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What proportion of international travellers acquire a travel-related illness? A review of the literature

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Abstract

Introduction—As international travel increases, travellers may be at increased risk of acquiring infectious diseases not endemic in their home countries. Many journal articles and reference books related to travel medicine cite that between 22–64% of international travellers become ill during or after travel; however, this information is minimal, outdated and limited by poor generalizability. We aim to provide a current and more accurate estimate of the proportion of international travellers who acquire a travel-related illness.

Methods—We identified studies via PubMed or travel medicine experts, published between January 1, 1976–December 31, 2016 that included the number of international travellers acquiring a travel-related illness. We excluded studies that focused on a single disease or did not determine a rate based on the total number of travellers. We abstracted information on traveller demographics, trip specifics, study enrollment and follow-up and number of ill travellers and their illnesses.

Results—Of 743 studies, nine met the inclusion criteria. The data sources were from North America (four studies) and Europe (five studies). Most travellers were tourists, the most frequent

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destination regions were Asia and Africa, and the median trip duration ranged from 8–21 days. Six studies enrolled participants at the travellers' pre-travel consultation. All studies collected data through either extraction from the medical record, weekly diaries, or pre- and post-travel questionnaires. Data collection timeframes varied by study. Between 6–87% of travellers became ill across all studies. Four studies provided the best estimate: between 43–79% of travellers who frequently visited developing nations (e.g. India, Tanzania, and Kenya) became ill; travellers most frequently reported diarrhoea.

Conclusion—This is the most comprehensive assessment available on the proportion of international travellers that develop a travel-related illness. Additional cohort studies would provide needed data to more precisely determine the rates of illness in international travellers.

Keywords

International travel; travel; illness

Introduction

Projections suggest the annual number of international travellers will reach 1.8 billion by 2030. Europe remained the most common destination for international travellers in 2015, accommodating approximately 600 million arrivals, an increase of almost 5% from the previous year. However, travellers are increasingly visiting regions with emerging economies, and travel to Asia, Africa, Latin America and the Middle East is projected to rise in the coming years.¹ Of the top 10 international destinations in 2015 identified by the United Nations World Tourism Organization, four (China, Turkey, Mexico and the Russian Federation) were outside of the United States and Western Europe; combined, these four destinations accounted for 160 million arrivals.¹

As international travel increases and travel destinations diversify, travellers increasingly acquire infectious diseases not endemic in their home countries²; therefore, there is a need for current and accurate data on the proportion of international travellers who acquire an illness while abroad. Despite this need, estimating this proportion is difficult, since ill travellers may not seek care from a healthcare provider if they have mild symptoms or do not know where or how to access care in the country they are visiting. Also, travellers may not attribute their illness to travel, especially if they acquire illnesses with long incubation periods and their symptoms manifest weeks or months after returning home.

Global, clinician-based surveillance of travel-related illness is one way to address this need, and is a primary objective of travel and tropical medicine surveillance networks such as GeoSentinel.^{2–4} Although such data are useful, there are limits to their application, especially when determining the rates of an illness globally or for a specific geographic area. For example, a GeoSentinel analysis on the surveillance of ill returned travellers from 2007–11 reported that 34% of illnesses reported to GeoSentinel were gastrointestinal,³ but readers must interpret this estimate with caution, since GeoSentinel data come from a finite number of travel and tropical medicine clinics and, more importantly, do not capture total traveller numbers. Without this denominator, the rate of illness or incidence cannot be determined.^{3,5}

Estimating the proportion of international travellers who acquire a travel-related illness is important for two main reasons. First, the current trend toward increased globalization and urbanization will likely affect the prevalence and epidemiology of travel-related disease; knowing the proportion of travellers that become ill can be useful in observing trends over time. Second, medical providers can use this estimate to help provide optimal pre-travel advice to their patients. Many travel medicine journal articles and reference books currently cite an illness estimate of 22–64%^{5,6}; however, the basis for this estimate includes information that is based upon a limited number of studies, is outdated, and involves only specific traveller populations and, thus, is limited by poor generalizability. To address this knowledge gap, we conducted a literature search and review in an effort to provide a current and accurate estimate of the number of travellers that acquire travel-related illnesses during or after international travel.

Materials and Methods

Study Identification and Selection

We searched PubMed for relevant English-language studies, with specified search algorithms (international travel or traveller[s] and infectious disease[s]), published between 1 January 1976 and 31 December 2016 (>40 years). Our search included clinical studies, clinical trials, journal articles, meta-analyses, observational studies, reviews and systematic reviews. We interviewed experts in the field of travel medicine, identified through publications and field notoriety, to identify additional studies.

