Illness in Returned Canadian Travelers

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Objectives
- To understand the utility and limitations of large sentinel surveillance databases
- To appreciate the spectrum of illness among ill returned Canadian travelers and immigrants presenting for care at a CanTravNet site
- To recognize the demographic and travel-related associations between particular travelers and diagnoses

Outline
- GeoSentinel Surveillance Network
- CanTravNet
- First Surveillance Summary of CTN
  - Methods
  - Results
  - Limitations
  - Conclusions
- Questions / Discussion

GeoSentinel: The Global Surveillance Network of the ISTM and CDC
A worldwide communications and data collection network of travel/tropical medicine clinics
www.geosentinel.org

What is GeoSentinel?
- Provider-based Surveillance of international travelers and migrants.
- Does not cover endemic diseases in local populations
- 54 travel/tropical medicine clinics globally (since 1996)
- 233 Network Members on all 6 continents (since 2002)

Provider-based Sentinel Surveillance
The 3 Functions of GeoSentinel
1. Surveillance – Response
   - Alarming sentinel events
2. Surveillance – ongoing trends
3. Analysis of morbidity and estimating risk
   - Diagnosing the ill-returnee; the clinician perspective
   - Advising the Prospective Traveler; the traveler perspective
   - Defining associations between patient characteristics and disease
How does GeoSentinel Work?

- Patients with travel-related condition → GeoSentinel Site or GeoSentinel Network
- Surveillance Data → Central Database
- Reports → Secondary Response Arm
  - TravelMed +/-
  - ISTM Membership +/-
  - Partners (TropMed, ProMed, IDSA, etc) +/-
- Rapid Query Response Loop

Geosentinel data collection
- Data from patient (anonymous)
- Travel itinerary
- Data from provider
  - Presenting symptoms
  - Patient classification
  - Diagnosis
- Data entry on secure web site

Diagnoses: Comprehensive & Flexible

Comprehensive
- 521 available diagnosis codes in table
- New codes added as needed
- 214,212 final diagnoses for 167,060 patients

Flexible
- 1000x Etiologies
- 100x Diseases
- 10x Syndromes

GeoSentinel Dataset, Mar 2012

Place of Likely Exposure in Patients Seen After Travel

Who are GeoSentinel patients? (as of March 2012)
Rich Database of Travel Morbidity

- Benefits
  - Guide diagnostic approach
  - Guide empiric therapy
  - Prioritize pre-travel prevention strategies

GeoSentinel

Contribution by Treating Site
n = 167,060 patients as of March 2012

- US: 16%
- Europe: 33%
- Asia: 12%
- Aus/NZ: 3%
- Israel: 3%
- Canada: 11%

3% from Latin America/Africa/Caribbean

Profile of proportionate morbidity in ill returned travelers from the developing world by region of travel

- Nepal: 20%
- Europe: 33%
- Asia: 12%
- Aus/NZ: 3%
- US: 16%
- Israel: 3%

1.9% from Latin America/Africa/Caribbean

GeoSentinel data was used or cited for these 12 diseases in this 214 page Chapter:
- Amebiasis
- Cryptosporidiosis
- Dengue Fever & Dengue Hemorrhagic Fever
- Lymphatic Filariasis
- Giardiasis
- Histoplasmosis
- Malaria
- Onchocerciasis (River Blindness)
- Rickettsial (Spotted & Typhus Fevers) & Related Infections
- Schistosomiasis
- Sexually Transmitted Diseases
- Tuberculosis

Sections in Chapter 4 with GeoSentinel data/citations included:
- China
- Egypt & Nile River Cruises
- Guatemala & Belize
- India
- Safaris in East & Southern Africa

Sections in Chapter 5 with GeoSentinel data/citations included:
- General Approach to the Returned Traveler
- Fever in Returned Travelers
- Skin & Soft Tissue Infections in Returned Travelers

Sections in Chapter 8 with GeoSentinel data/citations included:
- Immigrants Returning Home to Visit Friends & Relatives (VFRs)
- Long-Term Travelers & Expatriates

GeoSentinel data/citations were used in these two appendices:
- Appendix B: Essential Electronic Resources for the Travel Medicine Practitioner
- Appendix D: The HealthMap System
What more do we need to know?

