

Short Report: Health Risks in Travelers to China: The GeoSentinel Experience and Implications for the 2008 Beijing Olympics

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Abstract. Selected data collected for travelers to China from 1998 through November 2007 by the GeoSentinel Surveillance Network were used to provide an evidence base for prioritizing recommendations for Olympic and other future travelers to China. Respiratory illness and injuries were common among patients seen during their travel; acute diarrhea and dog bites were common among those seen after travel. Tropical and parasitic diseases were rare. Pre-travel consultation for China travelers should be individualized according to these findings.

The August 2008 Olympic Summer Games in Beijing and other cities in China are expected to attract 600,000 foreign visitors and athletes and up to 2.5 million domestic visitors and volunteers.¹ A number of sources have provided general guidelines on health and safety issues for travelers to China.^{2,3} Beijing Olympic visitors may choose to extend their visit to other parts of China. Here, we present selected data collected from travelers to China over 10 years from 1998 through No-

vember 2007 by the GeoSentinel Surveillance Network to provide an evidence base for prioritizing recommendations for Olympic and other future travelers to China. Because China is often considered as an exotic destination by many travelers and health care providers, the actual health outcomes associated with travel to China were compared with two other regions of Asia—Southeast Asia and India.

GeoSentinel Sites are specialized travel or tropical medicine clinics that contribute point of care, clinician-based sentinel surveillance data (diagnosis, travel itinerary, demographics) on all ill travelers that present to the site. To be included in the database, patients must have crossed an international border within 10 years before presentation and have sought medical advice for a presumed travel-related illness. Detailed methods for patient recruitment, inclusion criteria, and limitations of the GeoSentinel database are described in previous publications.^{4,5} This report includes 2,427 patients (hereafter “China travelers”) of the 85,000 currently in the database who had China specified by the clinician as their country of exposure for a travel-related illness. Of these patients, 25% (598) were seen in their home country after completion of travel and 75% (1,829) were seen during their travel during the 10-year study period. Those seen during their travel primarily visited the Beijing GeoSentinel Site, a full-service hospital staffed mostly by expatriate physicians. The rest visited a new Hong Kong GeoSentinel Site beginning in 2007. China travelers seen after their travel visited 30 other GeoSentinel Sites in Canada, the United States, Europe, and Asia. Separate collection and analysis of data for those seen during travel allows detection and characterization of acute health events with short incubation periods and self-limited courses that would otherwise be resolved or already treated by the time the traveler has returned to their home country. When clinicians in the travel and tropical disease clinics cannot make a specific etiologic diagnosis, a full list of syndromic diagnosis codes can be used to facilitate the consistent classification of patients. The GeoSentinel database provides a standard list of > 500 individual diagnosis codes that are classified into 21 general syndrome groupings.⁵

As shown in Table 1, for patients seen during travel, the most frequent syndromes were respiratory (365 per 1,000 ill travelers), injury (126 per 1,000), dermatologic (includes animal bites; 103 per 1,000), psychological (84 per 1,000), systemic febrile illness (79 per 1,000), and acute diarrhea (61 per

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TABLE 1

Diagnoses ranked according to syndrome group and destination for patients with disease acquisition in China compared with Southeast Asia or India*

