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Patterns of illness in travelers visiting Mexico and Central America: the GeoSentinel experience

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Abstract: BACKGROUND: Mexico and Central America are important travel destinations for North American and European travelers. There is limited information on regional differences in travel related morbidity. METHODS: We describe the morbidity among 4779 ill travelers returned from Mexico and Central America who were evaluated at GeoSentinel network clinics during December 1996 to February 2010. RESULTS: The most frequent presenting syndromes included acute and chronic diarrhea, dermatologic diseases, febrile systemic illness, and respiratory disease. A higher proportion of ill travelers from the United States had acute diarrhea, compared with their Canadian and European counterparts (odds ratio, 1.9; $P < .0001$). During the 2009 H1N1 influenza outbreak from March 2009 through February 2010, the proportionate morbidity (PM) associated with respiratory illnesses in ill travelers increased among those returned from Mexico, compared with prior years (196.0 cases per 1000 ill returned travelers vs 53.7 cases per 1000 ill returned travelers; $P < .0001$); the PM remained constant in the rest of Central America (57.3 cases per 1000 ill returned travelers). We identified 50 travelers returned from Mexico and Central America who developed influenza, including infection due to 2009 H1N1 strains and influenza-like illness. The overall risk of malaria was low; only 4 cases of malaria were acquired in Mexico (PM, 2.2 cases per 1000 ill returned travelers) in 13 years, compared with 18 from Honduras (PM, 79.6 cases per 1000 ill returned travelers) and 14 from Guatemala (PM, 34.4 cases per 1000 ill returned travelers) during the same period. Plasmodium vivax malaria was the most frequent malaria diagnosis. CONCLUSIONS: Travel medicine practitioners advising and treating travelers visiting these regions should dedicate special attention to vaccine-preventable illnesses and should consider the uncommon occurrence of acute hepatitis A, leptospirosis, neurocysticercosis, acute Chagas disease, onchocerciasis, mucocutaneous leishmaniasis, neurocysticercosis, HIV, malaria, and brucellosis.

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MAJOR ARTICLE

Patterns of Illness in Travelers Visiting Mexico and Central America: The GeoSentinel Experience

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Background. Mexico and Central America are important travel destinations for North American and European travelers. There is limited information on regional differences in travel related morbidity.

Methods. We describe the morbidity among 4779 ill travelers returned from Mexico and Central America who were evaluated at GeoSentinel network clinics during December 1996 to February 2010.

Results. The most frequent presenting syndromes included acute and chronic diarrhea, dermatologic diseases, febrile systemic illness, and respiratory disease. A higher proportion of ill travelers from the United States had acute diarrhea, compared with their Canadian and European counterparts (odds ratio, 1.9; $P < .0001$). During the 2009 H1N1 influenza outbreak from March 2009 through February 2010, the proportionate morbidity (PM) associated with respiratory illnesses in ill travelers increased among those returned from Mexico, compared with prior years (196.0 cases per 1000 ill returned travelers vs 53.7 cases per 1000 ill returned travelers; $P < .0001$); the PM remained constant in the rest of Central America (57.3 cases per 1000 ill returned travelers). We identified 50 travelers returned from Mexico and Central America who developed influenza, including infection due to 2009 H1N1 strains and influenza-like illness. The overall risk of malaria was low; only 4 cases of malaria were acquired in Mexico (PM, 2.2 cases per 1000 ill returned travelers) in 13 years, compared with 18 from Honduras (PM, 79.6 cases per 1000 ill returned travelers) and 14 from Guatemala (PM, 34.4 cases per 1000 ill returned travelers) during the same period. *Plasmodium vivax* malaria was the most frequent malaria diagnosis.

Conclusions. Travel medicine practitioners advising and treating travelers visiting these regions should dedicate special attention to vaccine-preventable illnesses and should consider the uncommon occurrence of acute hepatitis A, leptospirosis, neurocysticercosis, acute Chagas disease, onchocerciasis, mucocutaneous leishmaniasis, neurocysticercosis, HIV, malaria, and brucellosis.

An estimated 13 million–20 million travelers visit Mexico every year; >8 million arrive from the United States, nearly 1 million from Canada, and approximately half a million from Europe [1]. More than 2.5 million US travelers visit Central America every year [2]. Despite the large number of travelers to this region and the availability of specific authoritative pretravel preventive recommendations, such advice is not frequently sought [3, 4].

