GEOSENTINEL

The Global Surveillance Network of the ISTM and CDC

GeoSentinel: A Surveillance Network of Returning Travelers and Migrants

David Hamer, MD
Department of Global Health
Boston University School of Public Health
Section of Infectious Diseases, Dept. of Medicine,
Boston Medical Center

Disclosures

- GeoSentinel funding from US CDC, ISTM and PHAC
- Consulting fees: iJET, Valneva
- Speaking honorarium: Merck

Talk Outline

- Description of GeoSentinel
- Analysis of ill travelers (2007 – 2011)
- GeoSentinel Zika analyses
- Examples of outbreak reports

GeoSentinel Surveillance Network Overview

- Established in 1995 by CDC and International Society for Travel Medicine (ISTM)
- Clinic-based global surveillance system
  - De-identified patient information
  - International travelers and immigrants
  - Central electronic database
  - Link time and place of exposure
  - Detect new infections and patterns
  - Monitor disease burden and distribution
- Co-funded by CDC (DGMQ), ISTM, and PHAC

Variables Collected in GeoSentinel

Demographics

Gender

Age

Country

- Birth
- Citizenship
- Residence before age 10
- Current residence

History of immigration

Pre-travel encounter with a healthcare provider

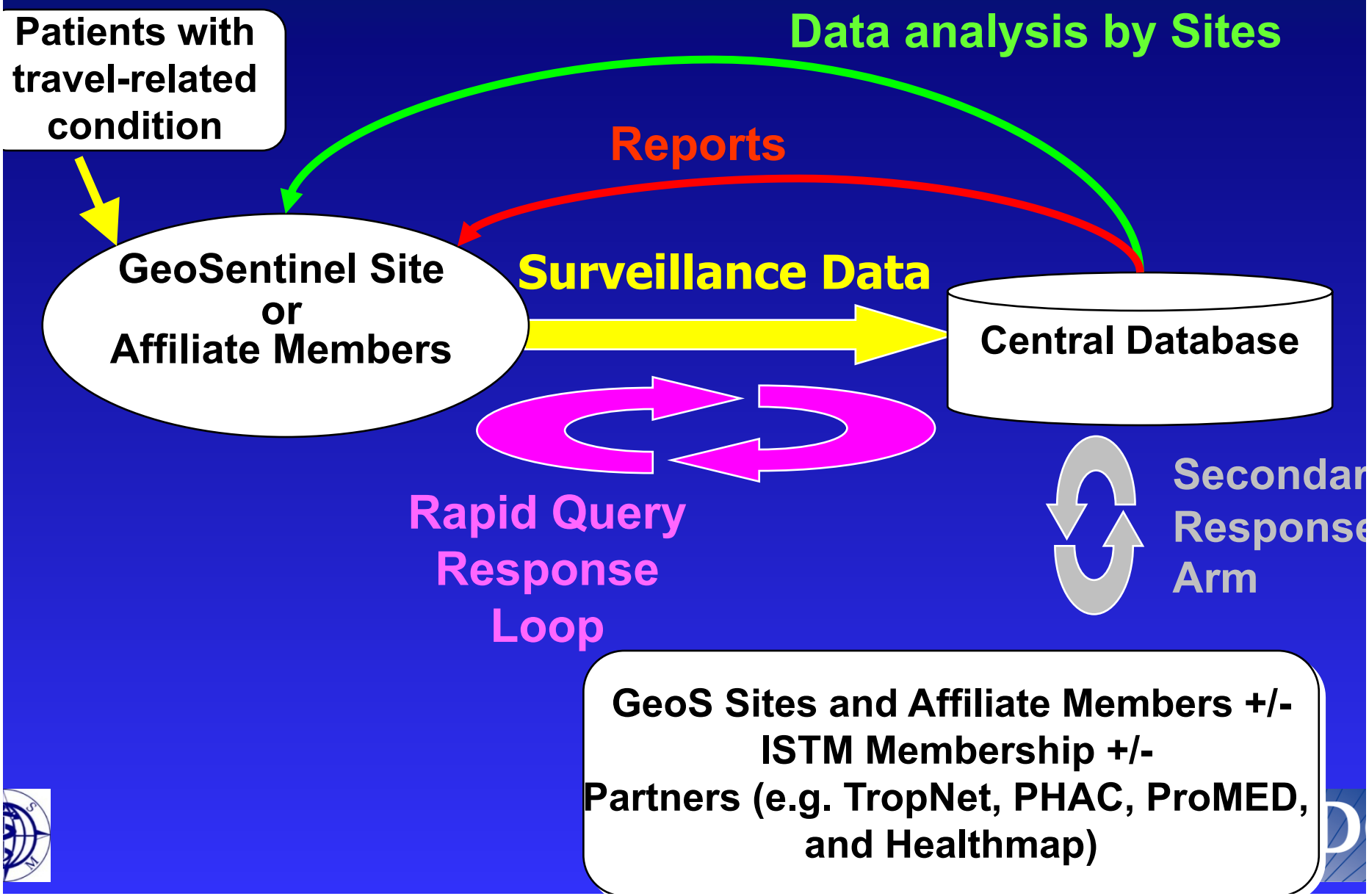
Travel History

- Recent travel history
- Previous travel history
- Country or countries of exposure to current illness
- Reason for travel related to current illness
- Seen during travel, after travel or after immigration

Clinical Information

- Inpatient/outpatient
- Main presenting symptoms
- Underlying conditions
- Diagnosis
- Diagnostic method(
- Diagnosis status (confirmed/probabl
- Antibiotic susceptibility data (for 9 select pathogens)

How does GeoSentinel work?



