games identified Legionnaires' disease prevention as an important objective for health protection during the Games. Special regulations and inspection procedures for the prevention of the disease were enacted in previous Olympic Games; therefore, in 2001 the Hellenic Ministry of Health established the Olympic Planning Unit at the National School of Public Health. The task of the Unit was to devise and carry out an environmental health surveillance programme covering a number of important targets for public health, including Legionnaires' disease prevention, for a period before and during the Games. Water supply systems of hotels and Olympic venues, cooling towers and decorative fountains had to be registered, inspected and microbiologically tested, in Athens and the other four Olympic cities (Thessaloniki, Patra, Volos and Iraklio), from June 2002 to July 2004.

More than 1,500 hotels were used to accommodate athletes and tourists during the Games. About 3.5 million spectators and 15,000 athletes consumed tapwater from hotels or Olympic venues during the same period. A large number of people congregated in areas of the Olympic cities where water-cooling systems with cooling towers and evaporative condensers and ornamental fountains were located. This increased the potential for the spread of waterborne illnesses.

The integrated environmental health surveillance programme included a computerised, standardised inspection system of all environmental health aspects and microbiological water quality monitoring issues. The Olympic Public Health Committee of the Hellenic Ministry of Health approved the programme. 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, fountains, cooling towers, passenger ships, campsites, sea coasts, 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. Out of a total 44,741 premises of environmental health interest identified as potential inspection sites, 5,724 premises were registered and inspected. The personnel of 13 Prefecture Departments of Public Health (PDPH) performed the inspections in the five Olympic cities of Greece.

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Picture 1: Communication flow chart of the environmental health surveillance and response system for the 2004 Olympic Games.



Source: BMC Public Health [2]

The integrated Environmental Health Surveillance Programme adopted a system of inspection scores for water supply systems in hotels and Olympic venues, cooling towers and decorative fountains as a result of water microbiological tests of samples collected from the above sites. A study was designed to evaluate the scoring system implemented in the inspection programme for the Olympic Games and to determine the contribution of standardised scored inspections in the assessment of the presence of *Legionella* in water systems.

3.2. Aims

The aim of the Environmental Health Surveillance Programme and of the inspections for the prevention of Legionnaires' disease in water supply systems, cooling towers and decorative fountains during 2004 Athens Olympic Games was to protect the health of athletes and tourists.

3.3. What was done, and how¹?

Environmental health inspections were performed using standardised reports, developed by the Olympic Planning Unit. The items included in the reports were based on requirements of national and European legislation, World Health Organisation guidelines and the International Standardization Organisation (ISO).

Standardised inspection reports

The inspection reports included 'critical' and 'non-critical' items. Critical items were violations 'which are more likely to contribute to food or water contamination, illness, or environmental degradation and represent substantial public health hazards and [are] most likely associated with potential foodborne or waterborne disease transmission' [3]. The water supply system standardised inspection report included 42 scored items, 11 of which were designated as

¹ What was done, including challenges faced and overcome

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'critical'. The items were classified into seven categories: construction – maintenance; cleaning – disinfection; cold-water distribution system; hot-water distribution system; system protection cross-connections – backflow; record keeping; and on-site manually conducted tests. The cooling tower standardised inspection report included 39 scored items, six of which were designated as 'critical'. The inspection items were classified into six categories: construction; operation; cleaning – disinfection; personnel; record keeping; and on-site manually conducted tests. The decorative fountain standardised inspection report included 17 scored items concerning operation, cleaning – disinfection and on-site manually conducted tests, three of which were designated as 'critical'. Data available for each standardised inspection report included: name of establishment, unique code, inspection identification code, county, date of inspection, overall score, specific violations cited, inspectors and time spent on inspection.

Scoring system and quantitative assessment

In each standardised inspection report, a standard number of scored items were included. The items were negatively scored from -1 to -3 points. Three negative points represented critical items. The non-critical items were given either a -1 or -2 point score according to their importance and the severity of the violation. The final scoring of each item was decided after the pre-testing of the standardised inspection reports during the first test event in 2002. For the standardised inspection report of water supply systems, the total negative score was calculated and classified qualitatively in the following three categories (A) satisfactory result (0 to -7 points, <10% of the total negative score, no critical violation), (B) relatively satisfactory result (-8 to -14 points, 11–20% of the total negative score, or a critical violation), and (C) unsatisfactory result (more than -14 points, >20% of the total negative score). For the standardised inspection report of cooling towers the classification was as follows: (A) 0 to -6 points, (B) -7 to -11 points, and (C) more than -11 points. For the standardised inspection report of decorative fountains the classification was: (A) 0 to -2 points, (B) -3 to -5 points, and (C) more than -5 points. The classified categories were standardised and printed in each inspection report. During inspection, all negative points from deficiencies were identified, calculated and the overall negative score was assigned to one of the three categories described above. In this study, satisfactory grading results were those assigned grade 'A', with grades 'B' and 'C' representing unsatisfactory grading results.