We present data collected over 13 years from travelers to Mexico and Central America who visited clinics

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affiliated with the worldwide GeoSentinel network. Our goal was to provide evidence-based information on regional illness patterns that could be used to update travel medicine recommendations for future travelers to the region. In addition, surveillance data collected during the 2009 H1N1 influenza outbreak from these clinics provided an opportunity to study the impact of the outbreak on travel-associated illness patterns among visitors to Mexico and Central America.

METHODS

GeoSentinel sites are specialized travel or tropical medicine clinics on 6 continents; providers from these clinics collect sentinel surveillance data for all ill travelers who visit the clinic during or after travel. These data include a broad sample of travel destinations and of morbidity among persons who become ill while traveling or when they return from travel.

Detailed methods for patient recruitment, inclusion criteria, and limitations of the GeoSentinel database are described elsewhere [5]. In brief, patients must have crossed an international border within 10 years before the clinic visit and have sought medical advice for a presumed travel-related illness. Anonymous surveillance data (including travel history) that cannot be linked to an individual patient are entered into a database at a central data center. Final diagnoses are assigned codes by the treating clinician from a standardized list of possible individual diagnoses that are also categorized under 21 broad syndromes. All sites use the best available reference diagnostic test in their own country. Patients can be assigned as many diagnosis codes as needed. Because most infections are associated with fever, diagnoses predominantly localized to one organ system were included in that organ-system syndrome category and were not attributed to the broader category of systemic febrile disease.

The GeoSentinel data collection protocol underwent ethical review and was classified as nonresearch public health surveillance. As such, it was not subject to institutional review board requirements.

Data entered into the GeoSentinel database from all sites from 11 December 1996 through 23 February 2010 were examined. Data were extracted by identifying all travelers who were seen after travel to Belize, Costa Rica, El Salvador, Guatemala, Honduras, Mexico, Nicaragua, and Panama. These travelers included tourists, students, business travelers, and persons visiting friends or relatives.

Statistical Analysis

Proportionate morbidity (PM) was expressed as the number of patients with a specific syndrome or diagnosis per 1000 ill travelers returned from Mexico or Central America. Statistical differences between groups were analyzed using the χ^2 test for categorical variables and the Wilcoxon rank-sum test for continuous variables. All diagnoses were examined and ranked according to syndrome groups. The top 5 diagnoses in each of the top 5 syndromic groups were queried from the database. A subanalysis of the PM for the top 5 diagnoses compared age, sex, pretravel advice, reason for travel, trip duration, and hospitalization. The effect size of demographic and trip characteristics on selected diagnoses was estimated using bivariate odds ratios (ORs). A 2-sided P value $\leq .05$ was considered to be statistically significant. SAS software, version 9.2 (SAS Institute) was used for statistical calculations.

RESULTS

Demographic Characteristics of Travelers Returning From Mexico and Central America

From December 1996 through February 2010, 4779 ill returned travelers to Mexico and Central America were included. Females represented 54% of the ill returned travelers. The mean age ($\pm$ standard deviation [SD]) was 35.9 $\pm$ 14.7 years, with a median trip duration of 17 days (interquartile range, 8–43 days). Most were tourists (68%), followed by missionaries/aid workers/volunteers (14%), business travelers (10%), travelers visiting friends or relatives (5%), and students (3%). Two hundred twenty-five ill returned travelers (5%) were hospitalized as a result of a travel-related illness. Most (66%) of the travel originated from the United States and Canada, 27% were from Western Europe, and the remaining 12% traveled from the rest of the world. Forty-eight percent of ill returned travelers had sought pretravel advice from a health provider (Table 1). Individuals traveling >7 days were more likely to have received pretravel advice than were short-term travelers (50% vs. 29%; OR, 2.4; 95% CI, 2.1–2.8; $P < .0001$).

Morbidity Patterns Among Travelers Returning From Mexico and Central America

Overall, the most common syndrome groupings among ill travelers returning from Mexico or Central America were acute diarrhea, dermatologic, and systemic febrile illnesses, followed by chronic diarrhea, other gastrointestinal, respiratory, nonspecific symptoms, and injuries and musculoskeletal illnesses (Table 2). Dermatologic illness accounted for the highest PM among ill returned travelers to Guatemala, Belize, Costa Rica, and Panama (Table 3). Moreover, the PM for dermatologic illness was nearly 2-fold higher than the PM for acute diarrheal diseases among travelers to Costa Rica and Panama.