Sentinel Sites Contributing Data
(as of February 20, 2018)

70 GeoSentinel sites in 31 countries:

- 27 North America
- 25 Europe
- 10 SE and South Asia
- 3 South America
- 2 Australia / New Zealand
- 2 Africa
- 1 Middle East

215 Affiliate members

GEOSENTINEL

GeoSentinel Sites

(dots = sites; shaded areas = affiliate members)

Affiliate Members: Benefits

- Accelerated acquisition of alerts & advisories on breaking events from GeoSentinel
- Routine reporting not required
- Recognition of individuals reporting a key sentinel event in the press, ProMed, ISTM NewsShare, and public health bulletins
- Potential participation in outbreak reports
- Access to members-only section of the GeoSentinel website

Data Summary

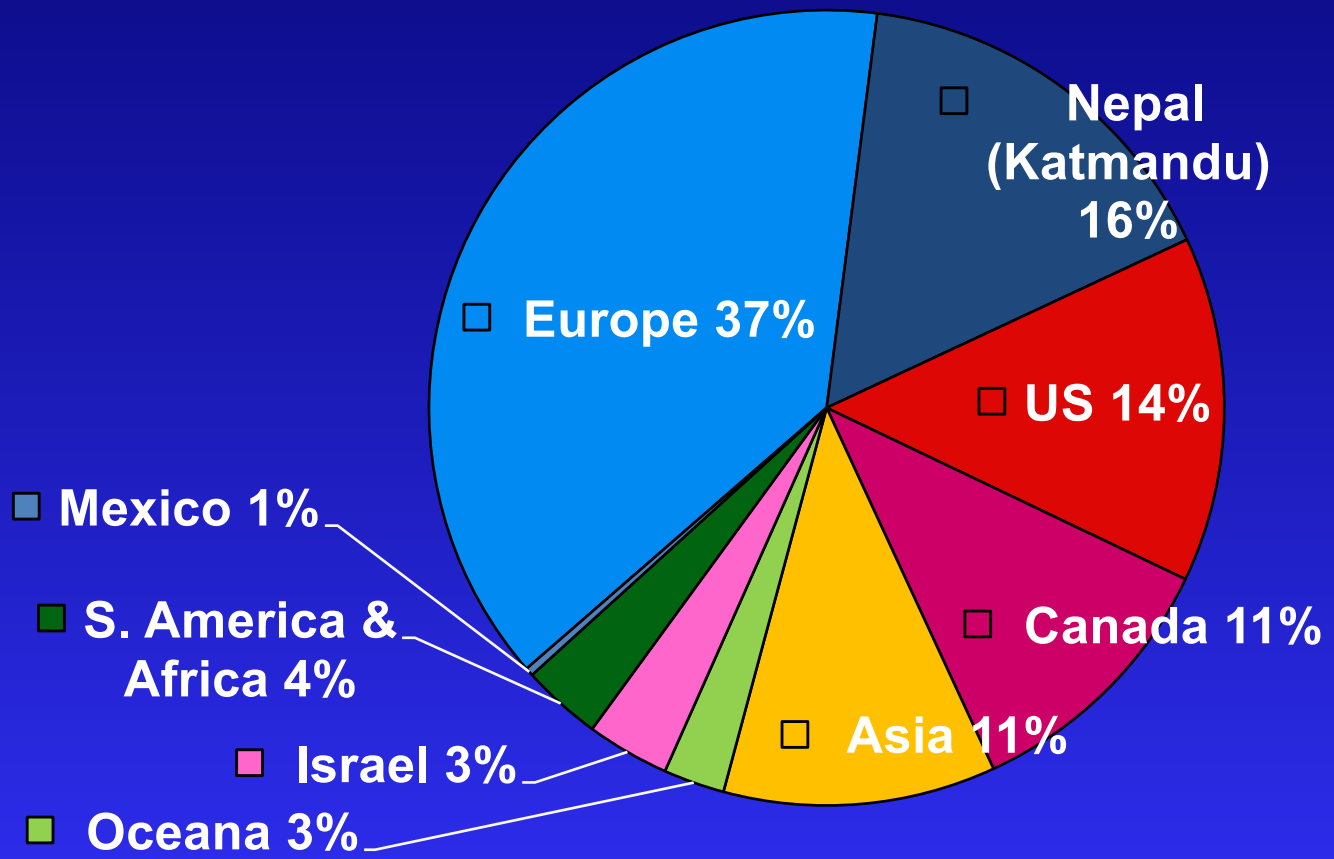
Numbers of patient encounters:

- **304,404 patients total**
- **385,172 final diagnoses**

as of 30 January 2018

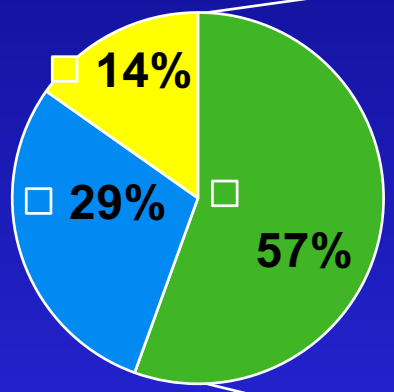
GeoS records cover traveler, immigrant, and refugee exposures in 251 countries and territories

GeoSentinel Contributions as of January 2018



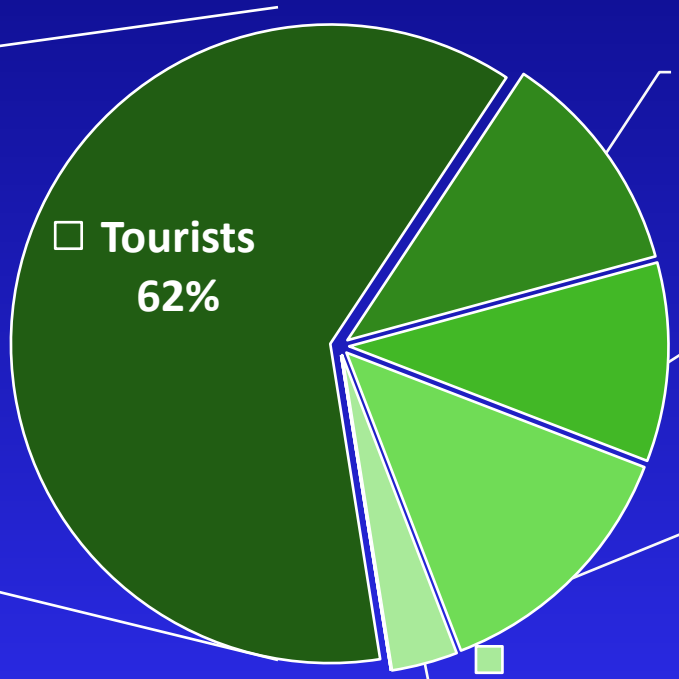
Who are GeoSentinel Patients?
(as of January 2018)

