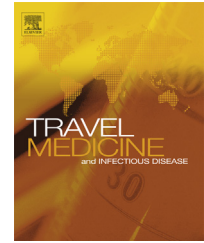




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## EDITORIAL

# Health risks among travelers to Brazil: Implications for the 2014 FIFA World Cup and 2016 Olympic Games



Travelers to Brazil for the 2014 FIFA World Cup and 2016 Olympic Games – whether athletes, spectators, or others – will be treated to a spectacular country of great natural beauty and a vibrant culture. It also will be a New World exploration with unfamiliar health risks for many visitors.

Assistance is available. Experts from the Latin American Society for Travel Medicine (SLAMVI) have prepared a review to assist clinicians who are preparing travelers for a visit to Brazil. It will also aid clinicians who see those who are ill after visiting Brazil [1]. Advice from those who live and work in Brazil is valuable and provides useful guidance.

We have taken a complementary approach to assessing infectious disease threats to travelers by looking at ill travelers returned from Brazil who were subsequently seen at a GeoSentinel clinic [2]. These sites, on six continents, are selected for expertise among staff in travel medicine and tropical diseases. Although individuals visiting these clinics are not representative of all ill travelers returned from Brazil, knowledge of their diagnoses provides insights into the types of exposures and risks experienced by travelers to Brazil. In our reported series of 1586 ill travelers returned from Brazil seen from July 1997 through May 2013 at multiple sites around the world, the most common travel-related diagnoses were dermatologic conditions (40%), diarrheal syndromes (25%), and febrile systemic illness (19%).

The two most common specific causes of fever were dengue fever and malaria, predominantly *Plasmodium vivax*. Dengue was much more common than malaria, being diagnosed in 31% of those with febrile systemic illness versus 8% for malaria. These two infections were also the most common reasons for hospitalization. Importantly, although cases of dengue occurred during every month of the year, dengue infections displayed marked seasonality with infections peaking in the period from February through June. Fortunately the sports events do not occur during peak dengue transmission. Nevertheless, because dengue transmission occurs widely in urban and rural areas, all

travelers should be alert to the risk of dengue. The widespread day-biting *Aedes aegypti* mosquito is the primary vector.

HIV infection was diagnosed in 28 ill returned travelers, including 11 with newly diagnosed asymptomatic infection and 9 with acute symptomatic HIV. This is a reminder of the importance of sexual contacts among travelers and the need to reinforce messages about avoiding unsafe sex and activities that would allow exposure to blood and body fluids (such as shared needles, injections, and tattoos). Notable – and reassuring – for their absence were any cases of yellow fever, rabies, meningococcal meningitis, and Chagas disease. With the exception of influenza, few diagnoses of vaccine preventable infections were recorded, perhaps reflecting high rates of vaccine coverage in Brazil and possibly also in travelers.

Dermatologic conditions were extremely common in returned travelers. The most common specific dermatologic diagnoses were cutaneous larva migrans (167), myiasis (37), and tungiasis (35), infestations involving exposed skin and acquired outdoors, often on or near beaches. These are found in many tropical areas but have been especially common in travelers to Brazil [3]. Many popular Brazilian tourist destinations are on the coast, and many (Rio de Janeiro, Salvador, Recife, Natal, Fortaleza) are also sites for World Cup events. The GeoSentinel database also recorded 13 cases of travel-related cutaneous leishmaniasis, transmitted by sandfly bites.

The sports events will take place during the cooler months, influenza season in Brazil. In tropical Brazil (northern part of the country) influenza transmission occurs throughout the year. In cooler, southern Brazil, influenza has clear seasonality with cases peaking in June and July [4]. Because the sports events will bring together individuals from around the world – and in crowded settings that will allow easy transmission of influenza and other respiratory pathogens – travelers to Brazil for the sports

events should receive influenza vaccine. Because measles has caused outbreaks during and after mass events in the past, it is prudent for all travelers to be immune to measles through immunization or previous infection.