Ill returned travelers residing in the United States had significantly higher PM for acute diarrhea after visits to Mexico and Central America, compared with ill returned travelers from Canada and Western Europe ($P < .0001$). Western Europeans returning from Mexico and Central America had a higher PM for chronic diarrhea, compared with their North

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American counterparts ($P < .0001$). Three hundred five travelers with postinfectious irritable bowel syndrome (PI-IBS), defined as diarrheal illness during travel, followed by posttravel chronic abdominal pain (usually cramping and of variable intensity) and altered bowel habits in the absence of any organic cause of at least 12 weeks duration, and 24 additional travelers with postinfectious lactose intolerance were identified after they had returned home. The vast majority of patients with PI-IBS were travelers from the United States and Canada (90.3%), with the same proportion of men and women affected ($P = .9$). Ill returned travelers visiting friends or relatives ($P = .03$) and students ($P = .004$) had the lowest PM for PI-IBS, whereas missionaries ($P < .0001$) had the highest PM, compared with tourists. Finally, older travelers had less diarrhea, compared with their younger counterparts ($P = .0002$). The PM for acute diarrheal illness was similar among ill returning travelers who received pretravel advice, compared with those who did not receive pretravel advice from a travel medicine provider ($P = .1$).

Table 1. Characteristics of Ill Travelers Returned From Mexico and Central America Seen at a GeoSentinel Network Clinic From 11 December 1996 through 23 February 2010

Characteristic	All travelers (N = 4779)
Female	2543 (54)
Mean age (SD)	35.9 (14.7)
Trip duration (median days, IQR)	17 (8–43)
Sought pretravel advice	2094 (48)
Travel reason	
Business	493 (10)
Tourism	3239 (68)
Student	139 (3)
Missionary	653 (14)
Visiting friends and relatives	231 (5)
Patient type	
Outpatient	4428 (95)
Inpatient	225 (5)
Region of origin[a]	
North America	3149 (66)
Central America	31 (0.7)
South America	16 (0.3)
Caribbean	1 (0.02)
Western Europe	1285 (27)
Eastern Europe	1 (0.02)
Middle East	189 (4)
North East Asia	34 (0.7)
South Central Asia	1 (0.02)
South East Asia	4 (0.08)
Sub-Saharan Africa	4 (0.08)
Oceania	62 (1)

NOTE. Central American countries include Belize, Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua, and Panama. Data are number (%) of patients, unless otherwise indicated. IQR, interquartile range; SD, standard deviation.

[a] Based on country of current residence.

Unspecified viral syndrome and dengue were the 2 most common diagnoses among returned travelers with a systemic febrile illness (Table 3). Fifty-seven cases of cutaneous myiasis were diagnosed, most of them among travelers who had returned from Belize ($n = 21$; PM, 130.4 cases per 1000 patients) and Costa Rica ($n = 22$; PM, 35.4 cases per 1000 patients), followed by Guatemala ($n = 6$, PM, 15.2 cases per 1000 patients), El Salvador ($n = 1$; PM, 10.1 cases per 1000 patients), Nicaragua ($n = 1$; PM, 5.4 cases per 1000 patients), and Mexico ($n = 6$; PM, 3.5 cases per 1000 patients). In addition, 61 cases of cutaneous leishmaniasis were diagnosed: 41 from Costa Rica (PM, 65.9 cases per 1000 patients), 7 from Belize (PM, 43.5 cases per 1000 patients), 4 from Panama (PM, 29.2 cases per 1000 patients), 6 from Guatemala (PM, 15.2 cases per 1000 patients), and 3 from Mexico (PM, 1.7 cases per 1000 patients).

Uncommon diagnoses seen among nonimmigrant travelers included acute Chagas disease, fascioliasis, onchocerciasis, neurocysticercosis, brucellosis, *Bordetella pertussis* infection, leptospirosis, acute HIV infection, acute hepatitis A, and rubella (Table 4).