Complete Database



- Visit Clinic After Travel
- Visit Clinic During Travel
- Immigration Travel Only

After Travel Visits Only (~57%)



GEOSENTINEL

Top 10 Diagnoses: Travelers
(Previous 2 Years)

Diagnosis	Number of Diagnosis	Percent
DIARRHEA, ACUTE UNSPECIFIED	4137	12.3%
RESPIRATORY INFECTION, ACUTE	3515	10.4%
DIARRHEA ACUTE BACTERIAL	1956	5.8%
DIARRHEA, CHRONIC	1831	5.4%
VIRAL SYNDROME (WITH/WITHOUT RASH)	1589	4.7%
ZIKA (includes screening)	1495	4.4%
DENGUE, UNCOMPLICATED	1183	3.5%
DIARRHEA ACUTE parasitic	1148	3.4%
BITE, ANIMAL	1122	3.3%
MALARIA (ALL SPECIES)	1067	3.2%

Top 10 Diagnoses: Immigrants & VFR
(Previous 2 Years)

agnosis	Number of Diagnosis	Perce
AGAS DISEASE, CHRONIC	170	19.6
TENT TUBERCULOSIS, POSITIVE IFN-RELEASE ASSAY (e.g. Quantiferon or T-SPOT) (NOT ACTIVE DISEASE)	97	11.2
MATODE INFECTIONS, INTESTINAL	95	10.9
HISTOSOMIASIS	70	8.1
COBACTERIUM TUBERCULOSIS	69	7.9
SINOPHILIA	63	7.2
PATITIS (VIRAL- CHRONIC)	49	5.6
OS, HIV, SYPHILIS, GONORRHEA	25	2.9
HINOCOCCOSIS	18	2.1
ARRHEA ACUTE parasitic	17	2.0

Core Function – "ALERTS"

16 February 2018 ALERT - Media report of a yellow fever death in a Chilean tourist who visited Ilha Grande

14 February 2018 ALERT - GeoSentinel Yellow Fever cases - France ex Brazil, The Netherlands ex Brazil

08 February 2018 ALERT - Measles in Calgary ex Kolkata in a 1-year old VFR traveler

23 January 2018 ALERT - Acute Hepatitis E ex South Sudan

19 January 2018 ALERT - Measles ex Djibouti

18 January 2018 ALERT - Trypanosoma brucei rhodesiense ex Zambia (South Luangwa National Park)

21 November 2017 ALERT - Diphtheria in the Americas – 2017

05 October 2017 ALERT - Plague in Madagascar

21 September 2017 ALERT - Locally Transmitted Plasmodium falciparum and P. vivax Malaria Cases in Southern Europe

08 Sept 2017 CASE REPORT - Fatal cryptic case of malaria in a 4-year old Italian child

18 July 2017 ALERT: Non-tuberculous mycobacteria infections among medical tourists to the Dominican Republic

11 July 2017 ALERT - Increased hantavirus transmission in parts of Central, Eastern, and South-eastern Europe

Strengths of GeoSentinel

- Physician-confirmed diagnoses
- Network sites include many top tropical medicine sites and investigators
- Geographic coverage
- Ability to identify sentinel events (new foci of emerging infections)
- Capacity to describe characteristics of specific diseases among travelers
  - Country of exposure, timing, etc.

GeoSentinel Synergies

GeoSentinel

CanTravNet
EuroTravNet

ISTM

Surveillance

Collaboration

CDC
WHO
ECDC
PAHO

National public health authorities

Trop Net

HealthMap

ISID

Epicore

Rapid reports

Heightened awareness

Collaborative surveillance and analyses

ProMED

GeoSentinel alerts to Sites
GeoSentinel alerts to Affiliates

ORIGINAL RESEARCH | Annals of Internal Medicine

GeoSentinel Surveillance of Illness in Returned Travelers, 2007–2011

arin Leder, MBBS, MPH, PhD; Joseph Torresi, MBBS, PhD; Michael D. Libman, MD; Jakob P. Cramer, MD, MSc;
rancesco Castelli, MD, PhD; Patricia Schlagenhauf, PhD; Annelies Wilder-Smith, MD, PhD, MIH; Mary E. Wilson, MD;
ay S. Keystone, MD, MSc; Eli Schwartz, MD; Elizabeth D. Barnett, MD; Frank von Sonnenburg, MD, PhD;
ohn S. Brownstein, PhD; Allen C. Cheng, MBBS, PhD, MPH; Mark J. Sotir, PhD, MPH; Douglas H. Esposito, MD, MPH;
nd David O. Freedman, MD, for the GeoSentinel Surveillance Network*

Ann Intern Med. 2013;158:456-468.

