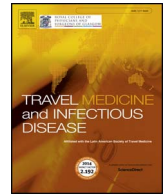




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Health risks and precautions for visitors to the Tokyo 2020 Olympic and Paralympic Games

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ABSTRACT

Background: In 2020, Japan will host the Tokyo Olympic and Paralympic Games in 2020 (Tokyo 2020) which will involve a large population influx from various countries to Tokyo, the most populated city in Japan. We summarize the potential health risks for visitors to Tokyo 2020, related to communicable disease risks and other health threats, based on recent national and local surveillance reports.

Methods: We reviewed up-to-date surveillance reports published by the National Institute of Infectious Diseases and Tokyo Metropolitan Infectious Disease Surveillance Center.

Results: Communicable disease risks for vaccine-preventable illnesses such as measles and rubella, as well as food and waterborne diseases represent the most likely risks. The risk of acquiring vector-borne diseases is considered low in Japan. On the other hand, however, heat-related illness represents a potential risk, as Tokyo 2020 is scheduled during the hottest season in Japan, with temperatures generally expected to exceed 30 °C.

Conclusion: Maintaining an up-to-date routine vaccination schedule is highly recommended for visitors attending the Tokyo 2020 and appropriate hygiene measures for food and waterborne diseases as well as health promotion for heat-related illness. It may also be useful to increase the number of multilingual triage clinicians whom can be placed within emergency departments during the Tokyo 2020 to provide first contact services and coordination of emergency care among non-Japanese speaking visitors to Tokyo.

1. Background

In 2020, Tokyo will be hosting the Olympic Games from July 24th to August 9th and the Paralympic Games from August 25th to September 6th. A large population influx from various countries is expected during this time. As international mass gatherings increase the risk of acquiring imported and locally endemic communicable diseases, it is important for visitors to be cognizant of the potential risks and be well-prepared before attending this event.

During the last decade, Japan has experienced several communicable disease outbreaks [1,2], which required attention at both the local and national level. For example, a dengue fever outbreak unexpectedly occurred in the summer of 2014, which was the first time in 70 years that Japan had experienced autochthonous transmission [3]. The increasing number of disease outbreaks may reflect a sharp increase in the number of annual visitors to Japan; an almost 4-fold increase from 6.2 million in 2011 to 24.0 million in 2016 [4]. Furthermore, the

Japanese government currently aims to increase the number of inbound visitors up to 40 million per year by 2020. In this article, we summarize the potential health risks for visitors to Tokyo 2020, related to communicable diseases risks and other health threats, based on up-to-date surveillance reports from the National Institute of Infectious Diseases and Tokyo Metropolitan Infectious Disease Surveillance Center.

2. Communicable disease risks

2.1. Vaccine-preventable diseases

Routine vaccinations for Japanese children cover most vaccine-preventable diseases, including diphtheria, pertussis, tetanus, polio, tuberculosis, measles and rubella [5]. The vaccination coverage for these diseases among the Japanese population is generally over 90%, therefore affording only a small possibility of epidemics originating from a domestic case. On the other hand, however, the risk of measles

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Table 1
Vaccination recommendations for visitors to the Tokyo 2020 Olympic and Paralympic Games.

Measles	Immunization recommended for all visitors unless they: 1. Have documented administration of two doses of live measles/rubella vaccination OR; 2. Have laboratory evidence of immunity OR; 3. Were born before the measles/rubella vaccination was instituted in their country of origin OR; 4. Have documentation of physician-diagnosed measles/rubella.
Rubella	
Mumps	
Varicella	
Pertussis	Immunization is recommended for visitors who have not been vaccinated.

and rubella outbreaks have increased in Japan, with several previous epidemics originating from imported cases [1,2]. Even though Japan eliminated measles in 2015, 35 imported cases were reported in the same year, followed by 159 imported cases in 2016, of which 22 cases were in Tokyo [1,6,7]. There has been an increase in reported measles cases in European countries as well, with 9642 in the first 7 months of 2017 [8–11]. Therefore, it is possible that measles may be imported into Japan during Tokyo 2020. Currently, the most effective preventative measure for preventing measles is vaccination (Table 1).

Between 2012 and 2014, Japan experienced a nationwide rubella epidemic [12], with approximately 14,000 cases and 45 congenital rubella syndromes being reported during the outbreak [12]. The majority of cases (68%) were among males aged 20–39 years [13], with the high proportion of young males affected mainly attributed to fluctuating vaccination rates in Japan. When the rubella vaccination was first introduced in Japan during 1976 for example, the target population was initially women aged 12–15 years; to reduce congenital rubella infection [13]. In 1995, the target population was expanded to both sexes, aged 12–90 months, to increase and maintain herd immunity [13]. This left males aged 30–50 years more susceptible, due to their lower vaccination rates [2,13]. The increasing number of overseas visitors suggests that imported rubella is occasionally transmitted through these susceptible populations. There were 162 cases reported in 2015 and 125 in 2016 for example, of which 19 cases were reported from Tokyo [6,14].