Malaria Among Travelers Returning From Mexico and Central America

Fifty-four cases of malaria among ill returned travelers who had visited Mexico or Central America were identified over the past 10 years. Eighteen cases were identified in travelers returning from Honduras, 14 from Guatemala, 4 from Costa Rica, 4 from Mexico, 1 from Panama, and 1 from Belize. No cases were identified among ill travelers returned from El Salvador or Nicaragua. Only 19 identified cases (36%) were in female individuals, and the mean age ± SD was 36.7 ± 12.3 years. Most of the ill returned travelers with malaria were tourists (56.5%), followed by missionaries (18.9%), travelers visiting friends and relatives (11.3%), students (9.4%), and business travelers (3.8%). Most of the identified malaria cases were due to *P. vivax* (40), followed by *Plasmodium falciparum* [5], *Plasmodium ovale* [2], and *Plasmodium malariae* [1]. *Plasmodium* species was not determined for 6 cases. The highest PM for malaria among ill returned travelers visiting the studied countries was in Honduras (79.6 cases per 1000 patients), followed by Guatemala (34.4 cases per 1000 patients), Panama (7.0 cases per 1000 patients), Costa Rica (6.1 cases per 1000 patients), Belize (5.8 cases per 1000 patients), and Mexico (2.2 cases per 1000 patients).

Illness Patterns in Travelers Returning From Mexico and Central America Before and After the H1N1 Influenza Pandemic

Some differences in characteristics of travelers to Mexico were observed after the onset of the pandemic of 2009 H1N1 influenza. The proportion of ill returning leisure travelers from Mexico remained constant after March 2009, when the H1N1

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Table 2. Proportionate Morbidity Per 1000 Ill Travelers Seen After Travel

Rank	All travelers	Mexico	Guatemala and Belize	Honduras, El Salvador, and Nicaragua	Costa Rica and Panama
1	Acute diarrhea (234.9)	Acute diarrhea (248.1)	Dermatologic (266.5)	Acute diarrhea (211.4)	Dermatologic (335.1)
2	Dermatologic (200.7)	Dermatologic (160.5)	Acute diarrhea (200.5)	Febrile/Systemic illness (190.9)	Acute diarrhea (178.6)
3	Febrile/Systemic illness (128.2)	Chronic diarrhea (143.5)	Febrile/Systemic illness (152.5)	Dermatologic (157.7)	Febrile/Systemic illness (161.8)
4	Chronic diarrhea (114.0)	Other gastrointestinal (107.7)	Chronic diarrhea (129.1)	Chronic diarrhea (124.6)	Chronic diarrhea (67.2)
5	Other gastrointestinal (88.9)	Febrile/Systemic illness (107.3)	Other gastrointestinal (85.2)	Other gastrointestinal (107.3)	Respiratory (54.6)
6	Respiratory (66.3)	Respiratory (72.9)	Nonspecific symptoms (35.7)	Respiratory (44.2)	Other gastrointestinal (52.5)
7	Nonspecific symptoms (35.3)	Nonspecific symptoms (32.2)	Respiratory (30.2)	Nonspecific symptoms (37.9)	Nonspecific symptoms (38.9)
8	Injury and musculoskeletal (21.7)	Chronic disease (24.1)	Chronic disease (19.2)	Chronic disease (25.2)	Injury and musculoskeletal (18.9)
9	Neurologic (21.5)	Neurologic (20.1)	Psychologic (19.2)	Neurologic (22.1)	Neurologic (17.9)
10	Chronic disease (19.1)	Psychologic (18.3)	Neurologic (12.4)	Genitourinary and STDs (18.9)	Gentourinary and STDs (16.8)

NOTE. Diagnoses ranked according to syndrome group and destination for patients with disease acquisition in Mexico and central America visiting a GeoSentinel network clinic from 11 December 1996 through 23 February 2010. Based on exposure country, if ascertainable as determined by clinician (N = 4970, patients can have ≥1 diagnosis).

influenza outbreak was identified, but the proportion of those who obtained pretravel health advice decreased ($P < .0001$). The proportion of hospitalizations also increased among ill travelers returning from Mexico after H1N1 influenza ($P < .0001$).

The pattern of respiratory illnesses diagnosed in ill travelers returned from Mexico and Central America is shown in Figure 1. The mean monthly PM for respiratory illnesses among ill returned travelers visiting Mexico from December 1996 through February 2009 increased ~4 times during the period after the influenza outbreak was identified in March 2009 (53.7 vs 196.0 cases per 1000 patients; $P < .0001$) but remained constant for the rest of Central America.

Among ill returned travelers who had a respiratory presenting symptom, unspecified upper respiratory tract infections remained the most common diagnosis before (PM, 18.6 cases per 1000 patients) and after (PM, 59.8 cases per 1000 patients; $P < .0001$) 31 March 2009, when the H1N1 influenza outbreak was identified. From April 2009 through February 2010, the PM for influenza, influenza-like illness ($P < .0001$), and acute bronchitis ($P < .02$) also increased. Fifty ill returned travelers who visited Mexico and Central America developed influenza, including infection due to H1N1 strains, and influenza-like illness.