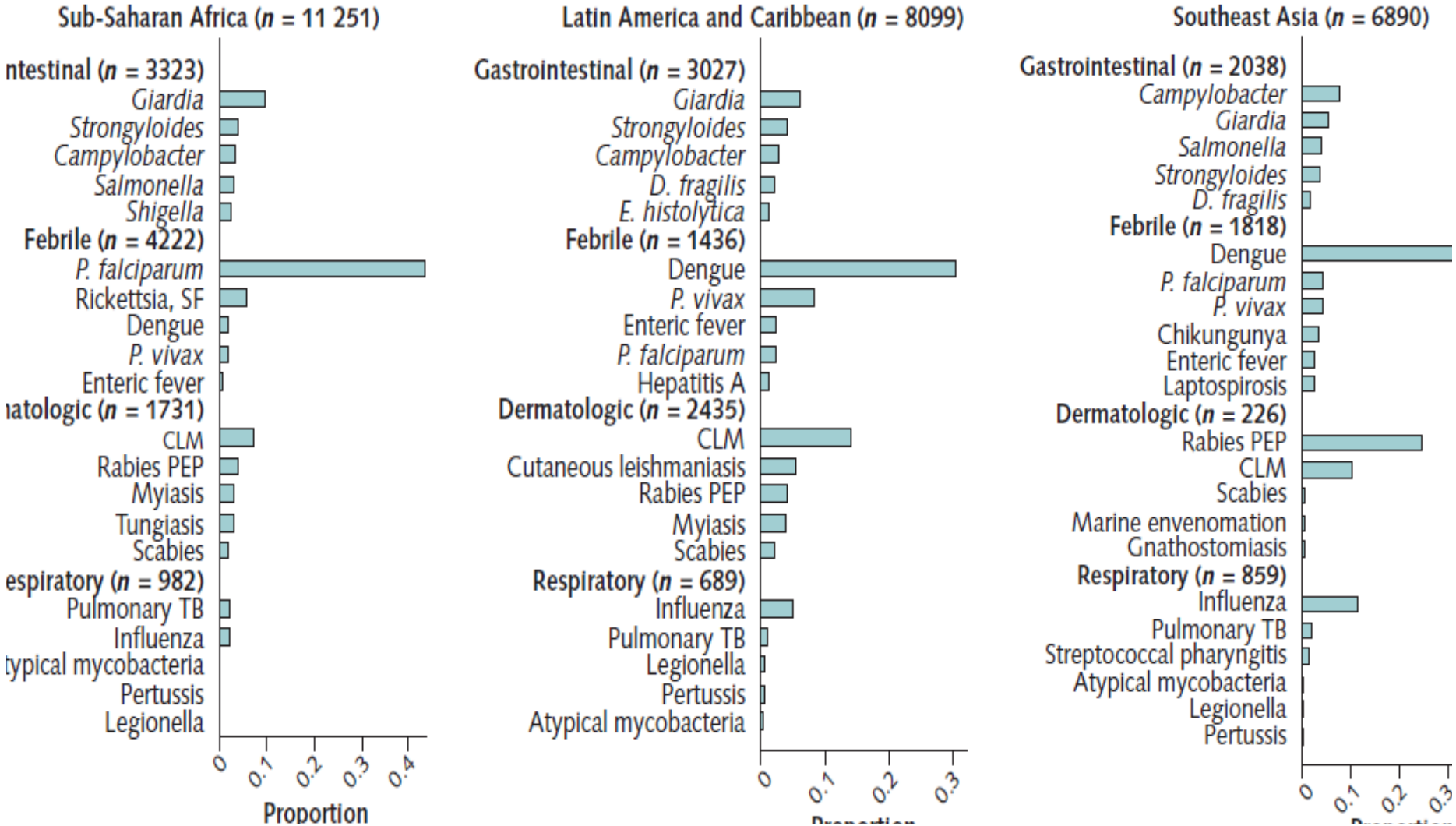
Objectives:

- To describe typical diseases in returned travelers according to region, travel reason, and patient demographic characteristics
- To describe pattern of low-frequency travel-associated diseases
- To refine key messages for care before and after travel

Results – 2007-2011 Returning Travelers

- 42,173 ill returned travelers
  - Asia (32.6%) and sub-Saharan Africa (26.7%)
- Illnesses: GI (34.0%), fever (23.3%), and dermatologic (19.5%)
- Only 40.5% reported pre-travel medical visits
- Relative frequency of many diseases varied with both travel destination and reason for travel

Top identified specific causes for GI, fever, dermatologic, and respiratory illnesses by region among ill returned travellers