Most travelers to Brazil do not visit malaria transmission zones. In an analysis of 369 travelers seen in the Boston Area Travel Medicine Network (BATMN) in advance of travel only to Brazil, 30% were prescribed malaria chemoprophylaxis because of plans to visit malaria-endemic areas of the country. More than twice as many (71%) received yellow fever vaccine, indicative of the large areas of Brazil for which yellow fever vaccination is recommended [5]. Brazil is not a common site for acquisition of malaria among travelers returning to the US. Among 1920 total cases of malaria reported to the US CDC in 2011, only 7 had acquired infection in Brazil (6 vivax; 1 species unknown) [6].

Knowledge of incubation periods is useful when evaluating returned ill travelers. A febrile illness with onset >14 days after a traveler has left Brazil (and other tropical areas) is not dengue fever (usual incubation 4–7 days; range 3–14). Chikungunya infection, recently confirmed in the Caribbean (see below) has a similar incubation period. One treatable infection that can first manifest >3 months after leaving Brazil is vivax malaria. Almost a third of vivax malaria infections reported in the US have onset of illness >3 months after return to the US [6]. Vivax malaria can be seen in patients who took standard chemoprophylaxis.

A useful framework for thinking about risks to those planning to visit Brazil for the World Cup events includes 1) locally endemic infections that may be unfamiliar to many travelers and clinicians (e.g., dengue, cutaneous larva migrans, malaria, yellow fever), 2) infections that may be more likely to occur because of crowding and activities related to the mass events (e.g., influenza, measles), 3) non communicable diseases and problems that stem from the high density of people engaged in competitive events in an environment that may be hot, volatile or otherwise unstable [7]. Travelers need to be prepared, as much as possible, for all types of challenges. Of course, illnesses that follow travel may be common cosmopolitan infections, such as streptococcal pharyngitis and pneumococcal pneumonia or non infectious problems, such as pulmonary emboli.

Visitors also pose risks to the host country. Visitors could carry pathogens that could spark a local epidemic, if the local population is susceptible or local conditions favor spread. Examples include a new influenza virus, a new coronavirus, or a new, virulent serogroup or strain of *Neisseria meningitidis*. Outbreaks of meningococcal meningitis have been associated with the Hajj, leading to a requirement by Saudi Arabia that all pilgrims to the Hajj be vaccinated with a quadrivalent meningococcal vaccine [8]. Since 1990, Brazil has had outbreaks of meningococcal meningitis caused by serogroups B, C and W135 [9]. Although no current outbreaks are identified, clinicians need to keep current with outbreak reports and respond rapidly to travelers with potential exposure.

Brazil is vulnerable to the introduction of vectorborne infections because of the wide distribution of the mosquito vectors *Ae. aegypti* and *Aedes albopictus*. Concerns might include a new genotype of dengue virus (all four serotypes currently circulate in Brazil), chikungunya virus, Zika virus,

and perhaps others. Chikungunya virus is now being transmitted in Latin America and could easily spread to Brazil. As of 28 March 2014 3441 confirmed cases and 21415 suspect cases of chikungunya virus infections had been reported in the Caribbean ([http://www.paho.org/hq/index.php?option=com\\_content&view=article&id=9053&Itemid=39843](http://www.paho.org/hq/index.php?option=com_content&view=article&id=9053&Itemid=39843)). All of these pathogens have shown the capacity to cause large outbreaks in susceptible populations. Enhanced surveillance will be important to identify infections early.

Visitors who are only attending the mass sporting events (and are in urban areas) face fewer risks than those who will have more extended stays that include the Amazon basin and rural areas. For example, although Brazil has largely controlled transmission of Chagas disease directly by the rejuviid bug, multiple outbreaks have occurred where apparently locally prepared sugar cane juice, acai juice, or other foods have become contaminated with trypanosomes via crushed bugs or their excreta, and this represents a potential risk for travelers to some areas [10]. In the pre-travel consultation, clinicians should assess specific locations within Brazil that the traveler plans to visit and the traveler's potential activities in order to determine their need for yellow fever vaccination, malaria chemoprophylaxis, other travel vaccinations, and to identify and discuss other possible risks.

With informed preparation, travelers can minimize illness before and during travel to Brazil.

## Conflict of interest statement

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