DISCUSSION

Using a sample of 4779 ill returned travelers, we elucidated illness patterns for Mexico and Central America that can direct pretravel advice and diagnosis of illness in future travelers to the region. Consistent with prior reports from this and other developing regions, diarrhea is the most common reason for seeking posttravel medical care [5]. As shown by Alon et al [6], we observed that elderly ill returned travelers had a lower PM for diarrhea, compared with younger travelers. This observed lower proportion of diarrhea among older travelers could possibly be attributed to increased dietary caution in this age group, the development of immunity from earlier travel, or the possibility that the older travelers have comparatively greater numbers of visits for other health problems. As noted elsewhere [7], visiting a travel medicine practitioner for medical advice before visiting Mexico and Central America was not associated with a lower proportion of acute diarrhea among the studied population, although this dataset does not allow an assessment of the benefit of seeking advice. One explanation is the possibility that travelers who seek pretravel medical advice at a travel clinic tend to return to the same clinic (ie, a GeoSentinel clinic) if they are sick, whereas those who did not seek pretravel health advice tend to go elsewhere for posttravel problems and are not captured in the GeoSentinel database. Travelers who seek pretravel advice may also be more likely to consult for posttravel symptoms, in general.

We observed a large difference in PI-IBS and chronic diarrhea diagnoses between North Americans and Europeans; whereas

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Table 3. Proportionate Morbidity (PM) Per 1000 Ill Travelers Visiting a GeoSentinel Network Clinic After Travel

Mexico	PM	Guatemala and Belize	PM	Honduras, El Salvador, and Nicaragua	PM	Costa Rica and Panama	PM
Respiratory		**Respiratory**		**Respiratory**		**Respiratory**	
Upper respiratory tract infection	24.1	Upper respiratory tract infection	12.4	Upper respiratory tract infection	15.8	Upper respiratory tract infection	17.9
Influenza-like illness	8.9	Acute bronchitis	4.1	Influenza-like illness	6.3	Acute bronchitis	8.4
Acute bronchitis	8.5	Mycobacterium TB, pulmonary	4.1	Acute bronchitis	4.7	Acute sinusitis	7.4
Pneumonia, bacterial	5.4	Influenza-like illness	2.7	Pneumonia, bacterial	3.2	Influenza-like illness	4.2
Acute sinusitis	4.5	Asthma	1.4	Acute sinusitis	3.2	Influenza A	2.1
Acute diarrhea		**Acute diarrhea**		**Acute diarrhea**		**Acute diarrhea**	
Acute unspecified diarrhea	89.0	Acute unspecified diarrhea	93.4	Acute unspecified diarrhea	91.5	Acute unspecified diarrhea	59.9
Acute bacterial diarrhea [a]	44.7	Giardia	26.1	Giardia	20.5	Acute bacterial diarrhea [a]	28.4
Giardia	26.4	Acute bacterial diarrhea [a]	23.4	Acute bacterial diarrhea [a]	18.9	Giardia	27.3
Gastroenteritis [b]	17.0	Ameba infections	9.6	Dientamebiasis (*D. fragilis*)	12.6	Campylobacter	12.6
Ameba infections	14.3	Dientamebiasis (*D. fragilis*)	8.2	Ameba infections	9.5	Gastroenteritis	11.6
Dermatologic		**Dermatologic**		**Dermatologic**		**Dermatologic**	
Cutaneous larva migrans	31.3	Insect bite	54.9	Insect bite	37.9	Insect bite	53.6
Insect bite	20.6	Myiasis	49.5	Cutaneous larva migrans	23.7	Cutaneous leishmaniasis	50.4
Unspecified rash	17.4	Unspecified rash	23.4	Unspecified rash	12.6	Unspecified rash	36.8
Photosensitivity rash	9.8	Cutaneous larva migrans	19.2	Fungal infection	11.0	Myiasis	23.1
Skin abscess	7.6	Cutaneous leishmaniasis	19.2	Rash, contact dermatitis	7.9	Insect bite, superinfected	17.9
Systemic illness		**Systemic illness**		**Systemic illness**		**Systemic illness**	
Unspecified viral syndrome	42.0	Unspecified viral syndrome	38.5	Unspecified viral syndrome	50.5	Unspecified viral syndrome	56.7
Dengue infection	13.0	Dengue infection	34.3	Dengue infection	36.3	Dengue infection	31.5
Febrile illness, unspecified (≥3 weeks)	6.3	Malaria, *P. vivax*	15.1	Histoplasmosis	23.7	Febrile illness, unspecified (<3 weeks)	21.0
Epstein-Barr virus infection	5.8	Histoplasmosis	12.4	Malaria, *P. vivax*	20.5	Leptospira	9.5
Febrile illness, unspecified (<3 weeks)	5.8	Cellulitis	9.6	Febrile illness, unspecified (<3 weeks)	11.0	Cellulitis	4.2
Chronic diarrhea		**Chronic diarrhea**		**Chronic diarrhea**		**Chronic diarrhea**	
Post-infectious IBS	73.8	Post-infectious IBS	63.2	Post-infectious IBS	61.5	Unspecified chronic diarrhea	30.5
Unspecified chronic diarrhea	51.9	Unspecified chronic diarrhea	54.9	Unspecified chronic diarrhea	48.9	Post-infectious IBS	29.4