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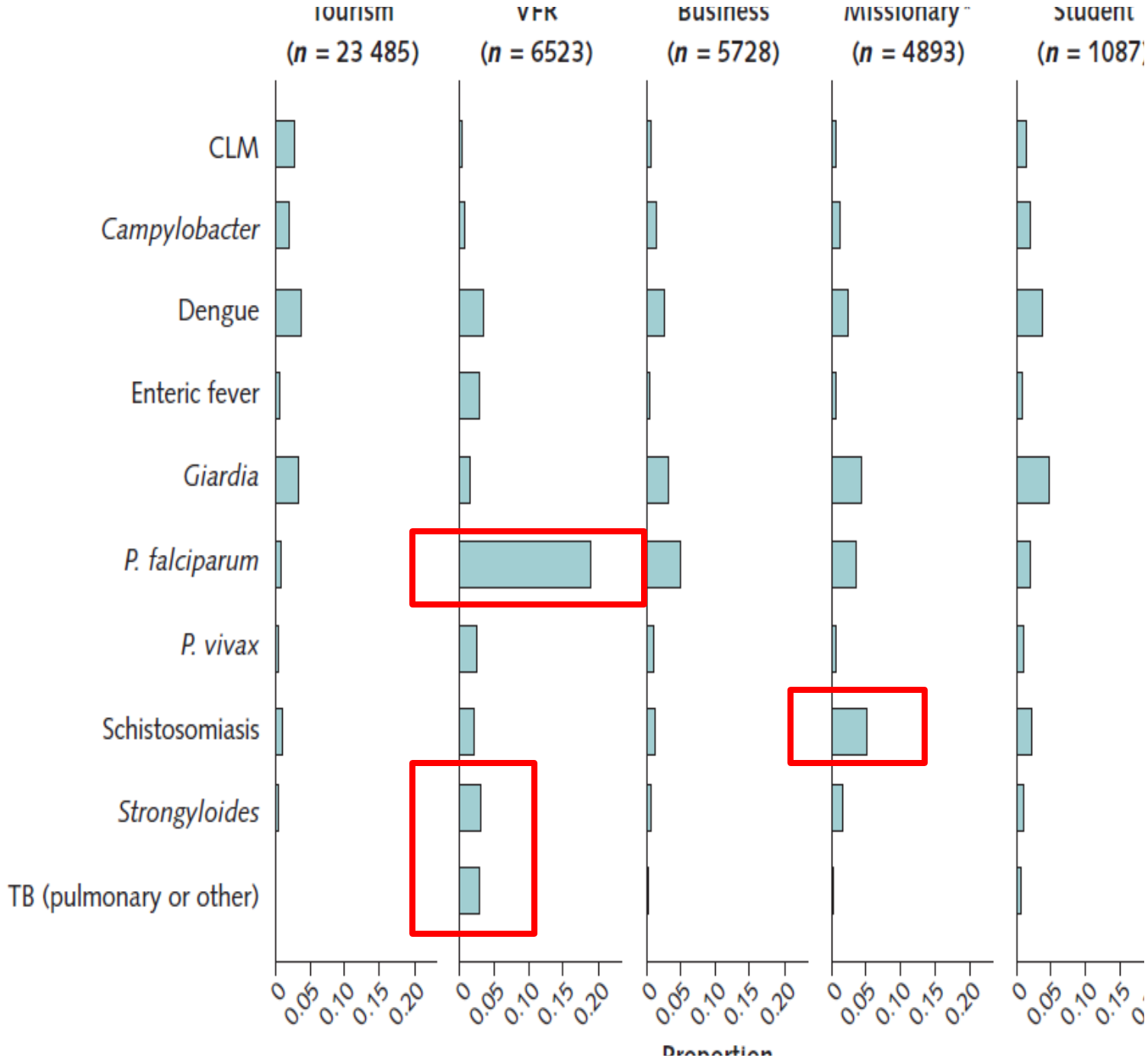
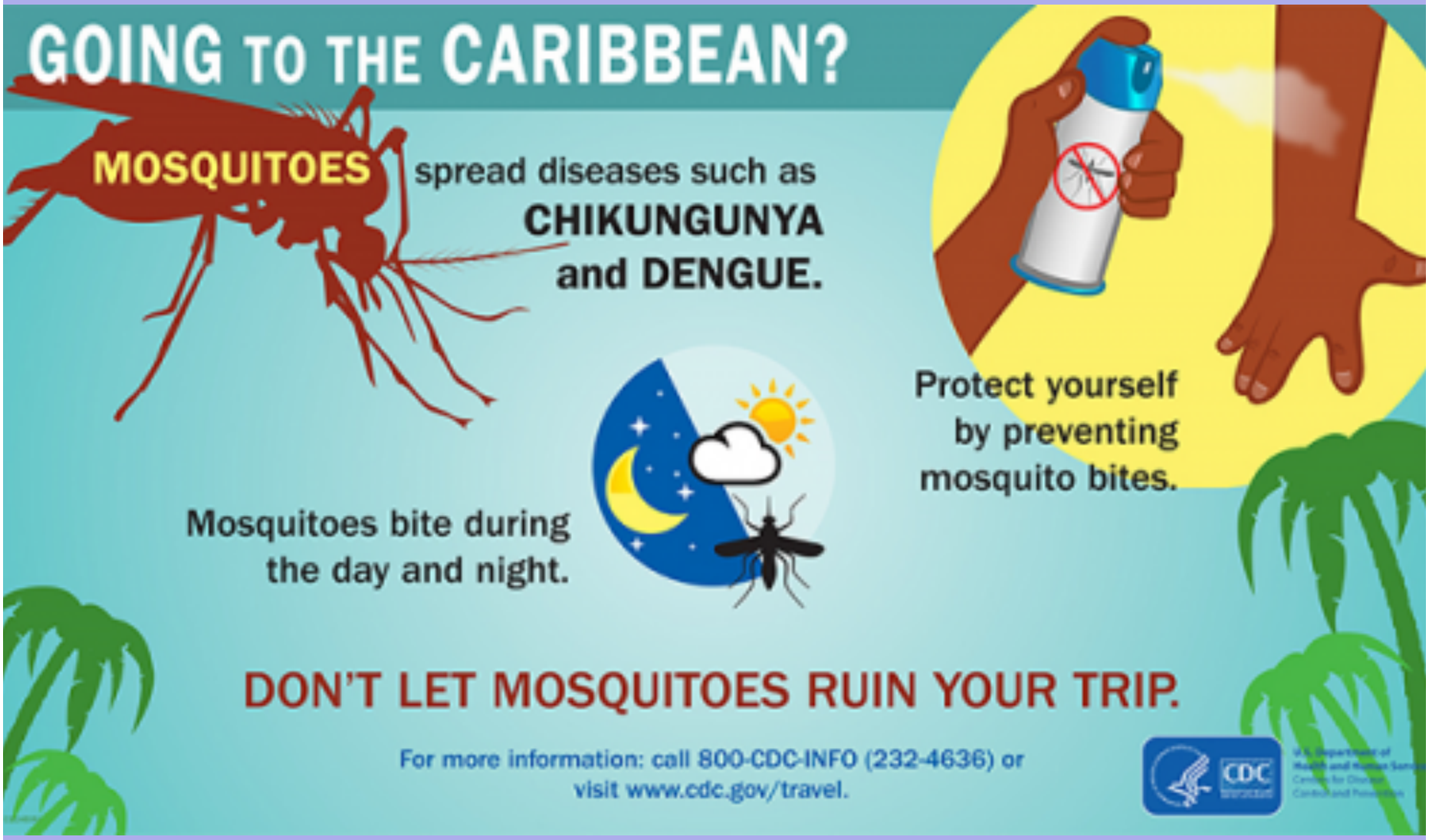