- Our understanding of the range and frequency of infectious diseases in Canadian travelers is based on existing synthesized knowledge of travel acquired illness in other populations
- Expert references such as the WHO Green Book, CDC Yellow Book, and PHAC’s CATMAT provide guidance to practitioners but whether these guidelines are appropriate in the Canadian context is unknown
- Many imported communicable diseases are nationally notifiable to PHAC, the quality of data accrued is hindered by delayed and under-reporting

What more do we need to know?

- A comprehensive multicentre comparison of the spectrum of illnesses acquired by a broad range of Canadian travelers returning from developing regions on all continents has been lacking

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CanTravNet

- Consortium of Canadian GeoSentinel sites located in:
  - Vancouver / Victoria (1)
  - Calgary (1)
  - Toronto + satellite Mississauga (1)
  - Ottawa (1)
  - Montreal (2)

CanTravNet

- Structure:
  - Kevin C. Kain, Director
  - Andrea K. Boggild, Associate Director
  - Site Directors and Co-directors:
    - Patrick Doyle and Wayne Ghesquiere
    - Susan Kuhn
    - Anne McCarthy
    - Michael Libman
    - Jean Vincelette
  - Collaboration with Travel and Migration Health Division of PHAC
Contributions to the Network:
- 16,696 records between Jan. 1/00 – Jan. 1/12
- 545 cases of intestinal nematode infections
- 398 cases of malaria
- 368 cases of TB
- 237 cases of schistosomiasis
- 169 cases of dengue
- 131 cases of filariasis
- 123 cases of echinococcosis
- 54 cases of cysticercosis
- 29 cases of rickettsioses

Contributions to the Network:
- 16,696 records between Jan. 1/00 – Jan. 1/12
- Tourists – 7847 (47%)
- Immigrants – 3652 (22%)
- VFRs – 1970 (12%)
- Business travelers – 1549 (9.3%)
- Missionaries / volunteers / researchers / aid workers – 1556 (9.3%)
- Students – 282 (1.7%)
- Medical tourists – 10 (0.06%)

First Major Initiative
- Collaboration between PHAC-CanTravNet modeled after that between ECDC-EuroTravNet
- Contracts between PHAC-CTN and PHAC-GeoSentinel for deliverables including:
  - On-screen report access
  - Annual “data deposit” for production of a surveillance report
  - Queries to the master database ad hoc
  - Canada-specific Healthmap

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Annual Surveillance Report
- To date, there are no specific, comprehensive, and large-scale published data on illness in Canadian travelers
- Descriptive analysis of Canadian data from September 2009-September 2011 for publication in a Canadian journal and internal use by PHAC
- Standard GeoSentinel methodology and analysis applied
Annual Surveillance Report

- Sub-categorical analyses relevant to the public health of Canadians
  - Blood-borne illness: HBV, HCV, HIV/AIDS, and HTLV-I/II
  - Vaccine preventable illness: HAV, HBV, influenza and ILI, enteric fever, varicella, measles, Japanese encephalitis, and cholera
  - Sexually transmitted infections: Chlamydia trachomatis, HSV, molluscum contagiosum, scabies, syphilis, and unspecified sexually transmitted disease

Proportionate Morbidity

do. of patients with given diagnosis (or group of diagnoses)

<table>
<thead>
<tr>
<th>Risk</th>
<th>All travelers to a destination</th>
</tr>
</thead>
<tbody>
<tr>
<td>All incident cases</td>
<td></td>
</tr>
</tbody>
</table>

*Estimation of Risk requires that true numerator and true denominator are ascertainable*

Odds Ratio

Defines quantitative associations between patient related characteristics and diagnosis
- Does not define absolute incidence or risk of disease

<table>
<thead>
<tr>
<th>Risk</th>
<th>All travelers to a destination</th>
</tr>
</thead>
<tbody>
<tr>
<td>All incident cases</td>
<td></td>
</tr>
</tbody>
</table>

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Results

- 4365 travelers or immigrants seen at a CTN site between 09/2009 and 09/2011
- 4776 confirmed and 535 probable diagnoses
- 3943 (90.3%) had a travel-related diagnosis, 363 (8.3%) had a non-travel related diagnosis, and 59 (1.4%) had a diagnosis whose relatedness to travel could not be ascertained