We selected studies if they described the number of travellers with travel-related illness either during or after international travel. From this initial selection, we excluded studies that focused on a single disease or that did not include the total number of travellers (a denominator to determine a rate) in addition to the total number ill.

Data Extraction and Analysis

We abstracted and summarized the following variables from the studies: baseline traveller demographics, trip specifics (including travel reason, duration and destination), total number of travellers, number of ill travellers, illnesses acquired, the data source, enrollment information and the type(s) and frequency of administration of the data collection instrument(s). We critically evaluated each study based on these characteristics to determine the best estimate of the number of international travellers with a travel-related illness.

Narrative Review Methodology

Differences in study design, purpose, objectives and outcomes resulted in a large heterogeneity of articles. We performed a narrative review on the available evidence for our clinical question and qualitatively described the findings of the included studies.

Results

We identified 743 studies through the literature search and consultation with experts; nine met the inclusion criteria. Publication dates ranged from 1985–2016, and the data sources

were from North America (four studies) and Europe (five studies) (Table 1). The number of study participants ranged from 122 (Balaban *et al.*) to 10 555 (Steffen) travellers. All travellers were adults 18 years or older; the median age of travellers ranged from 35 years (Vilkman *et al.*) to 52 years (Stoney *et al.*). Travellers were predominantly female in six of the nine studies. Among studies with information available, most travellers were travelling for tourism or vacation, the most frequent destination regions were Asia and Africa, and the median trip duration ranged from 8 days (Dia *et al.*) to 21 days (Steffen). Travel was to both developed (e.g. Canada and Italy) and developing (e.g. Tanzania and Nepal) countries.

Enrollment of Study Participants

The studies recruited and enrolled travellers through various mechanisms (Table 2). Six studies enrolled participants at the travellers' pre-travel consultation with a healthcare provider, two studies enrolled participants during travel to or from their destination, and one study enrolled participants through random-digit-dialing. All studies collected data through extraction from medical records, weekly diaries, or pre- and post-travel questionnaires; data collection timeframes varied by study.

Proportion Ill

Across all studies, 6–87% of travellers became ill during or after travel (Table 1). In four of the nine studies, less than half of travellers became ill during or after travel; travellers were predominantly tourists in three of the four studies (71% tourists in Stoney *et al.*; 100% tourists in Rack *et al.*; and 93% tourists in Steffen *et al.*). In the fourth study (Balaban *et al.*), the majority of travellers provided scientific or technical assistance, performed teachings or trainings and/or attended a professional meeting. In these studies, travel destinations included both developed and developing nations. In the remaining five studies, 64–87% of travellers became ill during or after travel; these travellers were also predominantly tourists. Among these remaining studies, travellers frequently travelled to developing nations; three of these studies included information on the top five destination countries: India, Tanzania and Kenya were among the top five travel destinations for all three studies, and Thailand was among the top five travel destinations for two studies.

Types of Illness

In seven studies for which information was available on the type of illness acquired while abroad (Stoney *et al.* did not include this information), travellers were most frequently ill with diarrhoea (Table 3). Travellers also frequently reported gastrointestinal symptoms in addition to diarrhoea, such as nausea, vomiting, constipation, or abdominal cramps. In Dia *et al.*, travellers most often reported a dermatological condition (75%). Other symptoms reported with moderate frequency included respiratory tract symptoms, skin problems, and fever. Between 8–55% of ill travellers sought medical care during travel or after travel within the studies' follow-up period. The follow-up period post-travel among the studies varied. The shortest period of post-travel follow-up was in Steffen, in which a questionnaire was administered on the flight back to Switzerland, and the longest period of post-travel follow-up was in Stoney *et al.* in which travellers were asked about travel anytime in the previous 12 months. Other follow-up periods ranged from a week after return (Dia *et al.*), to

seven months after departure (Steffen *et al.*); two studies did not provide follow-up periods. Between <1–3% of travellers were hospitalized.

Discussion

Two studies (Hill in 2000 and Steffen *et al.* in 1987)^{7,8} are commonly cited in the travel medicine literature when discussing the proportion of international travellers who become ill with a travel-related illness while abroad. Despite the large number of travellers in these two studies and the exposures in various geographic regions, these estimates may not be representative of all international travellers, even though considered the best estimates available. These two studies are dated, lacking diversity in the type of travel (e.g. tourists or conference attendees) and nationality of travellers included. During the past 40 years, seven additional studies,^{9–15} six of which were published since 2006, have provided information that may lead to a more generalizable and accurate estimate of the proportion of international travellers that acquire a travel-related illness.