NOTE. Top 5 individual diagnoses among selected main syndrome groups for patients with disease acquisition in Mexico and Central America from 11 December 1996 through 23 February 2010. Based on exposure country, if ascertainable as determined by clinician (N = 4970, patients can have ≥1 diagnosis).

[a] Refers to acute diarrhea due to a bacterial pathogen other than *Clostridium difficile*, *Campylobacter* species, *Vibrio cholerae*, *Salmonella* species, and *Shigella* species, which each one have a distinct diagnostic code.

[b] Refers to individuals with predominant upper gastrointestinal disease with major component of nausea and vomiting with accompanying diarrhea.

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Table 4. Characteristics of Ill Travelers With Selected Infectious Diseases After Visiting Mexico and Central America, Seen After Travel at a GeoSentinel Network Clinic From 11 December 1996 through 23 February 2010

Individual diagnosis	Traveler origin	Age	Sex	Traveler destination	Date of travel	Type of travel	Pretravel advice
Acute chagas disease	Canada	26	Female	Mexico	Jun 2008	Tourist	UNK
Fascioliasis	Germany	58	Female	Mexico	Jun 2000	Tourist	Yes
Onchocerciasis	United States	31	Male	Guatemala	May 2005	Business	UNK
Mucocutaneous leishmaniasis	Germany	64	Male	Costa Rica	Feb 2004	Tourist	Yes
Neurocysticercosis	United States	20	Male	Guatemala	Jul 2002	Missionary	No
Neurocysticercosis	United States	23	Female	Guatemala	Oct 2002	Missionary	Yes
Acute brucellosis	United States	33	Female	Mexico	Aug 2003	Visiting Friends and Relatives	No
Chronic brucellosis	United States	24	Female	Honduras	Feb 2008	Tourist	Yes
Pertussis	United States	68	Male	Guatemala	Jan 2007	Tourist	Yes
Pertussis	United States	24	Female	Costa Rica	Jun 2009	Tourist	No
Leptospirosis	Canada	37	Female	Costa Rica	Apr 2000	Tourist	No
Leptospirosis	United States	55	Male	Panama	Feb 2005	Tourist	No
Leptospirosis	United States	30	Male	Panama	Nov 2007	Tourist	No
Leptospirosis	France	48	Female	Costa Rica	Jul 2008	Business	UNK
Leptospirosis	United States	24	Female	Costa Rica	Dec 2008	Tourist	No
Leptospirosis	United States	33	Male	Costa Rica	Oct 2009	Tourist	No
Acute HIV	Canada	30	Male	Mexico	Nov 2002	Missionary	UNK
Acute HIV	Switzerland	43	Male	Central America	Aug 2005	Tourist	UNK
Acute hepatitis A	Israel	24	Male	Nicaragua	Jan 2000	Tourist	No
Acute hepatitis A	Canada	28	Female	Central America	May 2000	Tourist	No
Acute hepatitis A	USA	55	UNK	Mexico	Mar 2005	Tourist	No
Acute hepatitis A	USA	49	Female	Mexico	Aug 2005	Tourist	No
Acute hepatitis A	Canada	57	Male	Mexico	Apr 2007	Tourist	UNK
Acute hepatitis A	Canada	56	Female	Mexico	Apr 2007	Tourist	UNK
Acute hepatitis A	USA	7	Female	Mexico	Oct 2007	Visiting friends and relatives	UNK
Rubella	Brazil	33	Female	Costa Rica	Mar 2008	Visiting friends and relatives	No

travelers from the United States and Canada had a higher PM for PI-IBS, European travelers had a higher PM for chronic diarrhea. This finding may represent a difference in the definition and use of these diagnoses among medical practitioners on the different continents.