Rank	Patients seen during travel			Patients seen after travel		
	China (2,576 diagnoses†)	Southeast Asia (1,437 diagnoses)	India (84 diagnoses)	China (714 diagnoses)	Southeast Asia (6,913 diagnoses)	India (3,543 diagnoses)
1	Respiratory (365)	Systemic febrile illness (806)	Acute diarrhea (321)	Dermatologic (226)	Dermatologic (209)	Acute diarrhea (294)
2	Injuries (126)	Respiratory (50)	Systemic febrile illness (214)	Acute diarrhea (182)	Systemic febrile illness (205)	Systemic febrile illness (168)
3	Dermatologic (103)	Dermatologic (47)	Dermatologic (155)	Respiratory (137)	Acute diarrhea (168)	Chronic diarrhea (116)
4	Psychologic (84)	Acute diarrhea (15)	Respiratory (107)	Systemic febrile illness (92)	Nondiarrheal GI (76)	Nondiarrheal GI (104)
5	Systemic febrile illness (79)	Underlying chronic disease (14)	Injuries (36)	Nondiarrheal GI (92)	Respiratory (73)	Dermatologic (100)
6	Acute diarrhea (61)	Injuries (14)	Nondiarrheal GI (36)	Chronic diarrhea (69)	Chronic diarrhea (66)	Respiratory (51)
7	Dental (35)	Nondiarrheal GI (12)	Cardiovascular (24)	Underlying chronic disease (55)	Nonspecific symptoms or signs (38)	Nonspecific symptoms or signs (50)
8	Genitourinary (27)	Genitourinary (6)	Neurologic (24)	Nonspecific symptoms or signs (35)	Underlying chronic disease (22)	Underlying chronic disease (15)
9	Nondiarrheal GI (27)	Nonspecific symptoms or signs (6)	Nonspecific symptoms or signs (24)	Injuries (15)	Genitourinary (22)	Genitourinary (13)
10	Ophthalmologic (22)	Neurologic (5)	Genitourinary (12)	Psychologic (14)	Dental (17)	Neurologic (10)

* The primary variable analyzed was proportionate morbidity (PM): number of patients with a specific diagnosis or group of diagnoses as a proportion of all ill travelers returning from a destination.³ Numbers of cases per 1,000 ill patients seen are given for each syndrome group. Only the top 10 syndrome groups are listed.

† Number of diagnoses in this row may exceed the corresponding number of patients because each patient may have more than one diagnosis.

1,000). Of note, within the injury grouping, the most frequent diagnoses were sprain/strain (60 per 1,000 ill travelers), laceration (11 per 1,000), fracture (10 per 1,000), and contusion (9 per 1,000).

For patients seen after travel to China, the most frequent syndrome groupings were dermatologic (includes animal bites; 226 per 1,000), acute diarrhea (182 per 1,000), respiratory (137 per 1,000), systemic febrile illness (92 per 1,000), non-diarrhea gastrointestinal illness (92 per 1,000), and chronic diarrhea (69 per 1,000). Of note, dog bite (60 per 1,000) was the second most common individual diagnosis code assigned.

The most common diagnoses for the top three syndrome groups are listed in Table 2, separately for patients seen during travel and seen after travel. For respiratory syndrome, upper respiratory tract infection and acute bronchitis were the top two diagnoses among patients seen during and after travel. Pneumonia and influenza were not common among those seen during travel but were among the top five diagnoses among those seen after travel. For dermatologic problems, eczema was the most common diagnosis among those seen during travel, and dog bite was the most common diagnosis among those seen after travel.

A multivariate logistic regression model was done to derive statistically significant risk factors for dog and cat bites, adjusting for co-factors that were significant at the univariate level. China travelers were more likely to present with a dog or cat bite if they did not have a pre-travel medical consultation (3.9 times more likely), were ≤ 1 year of age (1.1 times more likely), were travelers visiting friends and relatives (VFRs) (9.8 times more likely), or were students (6.7 times more likely).

We compared the spectrum of disease and relative probability of common syndromes between China travelers and those who had traveled to Southeast Asia or India (Table 1). Among patients seen during travel, systemic febrile illness and acute diarrhea were the most common syndromes experienced by travelers to Southeast Asia and India, respectively, whereas respiratory ailments were the most common syndrome reported by China travelers. Importantly, among all ill

travelers exposed in China over 10 years, there were no cases of malaria, dengue, leishmaniasis, or Japanese encephalitis (JE). There was one case of leptospirosis and two cases of unspecified rickettsial disease.

Only limited data on immunization of China travelers seen after travel were available from GeoSentinel, because this data entry module is optional. Among China travelers, 89/598 (15%) provided immunization information. Of these, 22/89

TABLE 2

Top five individual diagnoses* among selected main syndrome groups for China travelers