Among the nine studies assessed, the majority (six studies) prospectively enrolled travellers during their pre-travel consultation with a healthcare provider.^{7,9,10,12,13,15} Travellers who attend a pre-travel consultation receive education on mitigation of health risks during travel and prevention of infectious diseases, including personal protective measures, chemoprophylaxis, and vaccination.¹⁶ Attendance at a pre-travel consultation may result in decreased illness if clinicians provide travellers with prevention information¹⁷ and the travellers adhere to these preventive measures. Additionally, travellers who attend a pre-travel consultation may also have greater motivation to prevent illness than those who do not attend. Therefore, the studies that enrolled travellers at the pre-travel consultation may not portray an accurate estimate of travel-related illness for all travellers because the travellers underwent pre-travel health preparations. On the other hand, enrollment of travellers who attend pre-travel consultations may overestimate the proportion of travel-related illness due to overrepresentation of travellers visiting developing regions (due to the need for vaccinations and chemoprophylaxis). This latter hypothesis is supported by findings in Vilkman *et al.*: travellers were enrolled at the pre-travel consultation, and 84% visited Asia or Africa, while only 3% visited North America or Europe; almost 80% of travellers became ill while abroad.¹³ In addition, in the United States, many health insurance plans do not pay for pre-travel health consultations and vaccines, which may result in a selection bias among the studies that enrolled travellers at the pre-travel consultation since they likely included only travellers with the means to pay out-of-pocket for their preventive care. In Europe, a similar bias may arise due to country variation on whether pre-travel consultation is provided by the public or the private sector.

The studies also included varied completion rates for the data collection instruments, possibly creating a reporting bias. For example, Chen *et al.* found that white and older travellers had a higher completion rate of the data collection instrument than other ethnicities and younger travellers,¹⁰ likely decreasing representativeness. Balaban *et al.* had the poorest follow-up of all studies, in which only 14% of respondents completed the pre-travel survey and only 7% completed both surveys.⁹ In addition, the follow-up periods for data collection varied among studies, from as short as during the flight home¹⁴ to up to 12

months after departure¹¹; two studies did not mention the timeframe of the follow-up period.^{9,12} Long follow-up periods may increase recall bias, resulting in an underestimation of travel-related illness if the traveller was unable to recall feeling ill, or an overestimation of travel-related illness if they became ill months after returning home but attributed their symptoms to travel. On the contrary, short follow-up periods may not capture illness from diseases with long incubation periods, such as *Plasmodium ovale* or *Plasmodium vivax* malaria. Exclusion of travellers from the study for travel lasting longer than 2 or 3 months^{12,14,15} may create similar issues.

Differences in the main objectives of each study's surveys or questionnaires may also introduce bias. For example, in Dia *et al.*, 87% of travellers, the most of any study, experienced health a travel-related complaint.¹⁵ The post-travel questionnaire in this study included specific questions about arthropod bites and sunburns, which likely contributed to the high prevalence of dermatological complaints in this cohort. In five other studies,^{7,8,10,12,14} travellers were asked about 'skin problems', 'dermatosis' or 'dermatological problems', while only Vilkman *et al.* further specified the exclusion of dry skin, atopy, acne and insect stings, while including sunburn, sun rash and infected skin due to insect stings as travel-related illnesses. The inclusion or exclusion of exposures or illnesses in the questionnaires or during data analysis may create variability in the proportion of ill travellers reported among studies.

The variation in travel reasons and traveller age may also affect the generalizability of the estimates from these studies. Although the majority of travellers were tourists, there were travellers with other travel reasons enrolled; these variations in travel reason may affect the generalizability of results. Chen *et al.* found higher proportions of business travellers and volunteers/missionaries/aid workers,¹⁰ while Stoney *et al.* included the largest proportion of travellers visiting friends and relatives (VFR) (18%)¹¹ and Balaban *et al.* included only travellers from a large American public health agency.⁹ Each travel group has different characteristics that may place them at either increased or decreased risk of acquiring an illness while abroad. For example, VFR's may be prone to acquiring preventable infectious diseases while abroad due to lack of risk awareness, travel to high-risk destinations, cultural or financial barriers that preclude access to pre-travel care, and approximating the living conditions of the local community.^{18,19} Even VFRs that do receive pre-travel care may encounter financial barriers preventing them from filling prescriptions for prophylactic medications or receiving certain vaccines, or may face cultural barriers that could decrease their adherence to recommendations while abroad. American public health agency workers, despite most travelling to Africa or Asia, may be at lower risk of travel-related illness due to prior knowledge of travel-related risks; they may also be more proactive about taking preventive measures and travel preparations than tourists or VFRs, and receive pre-travel care free of charge. The median traveller age may also affect generalizability; travellers in Stoney *et al.* had the highest median age among the nine studies, likely due to the administration of the questionnaire through random-digit-dialing of landline phone numbers.¹¹