Dermatologic illnesses had an important impact on travelers, especially those visiting Guatemala, Belize, Costa Rica, and Panama. The increased PM for dermatologic illnesses might be explained by a higher proportion of travelers visiting these areas for eco-travel, spending time in the forest and/or jungle, and sleeping in remote areas. Myiasis in Belize seems especially common. Most of the cutaneous leishmaniasis cases were diagnosed in travelers who had visited Costa Rica and Belize. Although cutaneous leishmaniasis is an endemic disease in Central America, mucocutaneous [8] and visceral [9] leishmaniasis are rarely identified. Mucocutaneous leishmaniasis was confirmed in a 64-year-old German man who traveled to Costa Rica during February 2004. Travelers to Central America should be advised on measures to prevent insect bites and secondary infections of these lesions and management of cuts and small injuries that can predispose to cellulitis and prevention of dermatophytes.

Vaccine-preventable illnesses were observed among ill returned travelers from developed nations, where vaccines are widely available. These cases included a 68-year-old American man traveling to Guatemala during January 2007 and a 24-year-old American woman traveling to Costa Rica during June 2009, both of whom received a diagnosis of pertussis. Seven travelers from the United States, Canada, and Israel who returned from Mexico and Central America during January 2000–October 2007 received a diagnosis of acute hepatitis A infection; the youngest was 7 years of age, and the oldest was 57 years of age. In addition, a rubella case was identified in a 33-year-old female, Brazilian US resident traveling to Costa Rica in 2008. As was shown by Boggild et al [10], these findings highlight the importance of using the pretravel consultation to catch-up on routine vaccinations that may have been missed and those indicated primarily for travel.

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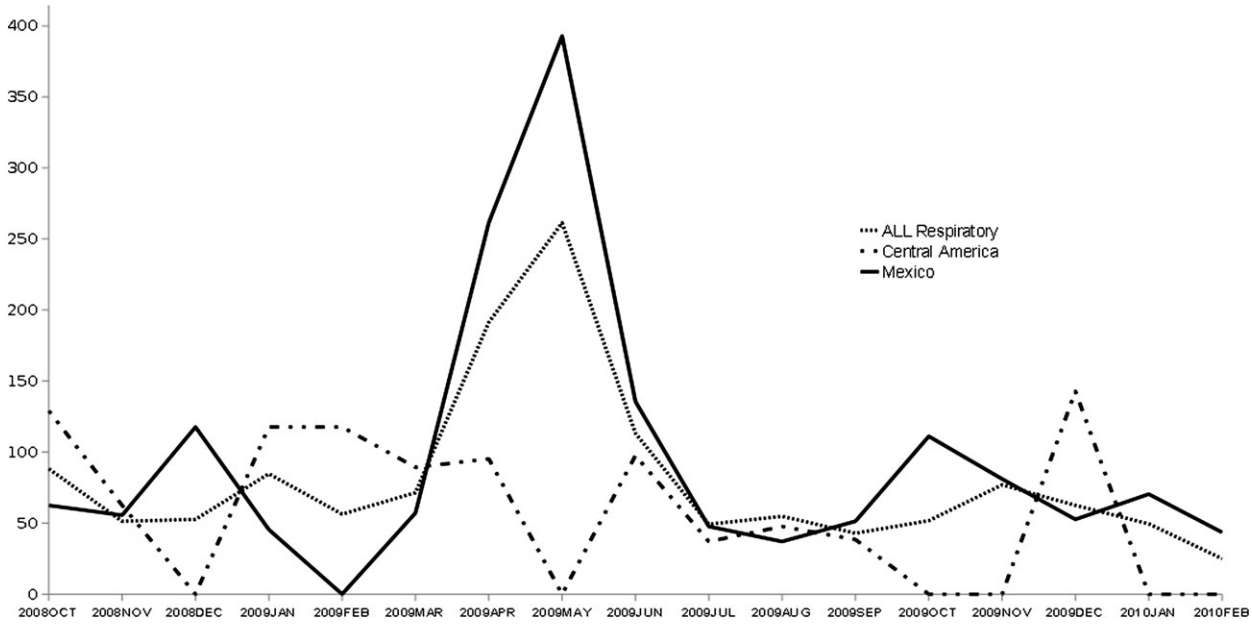

Figure 1. Monthly proportionate morbidity per 1000 ill travelers returned from Mexico and Central America who received diagnoses of respiratory illnesses, seen at a GeoSentinel Network clinic, from 11 December 1996 through 23 February 2010.

