Measles in the 21st Century, a Continuing Preventable Risk to Travelers: Data From the GeoSentinel Global Network

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Measles remains a risk for travelers, with 94 measles diagnoses reported to the GeoSentinel network from 2000 to 2014, two-thirds since 2010. Asia was the most common exposure region, then Africa and Europe. Efforts to reduce travel-associated measles should target all vaccine-eligible travelers, including catch-up vaccination of susceptible adults.

Keywords. measles; infection; travelers; GeoSentinel; surveillance.

Measles is a highly contagious viral disease that can lead to substantial morbidity, including dehydrating diarrhea, pneumonia, encephalitis and death [1–3]. Measles is transmitted primarily from person to person by large respiratory droplets but can also spread by the airborne route as aerosolized droplet nuclei [1]. The incubation period ranges from 7 to 21 days from exposure to the onset of fever; rash generally appears 14 days after exposure [1]. Symptoms include prodromal fever that can rise to the onset of fever; rash generally appears 14 days after exposure [1]. The incubation period ranges from 7 to 21 days from exposure to the onset of fever; rash generally appears 14 days after exposure [1]. The incubation period ranges from 7 to 21 days from exposure to the onset of fever; rash generally appears 14 days after exposure [1]. The incubation period ranges from 7 to 21 days from exposure to the onset of fever; rash generally appears 14 days after exposure [1].

RESULTS

During the 15-year study period, 94 patients with measles were reported from 30 GeoSentinel clinics on 6 continents. Patients were reported in all years except 2002, and two-thirds were reported since 2010 (Figure 1). Sixty-three patients were seen after travel and 31 during travel. Among the 81 patients with reported diagnostic information, 77 (95%) had diagnoses confirmed by positive immunoglobulin M or polymerase chain reaction findings, and 4 cases were diagnosed clinically. Fifty-three (56%) were seen as inpatients, and 41 (44%) as outpatients. No deaths or episodes of encephalitis were reported.

Sixty-three patients (67%) were male. The median age was 27 years (range, 1–57 years); 82 patients (87%) were aged 18–45 years, and 4 were ≤2 years old (none were <1 year old). Tourism (41 patients; 44% of total) was the most common travel purpose, followed by business (27; 29%), visiting friends and relatives (16; 17%), and travel as a missionary, volunteer, researcher,
aid worker, or student (10; 10%). Eighteen patients were expatriates, all of whom were business travelers and citizens of 12 countries in Asia, Europe, and Africa. Of the 74 patients with information, only 18 (24%) sought a pretravel medical consultation before their trip.

Among the 89 patients with reported region of exposure, 59 (66%) were exposed in Asia (35 in Southeast Asia, 17 in South-Central Asia, and 17 in Northeast Asia). Patients exposed in Asia were reported consistently starting in 2003 (Figure 1). Fifteen (17%) reported exposure in Africa, 14 of them in sub-Saharan Africa and 1 in North Africa. Eleven (13%) were exposed in Europe, 10 in Western Europe and 1 in Eastern Europe; 8 cases were reported during 2011 (Figure 1). Two patients (3%) were exposed in the Caribbean, and 2 (2%) the Middle East. The country of exposure to measles was reported for 84 patients. Exposure was reported in 30 countries, with the most reported exposures in Thailand (13; 15% of total), India (8; 10%), Singapore (8; 10%), Nepal (7; 8%), China (6; 7%), and the Philippines (5; 6%). Exposure for 2 patients was probably associated with air travel.

**DISCUSSION**

Our data indicate that measles has remained a risk for travelers to developing and industrialized nations across the world since the turn of the 21st century. Patients with measles were reported to GeoSentinel during all but 1 year during the study period and from most world regions, highlighting the continued importance of measles vaccination for all international travelers. Although two-thirds of measles diagnoses were associated with exposure in Asia, particularly Southeast and South-Central Asia, there was a surge in patients with measles exposed in Western Europe during 2011, corresponding to a large outbreak in Europe [7–9]. In addition, two-thirds of measles diagnoses were reported since 2010, mirroring ongoing measles activity worldwide [2]. Although consistent with reports of endemic or increased measles activity, our data are limited by the inability to confirm specific location of exposure for all patients and might also be subject to some reporting bias due to the geographic locations of GeoSentinel clinics and their patient populations.

Measles risk for travelers is not confined to exposure in a destination country, because we identified 2 patients with likely exposure associated with air travel. Measles transmission has also been reported recently among multiple unvaccinated travelers likely exposed during layovers at an international airport terminal [10]. These instances illustrate the additional risk of measles among travelers during transit and the high transmissibility of the pathogen to persons in closed or crowded spaces.

Measles continues to affect industrialized countries. Recent importations and resulting outbreaks have been reported in the Americas ([11], http://www.paho.org/hq/index.php?option=com_docman&task=doc_view&Itemid=270&gid=29016&lang=en), although measles was eliminated in the United States in 2000 and in the rest of the region in 2002 [4]. Measles is also reemerging in Europe, as exemplified by the recent outbreaks in Bosnia and Herzegovina, Croatia, and Germany ([12], http://ecdc.europa.eu/en/publications/Publications/measles-rapid-risk-assessment-France-may-2015.pdf). These outbreaks not only highlight the risk of measles to travelers to these areas but also demonstrate how infected travelers can infect unprotected persons in destination countries or in their home countries after their return, leading to importations and outbreaks. These events also underscore the importance of measles vaccination for all persons for whom the vaccine is recommended, including travelers to both industrialized and developing nations.

Tourists and business travelers made up the most patients with measles reported to GeoSentinel during the study period.
(44% and 29% of cases, respectively). However, cases were also reported among other groups, including those visiting friends and relatives. These data indicate that different types of travelers are susceptible to measles during their trips and stress the need to vaccinate all who meet vaccination criteria. Because travelers to industrialized countries might not seek a pretravel medical consultation from a travel medicine provider, primary care practitioners should ensure that their patients are protected against measles.

In addition, 87% of reported measles cases were in adults aged 18–45 years. Measles cases in adults can result in significant morbidity effects, as occurred during the recent large measles outbreak in France, where adults were hospitalized more frequently than infants and incidence of measles-related pneumonia increased with age [7]. Although children may be underrepresented in GeoSentinel owing to the adult focus of many GeoSentinel clinics and the likelihood that children would have been seen by pediatricians or family medicine physicians, the adults with measles in our study highlight why clinicians should inquire about the measles vaccination status of their adult patients. Countries have differing guidelines regarding presumption of immunity according to birth year; antibody testing can help determine immunity from previous measles infection or vaccination. Clinicians should vaccinate against measles whenever indicated, including if there is doubt regarding immunity.

Only one-quarter of patients with measles in our analysis sought a pretravel medical consultation, at which measles and other routine vaccinations can be administered. The World Health Organization recommends immunization against measles for all susceptible children and adults in whom measles vaccination is not contraindicated [3]. For example, current US recommendations for protection against measles for persons without evidence of measles immunity include 2 doses of measles-containing vaccine for persons aged ≥12 months and 1 dose for traveling infants aged 6–11 months [1]. Measles vaccination is the best way to protect a traveler against measles and decrease the likelihood of measles importations and resulting outbreaks. Efforts to reduce travel-associated measles should include public health messaging targeted directly to tourist and business travelers, increased attention to catch-up measles immunization of susceptible adults, and increased attention to immunizing vaccine-eligible traveling children and adults.

Notes

Disclaimer. The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the US Centers for Disease Control and Prevention (CDC).

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