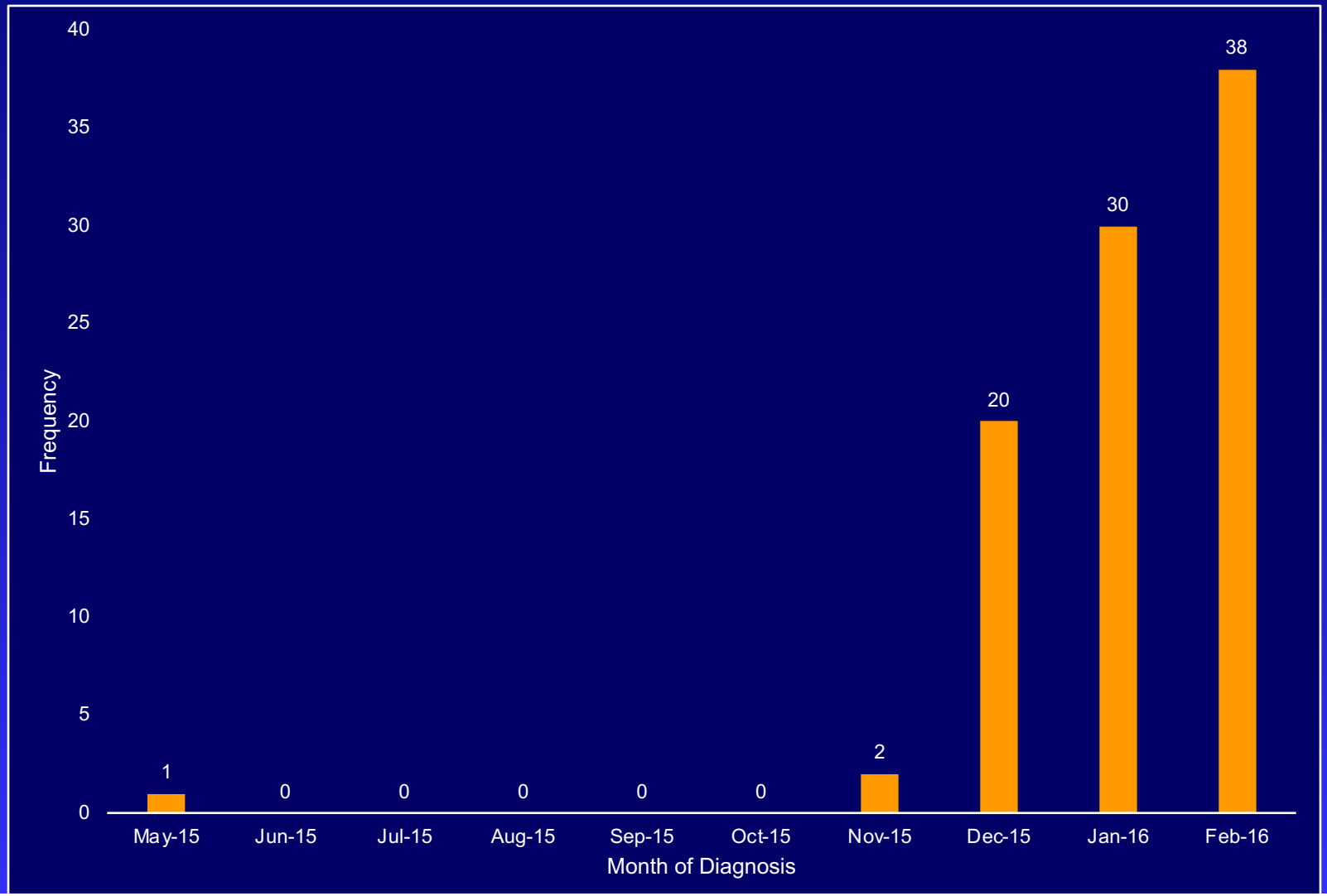
Zika and the Americas



GeoSentinel Zika in the Americas Analysis

- Cases entered by all sites between Jan 1, 2013 and Feb 29, 2016
- Limited to patients who had traveled to the Americas
- Standard GeoSentinel data collected plus supplemental information on exact destinations, symptoms and laboratory testing
  - Hamer DH et al. Ann Int Med 2017

Month of clinic visit for 93 Zika-infected patients evaluated at GeoSentinel sites



GeoSentinel Zika in Americas: Results

- 93 patients: 62% women
  - 69% confirmed; 14% probable; 17% clinically suspect
- Age distribution: mean 41 y, range 3-77 y
- Reason for travel: 48% tourism; 40% VFR; 8% business
- 96% of patients managed as outpatients
- Sentinel cases: Costa Rica, Danish traveler
  - Chen LH. Ann Int Med 2016

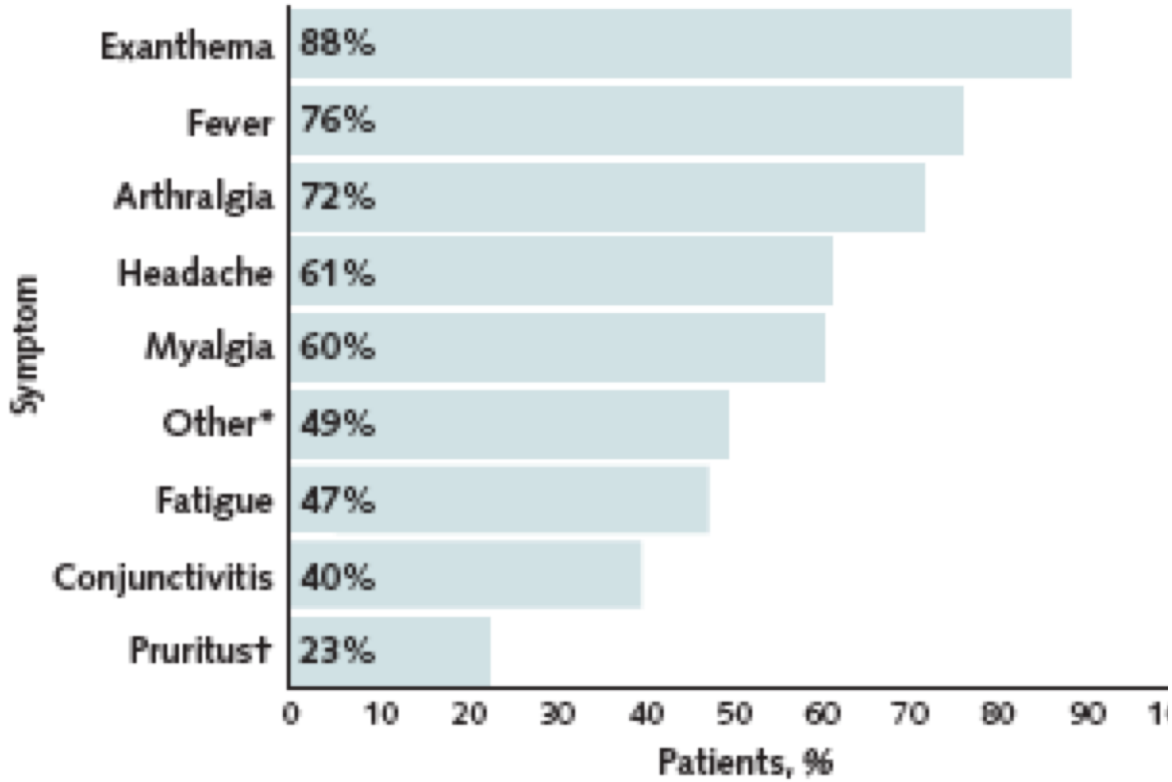
Region/Country of Exposure*

- South America: 59%
  - Suriname, Colombia, Brazil, Venezuela
- Caribbean: 24%
  - Martinique, Haiti, DR, Guadeloupe, Dutch Antilles
- Central America and Mexico: 16%
  - Honduras, Mexico, Costa Rica, El Salvador

*More than one region and country of exposure possible

ymptoms at Time of resentation to eoSentinel ite (n = 93)

Figure 2. Clinical symptoms and signs among 93 patients diagnosed with Zika virus disease acquired in the Americas.