Water supply systems

At least four water samples were drawn from the furthest outlet from the hot-water storage heater. The first sample was collected from hot water discharging from the showerhead immediately after it was turned on and the second sample after 60 sec flow time. The third sample was collected from cold water discharging from the showerhead immediately after it was turned on and the fourth sample after 2 min flow time. When the water supply system comprised more than one ring, four water samples were drawn from the showerheads 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 fountains

One sample was collected from each decorative fountain pond. Procedures recommended by ISO 11731 were followed.

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Microbiological analysis methods and criteria for the interpretation of the results

Water samples collected from water supply systems, cooling towers and decorative fountains were tested for *Legionella* spp. using methods in accordance with ISO 11731 and for aerobic count at 37 °C for a minimum of 48 hours incubation using the pour-plate method according to ISO 6222. All tests were performed at the *Legionella* Reference Laboratory of the National School of Public Health.

The criteria used to interpret the results of the bacteriological examination of various sampling points were those used by the European Working Group for *Legionella* Infection (EWGLI). [4].

From June 2002 to July 2004, 196 inspectors conducted registrations by using standardised data collection forms, inspections and samplings of 997 water supply systems of 887 hotels and 140 Olympic venues, 208 cooling towers, and 540 decorative fountains in all five Olympic cities. Analysis included samplings and the first inspections of water sites conducted the same day in the specific establishment. Inspections and samplings, that were not conducted on the same day in the specific establishment, were excluded from the analysis. Re-inspection scores and results from water samples collected after taking corrective action were not included in the analysis.

It should be noted that during the inspection period of water supply systems' only nine violations of the environmental health inspection scores were significantly associated with positive microbiological test results. Four of these were designated as 'critical' water safety hazards in the standardised inspection report. For the cooling towers, nine violations were significantly associated with a positive microbiological test result and one was designated as 'critical' in the standardised inspection report.

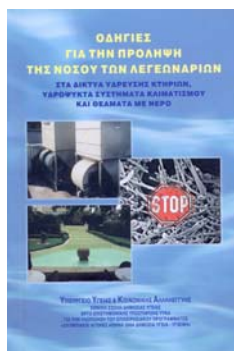
No cases of Legionnaires' disease were linked to the water sites inspected during the two-year period before and during the Olympic period.

Training and Guidelines for professionals and facility owners

From January 2003 until February 2004, 865 hours of training were conducted. A total of 196 environmental health inspectors underwent uniform training and certification in order to carry out consistent standardised inspections and water sampling. Moreover, a series of short training courses concerning epidemiological investigation, vector control, ship sanitation, response to emergencies and disasters, and relevant software were attended by 250 officers from the Prefecture Departments of Public Health, including the 196 environmental health inspectors of the Olympic cities.

A series of guidelines were published and distributed to the environmental health inspectors and facility owners: 5000 copies providing guidelines for safe operation of swimming pools, 5000 copies of guidelines for *Legionella* prevention in cooling towers, water systems, and decorative fountains and 5000 copies of guidelines for water sampling procedures.

Picture 2: Guidelines for the prevention of Legionnaires' disease



Source: Greek Ministry for Health and Social Solidarity



3.4. What was achieved²?

- An environmental health surveillance programme for the 2004 Athens Olympic Games was drawn up, which included a series of inspections for the prevention of Legionnaires' disease in water supply systems, cooling towers and decorative fountains
- Standardised inspection reports were designed and a scoring system for qualitative assessment was developed
- Environmental health inspectors were trained to carry out consistent standardised inspections and water sampling for Legionella.

3.5. Success factors

Good design of an Environmental Health Surveillance Programme and cooperation among different authorities (the Olympic Planning Unit, the 13 Prefecture Departments of Public Health and the Central Public Health Laboratory at the National School of Public Health) were vital for the success of the health-monitoring scheme during the 2004 Athens Olympic Games.

3.6. Further information

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3.7. Transferability

The Environmental Health Surveillance Programme was based on World Health Organisation (WHO) guidelines and International Standardization Organisation (ISO) standards. It could serve as a well-developed model for similar events worldwide.

3.8. Abstract

An environmental health surveillance programme was launched in advance of the 2004 Athens Olympic Games. Among many other activities it included a series of inspections for the prevention of Legionnaires' disease in water supply systems, cooling towers and decorative fountains. For the inspections, standardised reports were designed and a scoring system for qualitative assessment was developed. Environmental health inspectors were trained to carry out consistent standardised inspections and water sampling for *Legionella*. Guidelines for the prevention of Legionnaires' disease were published and distributed among the inspectors

² The outcome should be recorded here, including what was not achieved as well as any cost benefit analysis. This would also include anything created as part of the action (e.g. creation of a website for more information, and any social partner views)

4. References, resources:

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3. Borella P, Montagna MT, Stampi S, Stancanelli G, Romano-Spica V, Triassi M, et al., Legionella contamination in hot water of Italian hotels, Appl Environ Microbiol 2005;71:5805-13