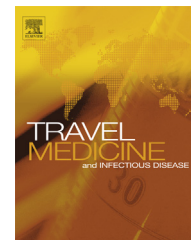


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Travelers to the FIFA world cup 2014 in Brazil: Health risks related to mass gatherings/sports events and implications for the Summer Olympic Games in Rio de Janeiro in 2016

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KEYWORDS

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Summary *Background:* Health threats during mass gatherings, such as the FIFA world cup 2014 differ from traditional health risks. The influence of event type, demographics of attendees and environmental conditions are still not fully understood.

Methods: An observational, prospective case–control survey conducted at the Frankfurt international airport in Germany on 544 travelers to the FIFA world cup 2014 and 432 regular travelers to Brazil departing after the end of the world cup.

Results: Travelers to the FIFA world cup 2014 were predominantly male whereas the gender distribution in the control group was more balanced. The majority in both groups obtained insect bites and sunburns as environmental risk factors. Every third traveler suffered from diarrheal complaints in both groups, whereas the proportion of travelers with flu-like symptoms was higher in the case group. Travelers to the FIFA world cup 2014 indicated alcohol intake and sexual contacts outside of a relationship more frequently than travelers in the control group.

Abbreviations: FIFA, Fédération Internationale de Football Association; MG, Mass gathering; STD, Sexually transmitted disease; UV, Ultraviolet.

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Conclusions: The additional health risks of travelers to sporting events as the FIFA world cup 2014 should be addressed in addition to traditional health threats in pre-travel counseling for the Summer Olympic Games 2016 in Brazil.

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1. Background

According to the World Health Organization (WHO), an event is classified as a mass gathering (MG) "if the number of people attending is sufficient to strain the planning and response resources of the community, state or nation hosting the event" [1]. Types of MGs are international sporting events, religious festivals, trade meetings, political events or cultural festivals [2].

For many major MGs, attendees are coming from all over the world. This potentially causes an increased risk for transmission of communicable diseases that are either brought from other regions into the host country or are spread out from the host country to new ecological settings by participants traveling home [3,4]. In some tropical countries, vector-borne diseases, such as malaria, Zika, chikungunya or dengue might be hazardous to attending vulnerable populations [5]. In addition to risks of infectious diseases during MGs, non-communicable risks include cardiovascular diseases, environment-related cold or heat injuries, illness related to use of drugs and alcohol, occupational injuries, trauma or crush injuries associated with stampedes, exacerbation of chronic diseases (respiratory diseases), and crowd safety [6,7]. Higher rates of morbidity and mortality during and after mass gatherings are not only a complex challenge to local health systems of host countries, but also for international public health care policies [8].

Health risks and threats differ between host regions of MGs, as well as the types of event [9]. International sporting events like the Olympic Games or the FIFA world cups typically take place outdoors with partially extreme weather conditions. They are attended by people from a wide range of different nations in a rivaling mood or shared identity in regards to the sport match, and a potentially increased use of alcohol and other drugs [10,11].

The FIFA world cup 2014 in Brazil was a major sporting event with football teams from 32 countries and an international audience coming to Brazil in June and July 2014 for attending matches in 12 cities throughout the country [12]. Based on experiences of past sporting events of this size, actions have been taken to prevent health threats for residents and visitors [13,14]. Additionally, research over the past years focused on measures aiming to improve the security at mass gatherings, especially of sport events like the FIFA world cup [15,16]. However, the complexity of health risks of MGs and the specific influence of event type, host country, home countries, environmental conditions and the demographics of attendees are still not fully understood. Knowledge on this may improve individual travel preparations as well as the planning of local, national and international health providers based on reliable risk assessments

[17]. Since surveys on travel related health measures or diseases are most often conducted in specialized travel clinics, mainly those subpopulations seeking health specific advice ('pre-travel') or travelers returning with imported diseases ('post-travel') are included in these kind of surveys [18,19]. However, it is known that only a fraction of travelers seeks pre-travel health advice or post travel medical consultation in specialized clinics which may not be representative for all travelers to a specific destination or event [20]. Moreover, health risks might be over- or underestimated due to a lack of evidence based data on the demographical background of attendees, their event-specific health behavior or seasonal and annual changes of risks for some vector-borne diseases [21,22].

Health threats during mass gatherings are increased for visitors and residents, but often preventable. This study assessed characteristics of travelers to the FIFA world cup 2014. The aim was to improve the understanding of factors influencing the frequency and type of medical events during MGs. Furthermore, the results of this study may support the preparation for the Olympic Games in 2016 which will also take place in Brazil.

2. Methods

2.1. Study design and study population

In this observational, prospective case-control airport-survey study, travelers to the FIFA world cup 2014 in Brazil that planned to attend one or more football matches in a stadium, were recruited between May and July 2014 at the Frankfurt international airport in Germany. As controls, other travelers to Brazil were enrolled from August to September 2014 right after the end of the FIFA world cup 2014. With permission of the airport as well as the involved airlines, consecutive passengers to Brazil were contacted in the check-in and boarding areas and offered participation.

2.2. Data collection

Trained study personnel collected demographical and socio-economic data, as well as information on medical history using a standardized questionnaire. Furthermore, questions related to travel preparations, such as destination, protectoral items carried in the luggage, or knowledge on specific health risks in Brazil, e.g. transmission way of malaria or dengue virus. All questions were answered voluntarily. Four weeks after return to their home countries, travelers were contacted either via phone or email and asked to fill a health related post travel

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