Destination, in addition to duration and season of travel, also contributes to the likelihood of acquiring a travel-related illness.²⁰ Dia *et al.* only included French travellers visiting

Senegal, predominantly during the dry season,¹⁵ which limits the generalizability of this study's data to both the other countries as well as Senegal's wet season. India, Tanzania and Kenya were among the top five travel destinations for the four studies where more than half of travellers became ill. Travel to the Indian subcontinent more than doubled the risk of becoming ill relative to other included destinations,^{7,12} and India was the most common country of travel among travellers who reported a health problem.¹⁰ India has a number of infectious disease risks for travellers, including malaria, dengue, chikungunya, hepatitis and tuberculosis.²¹ Travel to India accounts for almost 60% of typhoid fever among international travellers returning to the United States,²² and the highest worldwide burden of rabies, resulting in high numbers of individuals, including travellers, who may need post-exposure prophylaxis.²¹ Outbreaks may also affect the number of travellers that become ill while abroad; for example, the H1N1 pandemic in 2011 possibly contributed to illness among travellers.¹⁰

Two studies include data collected in the 1980s,^{8,14} one of which is included in the currently cited estimate.⁸ Although these studies provide the largest total number of international travellers, travel has changed dramatically over the past 40 years. Increased air travel and access to developing countries places travellers at higher risk of encountering infectious diseases not endemic in their home countries, such as malaria or other vector-borne diseases.²³ In addition, chemoprophylaxis for malaria has evolved significantly since the 1980s with the introduction of mefloquine in 1989, doxycycline in 1992 and fixed-dose atovaquone-proguanil in 2000.²⁴ New vaccines and updates to travel vaccine recommendations²⁵ likely also affect the proportion of international travellers that acquire a travel-related illness. Similarly, certain destination-specific illness risks have changed over the past 40 years. For example, the risk of acquiring an illness such as malaria, where national and global control programs successfully decreased disease prevalence, declined substantially,²⁶ while the risk of acquiring other emerging infectious diseases, such as Zika virus,²⁷ has simultaneously increased.

Despite the limitations and biases of the nine studies included in this analysis, four of these studies provide improved estimates on the number of travellers that acquire a travel-related illness.^{7,10,12,13} These four studies included data abstraction at the pre-travel consultation to obtain baseline characteristics, administered at least one post-travel questionnaire, enrolled travellers going to a variety of destinations and included data from the last 20 years to reflect recent rises in international travel. In these four studies, between 43–79% of travellers reported developing a travel-related illness; these were predominantly tourists from the United States and Europe that attended a pre-travel consultation and became ill during or after travel to Asia or Africa (more specifically, India, Tanzania, or Kenya). However, this estimate is limited to specific populations of travellers, and is subject to the biases of the included studies previously described. The other five studies^{8,9,11,14,15} provided estimates for very specific groups of travellers (e.g. public health workers, travellers to Senegal) or were outdated.

The most common infectious disease illnesses acquired abroad are usually gastrointestinal^{5,6}; our findings support this. From seven studies among eight with available information, diarrhoea was the most frequent illness reported; however, the proportion of

travellers with diarrhoea varied considerably among the studies, and we cannot draw conclusions on travellers' diarrhoea risk. Additionally, the numbers of travellers that sought medical care or were hospitalized must be interpreted with caution; it is unknown if medical care was sought for an infectious disease acquired during travel or for exacerbations of chronic conditions or non-travel-related illnesses or complaints.

A limitation of this narrative review is that only one database (PubMed) was searched and only English articles were included; thus, publications from Europe or other regions may have been missed. However, this is the most comprehensive assessment available on the proportion of international travellers that develop a travel-related illness. Epidemiologists may use this estimate to observe trends in travel-related illness, and clinicians may use the results to provide optimal pre-travel advice to their patients. Researchers may further delineate the proportion of international travellers that acquire a travel-related illness by age, travel reason, destination and duration of travel.