* 46 persons reported a total of 71 additional symptoms and sign the form of comments in this category. Those observed in ≥3 patie (≥3%) included diarrhea (12%), joint swelling/arthritis (9%), abdom pain (8%), nausea (6%), anorexia (4%), retro-orbital pain (3%), pha gitis (3%), and dysgeusia (3%).

Annals of Internal Medicine ORIGINAL RESEARC

Travel-Associated Zika Virus Disease Acquired in the Americas Throug February 2016

A GeoSentinel Analysis

avidson H. Hamer, MD; Kira A. Barbre, MPH; Lin H. Chen, MD; Martin P. Grobusch, MD, PhD; Patricia Schlagenhauf, PhD; braham Goorhuis, MD, PhD; Perry J.J. van Genderen, MD, PhD; Israel Molina, MD, PhD; Hilmir Asgeirsson, MD, PhD; hyllis E. Kozarsky, MD; Eric Caumes, MD; Stefan H. Hagmann, MD, MSc; Frank P. Mockenhaupt, MD; Gilles Eperon, MD; lizabeth D. Barnett, MD; Emmanuel Bottieau, MD, PhD; Andrea K. Boggild, MSc, MD; Philippe Gautret, MD, PhD; oreen A. Hynes, MD, MPH; Susan Kuhn, MD; R. Ryan Lash, MA; Karin Leder, MBBS, MPH, PhD; Michael Libman, MD; enis J.M. Malvy, MD, PhD; Cecilia Perret, MD; Camilla Rothe, MD; Eli Schwartz, MD; Annelies Wilder-Smith, MD, PhD, MIH; lartin S. Cetron, MD; and Douglas H. Esposito, MD, MPH; for the GeoSentinel Surveillance Network*

Conclusions

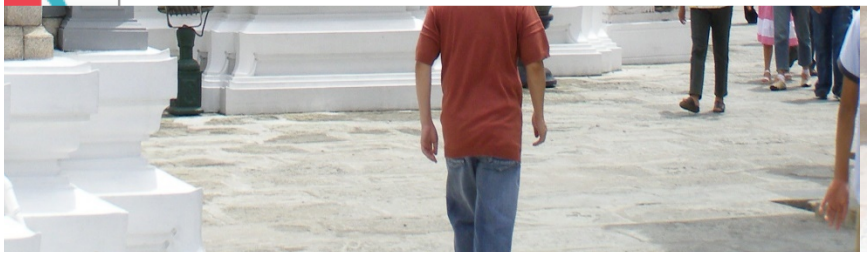
- Substantial regional variation in diagnostic testing for Zika
- Symptom data in travelers similar to case series from outbreak countries
- Assumed vector-borne transmission for all infected travelers

PLOS | ONE

RESEARCH ARTICLE

Zika beyond the Americas: Travelers as sentinels of Zika virus transmission. A GeoSentinel analysis, 2012 to 2016.

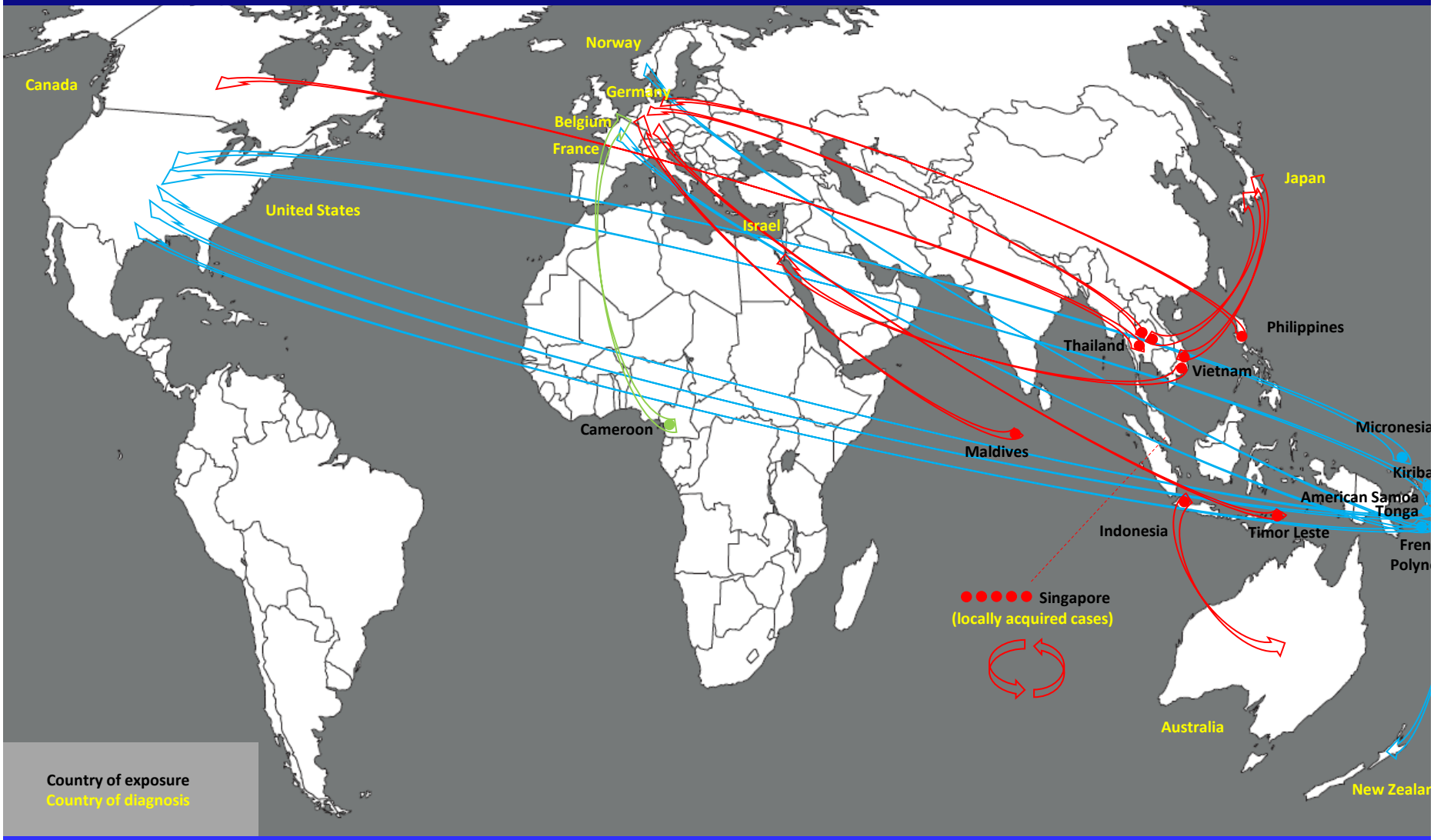
Karin Leder[1,2]*, Martin P. Grobusch[3], Philippe Gautret[4], Lin H. Chen[5,6], Susan Kuhn
Lian Lim[8,9], Johnnie Yates[10], Anne E. McCarthy[11,12], Camilla Rothe[13], Yasuyuki Kato
Emmanuel Bottieau[15], Kristina Huber[16], Eli Schwartz[17,18], William Stauffer[19],
Denis Malvy[20], Marc T. M. Shaw[21], Christophe Rapp[22], Lucille Blumberg[23],
Mogens Jensenius[24], Perry J. J. van Genderen[25], Davidson H. Hamer[26,27], for the
GeoSentinel Surveillance Network[¶]