Seen during travel (N = 2,576)	Seen after travel (N = 714)
Respiratory†	Respiratory
Upper respiratory tract infection (310)	Upper respiratory tract infection (245)
Acute bronchitis (134)	Acute bronchitis (225)
Allergic rhinitis (122)	Influenza (A,B, like illness) (143)
Asthma (102)	Atypical (diffuse) pneumonia (82)
Acute otitis media (88)	Bacterial (lobar) pneumonia (82)
Dermatologic	Dermatologic
Eczema (186)	Dog bite (400)
Insect sting (125)	Cat bite (86)
Non-drug-related allergic rash (110)	Monkey bite (67)
Skin abscess (e.g. furuncle, carbuncle, folliculitis) (106)	Non-febrile rash (67)
Superficial (infected wound) skin infection (57)	Insect sting (57)
Injury	Acute diarrhea
Sprain/strain (508)	Unspecified acute diarrhea (362)
Laceration (108)	Acute bacterial diarrhea (269)
Contusion (99)	<i>Giardia</i> (46)
Fracture (92)	<i>Campylobacter</i> (39)
Abrasion (46)	Acute parasitic diarrhea (39)

* The primary variable analyzed was proportionate morbidity (PM): number of patients with a specific diagnosis or group of diagnoses as a proportion of all ill travelers returning from a destination.³ Numbers of cases per 1,000 ill patients seen are given for each syndrome group.

† For those seen during travel, PM was 26 for pneumonia (atypical diffuse and lobar) and 29 for influenza (A, B, like illness).

(25%) had received between two and six immunizations. Immunization rates were as follows: hepatitis A, 17/81 (21%); hepatitis B, 12/79 (15%); influenza, 2/35 (5.7%); JE, 3/77 (4%); measles/mumps/rubella (MMR), 1/24 (4%); measles, 1/23 (4%); rabies, 2/84 (2%); typhoid, 10/78 (13%).

In Table 3, we compared characteristics of China travelers to those of Southeast Asia and India travelers combined ($N = 10,582$, 86% seen after travel and 14% seen during travel; $P < 0.01$; two-sided χ^2 for all comparisons below). For patients seen during travel, China travelers were significantly more likely to be an expatriate (97% versus 89%), to have sought pre-travel medical advice (76% versus 7%), to be a child (37% versus 1% < 15 years), and to be female (56% versus 23%). For patients seen after travel, China travelers were more likely to have taken shorter trips (43% versus 26% ≤ 2 weeks), to be older (23% versus 11% ≥ 55 years), to be traveling for the purpose of visiting friends and relatives (15% versus 7%), and to present more quickly to a clinic after their trips (51% versus 47% ≤ 1 week).

The high pre-travel consultation rate among China travelers seen during travel may be explained by requirements of employers and sponsors of expatriates and also by a high percentage of families with children in the Beijing expatriate community. A lower percentage of China travelers seen after travel (40% versus 59%) had sought pre-travel medical consultation. This was because of the lowest consultation rate among VFRs (8%), which made up 15% of the China travelers seen after travel. The VFR group traditionally does not often seek pre-travel advice.⁶

We found a high rate of injuries among China travelers seen during travel; construction and safety standards in public places and conveyances in China may not meet the usual expectations of many travelers, which may account for the increased injuries. Travelers, especially those with limited mobility, should be educated on practices to ensure safe mobility while in China.

Our findings corroborate previous reports that highlight respiratory illness as a particular concern for travelers return-

ing from Asia in general and China specifically.^{7,8} The respiratory grouping includes specific pathogens (e.g., influenza A and B and pneumococcus), as well as syndromic diagnosis codes for bronchitis, pneumonia, sinusitis, upper respiratory infection, and otitis. Respiratory illness was the primary syndrome that required hospitalization in China travelers seen during travel. Air pollution problems in Beijing and other Olympic venues^{9,10} may put athletes and spectators at an increased risk of occurrence of respiratory problems during the 2008 Olympics, although clean air measures are being implemented before the Games.