The best method to determine the proportion of travellers that become ill during or after travel would be to perform a prospective, multi-national study. This study should enroll travellers during pre-travel consultations in the healthcare setting, as well as from external settings, such as airports or train stations, to capture travellers who may not have received illness-prevention education. Travellers should also represent a broad range of travel reasons, as well as travel to various destinations for assorted durations. A study with these attributes would limit biases and increase generalizability. We would like to use this opportunity to call for an international effort to collect the necessary data due to the paucity and limitations for such an important topic for the international travel community. Specifically, cohort studies would provide needed data to more precisely determine the rates of illness in international travellers.

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Table 1 Characteristics of studies including the number of international travellers acquiring a travel-related illness, January 1, 1976–December 31, 2016(*n* = 9)

Study (Publication year)	Data year(s)	Study participant nationality	Median age in years (range)	Sex (%F)	Travel	Destination(s) region (%)	Top 5 Destination Countries (%)	Median travel duration, days (range)	Total travellers (<i>n</i>)	Travellers ill during or after travel, <i>n</i> (%)
Volunteer/missionary/aid (15) reasons (%)	Tanzania (5)									
Chen <i>et al.</i> (2016)	2009–11	United States ^a	47 (19–83)	59	Tourism/Vacation (67) Business (18) Visiting friends and relatives (14) Educational/Research (4) Medical/dental care (<1) Other (2)	N/A	India (12) South Africa (5) Kenya (4) Haiti (4)	1.2 (3–65)	628	400 (64)
Vilkman <i>et al.</i> (2016)	December 2008–February 2010	Finland	35 (27–54)	62	Vacation (84) Business (8) Other/multiple (8)	South East Asia (23) East Africa (21) West Africa, Middle Africa (19) Southern Asia (15) Latin America/Caribbean (9) Southern Africa (6) Europe/North America (3)	India (14) Thailand (13) The Gambia (11) Tanzania (10) Kenya (9)	16 (IQR: 13–27)	460	363 (79)
Stoney <i>et al.</i> (2016)	2011	United States ^b	52 (18–88)	59	Tourism (71) Visiting friends and relatives (18) Business (8) Other ^c (3)	N/A	Mexico(br/Canada Dominican Republic The Bahamas Italy	N/A ^b	841	48 (6)
Balaban <i>et al.</i> (2014)	September 2009–September 2010	United States	41 (25–63)	62	Epidemiology/technical assistance (66) Teaching/trainings (42) Attending professional meetings (37) Working in a laboratory (12) Working in a health care facility (12)	Africa (50) Asia (23) Mexico/Central America (8)	N/A	18 (4–99)	122	33 (27)
Dia <i>et al.</i> (2010)	January–December 2003	France	43.3 (19–79)	52	Tourism (77) Visiting friends and relatives (12) Business (7) Missionary (3) Study (1)	Africa (100)	Senegal	8 (3–92)	358	313 (87)
Rack <i>et al.</i> (2006)	July 2003–June 2004	Germany	40.3 ± 13.5	51.7	Tourism (100)	Asia (57) Africa (30) South America (13)	N/A	23.9 ± 10.3	658	282 (43)

Study (Publication year)	Data year(s)	Study participant nationality	Median age in years (range)	Sex (%F)	Travel	Destination(s) region (%)	Top 5 Destination Countries (%)	Median travel duration, days (range)	Total travellers (n)	Travellers ill during or after travel, n (%)
Volunteer/missionary/aid (15) reasons (%)	Tanzania (5)									
Hill (2000)	June 1989–May 1991	United States	44.1 ± 17.5	56	Vacation (74) Study or teaching (15) Missionary or service (6) Business (6)	Indian subcontinent (21) Central/East Africa (20) South America (16) South East Asia (14) West Africa (10) Central America/Mexico (10) North Africa (6) East Asia (6) Caribbean (5) Southern Africa (5) Middle East (3)	Kenya India Nepal Thailand Tanzania	19	784	501 (64)
Steffen <i>et al.</i> (1987)	July 1981–June 1984	German-speaking Switzerland	39.9 ± 14.2	47	Tourism (93) Business (1) Various (6)	East Africa (33) Sri Lanka/Maldives (26) West Africa (19) South America (9) Far East (east of Burma) (7) Asia, various regions (4) Various/other regions (2)	N/A	18 ± 11	7,886	1,209 (15)
Steffen (1985)	N/A	German-speaking Switzerland	N/A	41	N/A	N/A	N/A	21	10,555	7,906 (75)

N/A, not available; IQR, Interquartile range; n = 458 (2 missing).