<table>
<thead>
<tr>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex</td>
</tr>
<tr>
<td>Males 2026 (46.4%)</td>
</tr>
<tr>
<td>Females 2337 (53.5%)</td>
</tr>
<tr>
<td>Unknown 2 (0.1%)</td>
</tr>
<tr>
<td>Age - Median 38 years, range 0 - 95 years (IQR 28 - 53 years)</td>
</tr>
<tr>
<td>Immigrant (check-box)</td>
</tr>
<tr>
<td>Yes 1837 (42.1%)</td>
</tr>
<tr>
<td>No/Blank 2528 (57.9%)</td>
</tr>
</tbody>
</table>
Results

GeoSentinel Reporting Site

- Montreal 43.5%
- Toronto 24.9%
- Ottawa 19.5%
- Vancouver 7.3%
- Montreal-CHUM 4.8%

Top 10 Birth Countries

- India 24.6%
- Haiti 9.8%
- China 12.9%
- US 10.6%
- Philippines 10.6%
- France 8.1%
- Vietnam 7.1%
- UK 7.0%
- Somalia 6.7%

Results

GeoSentinel Reporting Site

- Tourism 46.0%
- Immigration 20.7%
- VFR 11.5%
- Missionary 9.9%
- Business 8.2%
- Student 2.5%
- Other 1.9%

Pre-Travel Encounter

- Yes 34.0%
- No 37.0%
- Unknown 26.1%

Results

Tourism 46.0%
Immigration 20.7%
VFR 11.5%
Missionary 9.9%
Business 8.2%
Student 2.5%
Other 1.9%

Travel Reason

Results

- Yes 34.0%
- No 37.0%
- Unknown 26.1%

Pre-Travel Encounter

Diagnoses
### Diagnosis: CHIEF COMPLAINT FEVER (N=675)

<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>Number with CC</th>
<th>% Total Number in Database</th>
<th>Top 3 Source Countries for Diagnosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Malaria</td>
<td>80</td>
<td>11.9</td>
<td>PF/complicated: Ghana, Burkina Faso, Guinea</td>
</tr>
<tr>
<td>Dengue fever</td>
<td>48</td>
<td>7.1</td>
<td>India, Indonesia, Nicaragua, Haiti</td>
</tr>
<tr>
<td>Active TB</td>
<td>48</td>
<td>7.1</td>
<td>India, China, Philippines</td>
</tr>
<tr>
<td>Enteric fever</td>
<td>29</td>
<td>4.3</td>
<td>India, Bolivia, Tanzania, Pakistan, Bangladesh</td>
</tr>
<tr>
<td>URTI</td>
<td>20</td>
<td>3.0</td>
<td>India, Mexico, Ghana</td>
</tr>
<tr>
<td>Pneumonia</td>
<td>18</td>
<td>2.7</td>
<td>Mexico, Canada, United States</td>
</tr>
<tr>
<td>URI</td>
<td>15</td>
<td>2.2</td>
<td>Tanzania, Panama, Brazil</td>
</tr>
<tr>
<td>Acute URTI</td>
<td>12</td>
<td>1.8</td>
<td>Mexico, India, Cameroon</td>
</tr>
<tr>
<td>Rickettsioses, spotted fever*</td>
<td>5</td>
<td>0.7</td>
<td>South Africa, Swaziland</td>
</tr>
</tbody>
</table>