Animal bites are common in China, with 140,000 animal bites reported in Beijing in 2006.² China currently has the second highest number of cases of human rabies in the world.^{11,12} Rabies has, since May 2006, become China's leading cause of reportable infectious disease mortality, killing 3,293 people in 2006, 27% more than in 2005,^{2,13} with cases in Beijing but with most of the cases occurring outside of Beijing.¹⁴⁻¹⁶ Children are at higher risk for rabies because they tend to play with animals, may receive more severe bites, and may not report bites.¹⁷ Dogs in China are often not properly vaccinated because of non-adherence to registration and vaccination requirements, especially in rural areas that travelers may visit after the Olympics. There are also anecdotal reports that counterfeit veterinary vaccines are on the market.^{2,18} More importantly, there is no World Health Organization (WHO)-approved imported rabies immune globulin (RIG) currently available in China, although it is available in Hong Kong. Travelers who are not part of the diplomatic corps or with official delegations will have access only to locally made Chinese RIG (S. MacDonald, unpublished data). Some authors recommend² that the threshold for pre-exposure rabies vaccination should be lower than usual and be recommended for persons with prolonged travel in China and for all those shorter-stay travelers who anticipate spending much of their time outdoors, particularly in rural areas. Travelers should be made aware of preventive measures such as consistently avoiding contact with any animals, cleansing

TABLE 3
Comparisons of characteristics of ill travelers visiting China vs. combined ill travelers visiting Southeast Asia or India

Characteristic	Patients seen during travel		Patients seen after travel	
	China (1,829 patients)	Southeast Asia or India (1,437 patients)	China (598 patients)	Southeast Asia or India (9,145 patients)
Female	1,030 (56%)*†	337 (23%)	287 (48%)	4,384 (48%)
Age (years)				
< 15	667 (36)†	19 (1)	19 (3)†	234 (3)
15-54	1,032 (57)	1,374 (96)	439 (74)	7,825 (86)
≥ 55	129 (7)	43 (3)	137 (23)	1,040 (11)
Sought pre-travel health advice	1,375 (76)†	102 (7)	226 (40)†	5,155 (59)
Risk level				
Expatriate	1,615 (97)†	1,172 (89)	76 (23)	641 (23)
Pre-arranged or organized travel	43 (3)	30 (2)	145 (44)	1,078 (38)
Risk travel	12 (1)	114 (9)	111 (33)	1,128 (40)
Travel reason				
Business	1,634 (89)†	1,171 (82)	166 (28)†	1,134 (12)
Tourism	106 (6)	178 (12)	287 (48)	6,703 (73)
Student	50 (3)	51 (4)	24 (4)	95 (1)
Missionary	37 (2)	17 (1)	33 (6)	577 (6)
Visiting friends and relatives (VFRs)	1 (0)	8 (1)	88 (15)	626 (7)
Trip duration ≤ 2 weeks	NA	NA	219 (43)†	2,133 (26)
Present to clinic within a week after trip completion	NA	NA	302 (51)†	4,287 (47)

* Number and percentage in parentheses for all rows, as shown in first row. Numbers may not total to the respective sample size because of missing values. Percentages may not total to 100 because of rounding.

† Statistical significance of difference between China patients and the Southeast Asia or India combined counterparts, $P < 0.01$, two-sided χ^2 test.

NA = not applicable.

wounds immediately, and seeking reliable medical care promptly for all animal bites, no matter how minor. Given the lower risk of rabies in urban areas, especially in Beijing, travelers who only plan to visit urban Beijing for the Olympics may not need to obtain routine pre-exposure immunization.

We found that immunization among travelers to China was low, but immunization histories were unavailable for the majority of our patient population. The pre-travel consultation is an important opportunity for health care providers to ensure that all travelers are up to date on immunizations¹⁹ such as MMR,²⁰ diphtheria/pertussis/tetanus (DTaP, Tdap, Td),²¹ and poliovirus vaccine²²; those who belong to the respective risk groups should receive pneumococcal vaccine.²³ In addition, any traveler who wants to reduce the risk for influenza infection should consider influenza vaccination.^{24,25} Hepatitis A, hepatitis B, and typhoid vaccines should be considered for all travelers to China. Travelers who plan to visit destinations in China outside Beijing should consider additional precautions. These include a pre-exposure rabies vaccine and JE vaccine for longer stays in rural areas,²⁶ as well as malaria prophylaxis for the infrequent traveler visiting malaria-endemic regions. Travelers with pre-existing conditions, such as asthma, may especially need to visit their health care providers for pre-travel advice.

In summary, we found that health outcomes of travel to China were not “exotic” compared with travel to the typical tropical countries of Asia but were substantial enough to result in medical encounters for a variety of significant health events; travelers and health care practitioners should work together to ensure safe and healthy travel to China.

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