^a Among these travellers, 18% were born outside the United States.

^b Among these travellers, 26% were born outside of the United States.

^c Other includes volunteers/missionaries, health/medical treatment, research/study, or 'other not mentioned'.

Table 2

Study characteristics used to determine the best estimate of the number of international travellers with a travel-related illness ($n = 9$)

Study	Data source	Enrollment	Data Collection Instrument(s)	Timeframe(s)
Chen <i>et al.</i>	Boston-Area Travel Medicine Network (BATMN)	Recruited at pre-travel consultation	Extraction from medical record Weekly diary Post-travel survey	At pre-travel visit During travel 2–4 weeks post-travel
Vilkman <i>et al.</i>	Travel clinic of Aava Medical Centre	Recruited at pre-travel consultation	Pre-travel questionnaire Follow-up questionnaire	At pre-travel visit 3 weeks after pre-travel visit
Stoney <i>et al.</i>	New Jersey Behavioural Risk Factor Survey (NJBRFS)	Random-digit-dialing	NJBRFS Travel Health Module	Travel in the previous 12 months
Balaban <i>et al.</i>	Large American public health agency	Recruited at pre-travel consultation	Pre-travel survey Post-travel survey (web-based)	At pre-travel visit N/A
Dia <i>et al.</i>	Marseille Travel Medicine Centre	Recruited at pre-travel consultation	Pre-travel questionnaire Post-travel questionnaire	At pre-travel visit Within a week of return
Rack <i>et al.</i>	Berlin Institute of Tropical Medicine	Recruited at pre-travel consultation	Extraction from medical record Post-travel questionnaire	At pre-travel visit N/A
Hill	University of Connecticut Health Centre	Recruited at pre-travel consultation	Brief questionnaire (with possible telephone interview) Standardized questionnaire (phone-based)	Within 2 weeks after travel 2 months after travel
Steffen <i>et al.</i>	N/A	N/A	Pre-travel questionnaire Retrospective questionnaire	Just prior to boarding a flight 7 months after departure
Steffen	Returning flights to Switzerland	Airplane	Questionnaire	Flight back to Switzerland

N/A, not available.

Table 3Illnesses acquired by international travellers in the included studies ($n = 9$)

Study (No. ill)	Top 5 illnesses (%)	No. (%) of travellers that sought medical care	Hospitalizations ⁿ (%)
Chen <i>et al.</i> ($n = 400$)	Diarrhoea (52) Headache (26) Fatigue (25) Cough (24) Runny/stuffy nose (24)	73 (18)	4 (<1) ^a
Vilkman <i>et al.</i> ($n = 363$) ^b	Travellers' diarrhoea ^c Skin problem Fever Vomiting Respiratory tract infection	N/A	3 (1)
Stoney <i>et al.</i> ($n = 48$)	N/A	N/A	N/A
Balaban <i>et al.</i> ($n = 33$)	Diarrhoea (21) Sore throat (11) Nausea/vomiting (9) Congestion/runny nose (8) Coughing (7)	6 (19)	1 (3)
Dia <i>et al.</i> ($n = 313$)	Arthropod bite (62) Diarrhoea (46) Sunburn (36) Vomiting (9) Cough (8)	33 (11)	1 (<1)
Rack <i>et al.</i> ($n = 282$)	Gastrointestinal (81) Respiratory (32) Fever (15) Dermatologic (10)	44 (16)	1 (<1)
Hill ($n = 501$)	Diarrhoea (46) Respiratory tract symptoms (26) Skin problem (8) High altitude sickness (6) Motion sickness (5)	59 (8)	2 (3) ^d
Steffen <i>et al.</i> ($n = 1209$)	Severe diarrhoea (56) Vomiting or abdominal cramps (26) Common cold (14) High fever over several days (13) Dermatosis (8)	659 (55)	43 (1)
Steffen ($n = 7906$)	Diarrhoea ^c Constipation Respiratory infections Insomnia Headache	N/A	N/A

N/A, not available.

^aOne traveller with heart disease and a pulmonary embolism; two others with unspecified chronic medical conditions; one unknown.^bBased upon data available for 459 of the 460 ill travellers in this study.^cDenominator could not be determined from the article.^dOne traveller with malaria and the other with angina..