A statistically significant decrease in the number of imported malaria cases from Latin America in the United States was noted during 2007–2008 [11]. Although our study was not designed to provide an assessment of current malaria risk and prophylactic effectiveness among travelers, the PM for malaria in Honduras (79.6 cases per 1000 persons) and Guatemala (34.4 cases per 1000 persons) was found to be significantly higher than in the other studied countries. Most of the identified malaria cases in the GeoSentinel database were caused by *P. vivax* rather than *P. falciparum,* and some cases might represent previously acquired relapsing disease [12]. We identified 4 malaria cases in Mexico, including 2 in US leisure travelers who visited Tulum (located in the state of Quintana Roo, bordering Guatemala) during January 2007 and were hospitalized after their return. The other 2 malaria cases, presumably acquired in Mexico, were in adult Canadians traveling during 2000; however, complete travel information and exposure details were not available. Malaria transmission in Mexico continues to decrease, and chemoprophylaxis against malaria is not routinely indicated for travelers visiting Mexico except some rarely visited regions, most notably, in Chiapas and Oaxaca. For Central America, detailed recommendations can be found on the Centers for Disease Control and Prevention Travelers' Health Web site (www.cdc.gov/travel). In general, only travelers to Costa Rica, Panama west of the canal, or El Salvador will require chemoprophylaxis.

Beginning in April 2009, the GeoSentinel Surveillance Network recorded an increased PM associated with all respiratory illnesses. During the 2009 H1N1 influenza outbreak, an increased awareness of the potential health risks of traveling to Mexico among returning travelers may have also led to the increased numbers of patients visiting travel medicine clinics for 2009 H1N1 influenza screening. Some differences among travelers to Mexico were observed after the onset of the 2009 H1N1 influenza pandemic. The proportion of ill leisure travelers returning from Mexico remained constant after March 2009, when the H1N1 influenza outbreak was identified. Because the proportion of travelers who obtained pretravel health advice decreased, we hypothesize either that those who consulted health care practitioners before travel were advised not to travel to this area or that most of the leisure travelers visiting Mexico during the H1N1 influenza outbreak chose not to visit a travel medicine clinic. The increase in hospitalizations may have been a result of travelers being more likely to consult for respiratory symptoms, because of the general concern about H1N1 influenza at the time.

This descriptive analysis from the GeoSentinel database has several limitations. First, the database represents ill travelers seeking medical care at GeoSentinel sites; thus, the data do not represent a comprehensive epidemiologic analysis of all travelers. Second, because no information related to healthy travelers was recorded and no denominator was available, we could not estimate rates or risk of travel-related illness. Third, because most GeoSentinel sites are travel or tropical medicine clinics located in Europe and North America, diseases with short incubation periods and/or self-limited symptoms that might manifest during travel may be underrepresented in the database. Fourth, GeoSentinel clinics tend to be referral clinics. As such, diseases with more severe, persistent, or complex and/or unusual

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clinical signs or symptoms might be overrepresented. Fifth, some GeoSentinel clinics might have different proportions of certain types of travelers; for example, American clinics are more likely to see more travelers visiting friends or relatives in Latin America, because of the higher proportion of Hispanic residents in the United States. Sixth, the GeoSentinel database is designed to collect epidemiologic information based on the diagnosis made by the practitioner seeing the ill traveler and depends on the best knowledge and resources available locally. Seventh, the GeoSentinel database collects predefined epidemiologic information and not additional detailed clinical information, such as the administration of prophylaxis, vaccines, or medication used by the traveler while in the destination country. Last, a proportion of exposure countries were missing or unascertainable as determined by the clinician; analysis based on exposure country may not be representative of travelers exposed in Mexico or Central America.

The information presented here provides a profile for practitioners seeing travelers returned from Mexico and Central America. The differences in proportionate morbidities seen in different regions of Central America can help guide pretravel interventions. In addition, this study describes the impact of the H1N1 influenza epidemic in Mexico and Central America on respiratory illness in returning travelers and illustrates how the GeoSentinel network can reflect such an outbreak.

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GeoSentinal Surveillance Network

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