Mumps is not currently included as a routine vaccination in Japan, and in recent years, the vaccination coverage for mumps has been around 30%–40%. The proportion of antibody positive individuals was approximately 70%, according to the National Epidemiological Surveillance of Vaccine Preventable Diseases (NESID), a level which is insufficient to prevent epidemic diseases [15]. In Tokyo, the number of mumps cases has increased from 4883 in 2015 [16] to 8526 in 2016 [17], suggesting that mumps represents a potential risk for visitors to Tokyo 2020.

Varicella vaccination was introduced into Japan's routine vaccination program in 2014 and the number of reported cases has been decreasing since that time [18]. In Tokyo for example, there were 6765 cases in 2015 [16] and 5541 cases reported in 2016 [17]. Visitors are advised to have the vaccination prior to attending Tokyo 2020, to reduce the risk of transmitting this virus to the Japanese population.

Pertussis has been included in Japan's routine vaccination program since 1948, although the type of vaccine has changed from whole cell pertussis vaccine to acellular pertussis, which is now combined with diphtheria and tetanus (DTaP). In 2013, the proportion of antibody positive children was 90% among those aged 6–11 months, reducing to 30% at age 5–6 years [19]. As immunity from the pertussis vaccine is estimated to last for approximately 5–10 years, vaccinated adults might be susceptible to pertussis [20], therefore it is recommended to have booster vaccinations after 10 years. Decreased immunity in adults means that Japan has experienced several pertussis outbreaks, including an outbreak at a university with more than 200 suspected cases in 2007, at a junior high school in 2015 and in a local community, with

cases originating from primary and junior high schools in 2017 [19]. Visitors to Tokyo 2020 are strongly advised to be immunized against mumps, varicella and pertussis before coming to Japan to ensure they cannot transmit or contract these viruses locally [21].

Rabies is present in most continents of the world, but the possibility of acquiring rabies in Japan is considered to be extremely low [21]. Japan is certified as a rabies-free country, with the last domestic case being reported in 1956 [22]. It is noteworthy, however, that there were two imported rabies cases in 2006, both originating from the Philippines [22].

The risk of hepatitis A infection during Tokyo 2020 is also thought to be low [21]. However, in 2016 there were 65 cases reported from Tokyo, among all 269 cases reported across Japan [6]. Previously, there has been an increase in reported cases in 2010 and 2014; with 347 cases in 2010 and 433 cases in 2014, from Tokyo and other cities [23]. There have also been over 100 cases reported between 2004 and 2014 [23]. According to the Infectious Disease Surveillance Annual Report by the National Institute of Infectious Diseases, these cases were not reported from a specific area, although Tokyo is one area with a higher number of reported cases; 24 cases from Tokyo, 33 cases from Osaka, 21 cases from Kanagawa while other cities reported less than 20 cases [24]. Considering these recent data, hepatitis A vaccination is advisable for visitors attending Tokyo 2020 (Table 1).

2.2. Communicable respiratory diseases

Communicable respiratory diseases are a potential public health risk for mass gathering events [25]. In Japan, seasonal influenza usually causes epidemics in winter, but small epidemics may still occur in summer. In the Southern Hemisphere, the influenza season is from April to September [26]; while in some countries of the Americas and Asia, the main season is between July and September [27]. This is when Tokyo 2020 will take place, meaning that influenza might conceivably be introduced during the Olympic Games. Previously, influenza outbreaks have been reported at international mass gatherings such as: Hajj pilgrimages; the World Youth Day 2008 in Sydney, Australia; the Iztapalapa Passion Play 2009 in Mexico; at three major outdoor music festivals in Europe; and the Winter Olympiad in Salt Lake City, United States of America (USA). Consequently, influenza vaccination is recommended for visitors before traveling to these types of events [28]. However, there are concerns regarding vaccine availability and possible differences in circulating strains between the Northern and Southern Hemispheres [29]. Visitors are therefore advised to consult travel clinics in their own countries before traveling to Japan.

Tuberculosis represents another potential risk for Tokyo 2020 visitors. In Japan, the prevalence of tuberculosis was 13.9 per 100,000 in 2016, which is relatively high when compared with other high-income countries; being for example 2.8 in the USA and 10.0 in the UK per 100,000 during 2016 [30]. In Tokyo, around 2300 to 2800 new cases have been reported annually [30], with the highest incidence in those aged from 20 to 29 years, of which, in 2016, immigrants accounted for 57.7% [30]. Considering the long incubation period for tuberculosis, transmission might not be observed during Tokyo 2020 and evidence regarding the efficacy of tuberculosis testing before and after mass gatherings is currently insufficient [31]. Further research is needed to assess whether testing is beneficial for visitors to countries with a high prevalence of tuberculosis or visitors to mass gatherings [31].

2.3. Food and waterborne diseases

The continued provision of safe food and water will be fundamentally important to ensure the success of Tokyo 2020. In Japan, the peak season for foodborne disease outbreaks is winter [32]; although bacterial foodborne diseases, such as campylobacter, clostridium and salmonella are usually reported in summer [32]. There were 271 reported cases of foodborne disease in Tokyo between July and September 2016,

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