Zika in SE Asia, South Pacific and Africa: GeoSentinel Analysis

- Database reviewed for reported Zika cases from 1995 to December 2016
- Cases classified using modified CSTE definitions – confirmed and probable
- Comprehensive search of PubMed, ProMED and other outbreak sites to identify reported cases and timing of reporting

Zika Countries of Exposure and Diagnosis



Possible Sentinel Cases

- 2012: Indonesia (diagnosed in Australia)
  - Kwong JC et al. AJTMH 2013
- 2013: Thailand (dx in Canada)
  - Serological data in Thailand from the 1950s
    - Fonseca C et al. AJTMH 2014
- 2015: Kirabati (dx in New Zealand)
  - First known report
- 2015: Vietnam (dx in Israel)
  - Serological data in Vietnam from the 1950s
    - Pond WL. Trans R Soc Trop Med Hyg 1963
- April 2016: East Timor (dx in Germany)
  - First known report (diagnosis - probable)

Conclusions

- Travelers may serve as sentinels of local Zika transmission and potentially impending outbreaks
- Travelers represent potential source for local introduction (if competent vector) or through sexual transmission
- Sentinel surveillance data can be used by international authorities for country risk categorization

Local and International Implications of chistosomiasis Acquired in Corsica, Franc

Philippe Gautret, Frank P. Mockenhaupt, Frank von Sonnenburg, Camilla Rothe, Michael Libman, Kristina Van De Winkel, Emmanuel Bottieau, Martin P. Grobusch, Davidson H. Hamer, Douglas H. Esposito, Philippe Parola, Patricia Schlagenhauf, for the GeoSentinel Surveillance Network[1]

Emerging Infectious Diseases • www.cdc.gov/eid • Vol. 21, No. 10, October 2015


Montréal
Hamburg
Düsseldorf
Berlin
Ghent
Munich
Mainland
France
Corsica

Schistosomiasis in Corsica

- Total of 11 patients identified at GeoSentinel sites and an affiliate member
- Most met definition of suspected or probable case
  - One confirmed with positive urine O&P and a second with dual serologies
- Common source = exposure to fresh water rivers in Corsica
  - Cavu River has competent intermediate host (Bulinus spp. Snails)

ıical Appendix Table 1. Summary public health measures in France regarding the emergence of schistosomiasis in Co

nitiated–date ended	Measure
2014	Prohibition bathing in or having other contact with water from the Cavu River and urinating in certain Corsican rivers to disrupt the infection cycle
November 26, 2014	Serologic screening of ≈20, 000 exposed persons and subsequent treatment for those who tested positive (n = 90) with praziquantel†
nber 27, 2014–March 25,	Identification of 20 additional cases No case was acquired after exposure in 2014‡
September 2014	Malacologic investigation in 38 sites in Corsica (20 rivers) with identification of *Bulinus* truncatus snails in the Cavu, Solenzara, Tarcu, and Osu rivers (none was found infected with *Schistosoma* spp.)
ng	Screening of cattle for *Schistosoma bovis* infection.

ources (*1–4*).

90 local cases, 20 had parasite eggs in urine samples, 24 had urinary or gynecologic symptoms that could be attributed to schistosom the cases were in persons under 16 years of age, and many were familial clusters. Nineteen cases were in persons living in Corsica, ıts of Provence-Alpes-Côte d'Azur region in southern mainland France, 54 in 13 other regions of mainland France.

ing 6 cases with parasite eggs in urine.

Yellow Fever in Travelers to Brazil

- Two sites (Rotterdam, Paris) reported (unvaccinated) patients with yellow fever acquired in Brazil—both non-fatal
  - Sao Paulo municipality (Jan 2018)
  - Brumadinho, Minas Gerais (1st week Feb 2018)
- Chilean media reports
- 3rd week of February: Bucharest site identified YF patient after travel to Rio and Ilha Grande
- 4th week of February: Swiss traveler dies from YF in Zurich (refused vaccination at pre-travel visit)

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LLOW FEVER - AMERICAS (15): BRAZIL (RIO DE JANEIRO)
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YELLOW FEVER - AMERICAS (13): BRAZIL
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A ProMED-mail post
http://www.promedmail.org
ProMED-mail is a program of the
International Society for Infectious Diseases
http://www.isid.org

In this update:
[1] Brazil case counts
[2] Chilean YF victim in Brazil
[3] Vaccination at gun point

Conclusions

- Travelers may serve as sentinels of infectious disease transmission and potentially early signals of outbreaks
- Sentinel surveillance can complement local surveillance activities
- Sentinel surveillance data can be used by international authorities to help identify specific travel-associated risks for specific countries or regions

Acknowledgments