### Diagnosis: CHIEF COMPLAINT GI (N=1950)

<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>Number with CC</th>
<th>% Total Number in Database</th>
<th>Top 3 Source Countries for Diagnosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>India, Sri Lanka, Honduras Entamoeba histolytica†</td>
<td>140.6</td>
<td>12%</td>
<td>Ghana, Burkina Faso, Guinea</td>
</tr>
<tr>
<td>Philippines, Mexico, India Cryptosporidium / Cyclospora</td>
<td>170.8</td>
<td>16%</td>
<td>India, Cuba, Dominican Republic</td>
</tr>
<tr>
<td>Peru, India Dientamoeba fragilis</td>
<td>251.2</td>
<td>23%</td>
<td>India, Cuba, Costa Rica</td>
</tr>
<tr>
<td>Mexico, India, Thailand Dientamoeba fragilis</td>
<td>663.2</td>
<td>63%</td>
<td>India, Cuba, Costa Rica</td>
</tr>
<tr>
<td>India, Mexico, Cuba, Dominican Republic Giardia</td>
<td>974.3</td>
<td>84%</td>
<td>India, Cuba, Costa Rica</td>
</tr>
<tr>
<td>Mexico, India, Thailand Cutaneous leishmaniasis</td>
<td>248</td>
<td>12.4</td>
<td>India, Cuba, Costa Rica</td>
</tr>
<tr>
<td>Jamaica, Mexico, Barbados Post-infectious Irritable Bowel Syndrome</td>
<td>727</td>
<td>38.1</td>
<td>Mexico, Indonesia, Nicaragua, Haiti</td>
</tr>
<tr>
<td>India, Mexico, Cuba, Dominican Republic Acute Diarrhea</td>
<td>722</td>
<td>37.0</td>
<td>Mexico, China, Philippines</td>
</tr>
<tr>
<td>Mexico, Cuba, India Chronic Diarrhea</td>
<td>268</td>
<td>13.7</td>
<td>Mexico, Cuba, India</td>
</tr>
<tr>
<td>Acute Diarrhea</td>
<td>246</td>
<td>12.6</td>
<td>Mexico, Cuba</td>
</tr>
<tr>
<td>Post-infectious Irritable Bowel Syndrome</td>
<td>241</td>
<td>12.4</td>
<td>Mexico, Cuba, Dominican Republic</td>
</tr>
<tr>
<td>India, Mexico, Cuba, Dominican Republic Pneumonia</td>
<td>357</td>
<td>18.7</td>
<td>India, Indonesia, Nicaragua, Haiti</td>
</tr>
<tr>
<td>India, China, Philippines URTI</td>
<td>176</td>
<td>9.1</td>
<td>India, Indonesia, Nicaragua, Haiti</td>
</tr>
<tr>
<td>India, Mexico, Ghana Cutaneous leishmaniasis</td>
<td>174</td>
<td>9.1</td>
<td>India, Indonesia, Nicaragua, Haiti</td>
</tr>
<tr>
<td>India, China, Philippines Enterotoxigenic Escherichia coli</td>
<td>151</td>
<td>8.3</td>
<td>India, Indonesia, Nicaragua, Haiti</td>
</tr>
<tr>
<td>India, Mexico, Cambodia Vibrio cholerae</td>
<td>149</td>
<td>8.0</td>
<td>India, Indonesia, Nicaragua, Haiti</td>
</tr>
<tr>
<td>India, Mexico, Cambodia Enterotoxigenic Escherichia coli</td>
<td>136</td>
<td>7.1</td>
<td>India, Indonesia, Nicaragua, Haiti</td>
</tr>
<tr>
<td>India, Mexico, Cambodia Vibrio cholerae</td>
<td>120</td>
<td>6.3</td>
<td>India, Indonesia, Nicaragua, Haiti</td>
</tr>
<tr>
<td>India, Mexico, Cambodia Enterotoxigenic Escherichia coli</td>
<td>104</td>
<td>5.8</td>
<td>India, Indonesia, Nicaragua, Haiti</td>
</tr>
<tr>
<td>India, Mexico, Cambodia Vibrio cholerae</td>
<td>93</td>
<td>5.0</td>
<td>India, Indonesia, Nicaragua, Haiti</td>
</tr>
<tr>
<td>India, Mexico, Cambodia Enterotoxigenic Escherichia coli</td>
<td>82</td>
<td>4.5</td>
<td>India, Indonesia, Nicaragua, Haiti</td>
</tr>
<tr>
<td>India, Mexico, Cambodia Vibrio cholerae</td>
<td>71</td>
<td>3.9</td>
<td>India, Indonesia, Nicaragua, Haiti</td>
</tr>
<tr>
<td>India, Mexico, Cambodia Enterotoxigenic Escherichia coli</td>
<td>60</td>
<td>3.3</td>
<td>India, Indonesia, Nicaragua, Haiti</td>
</tr>
<tr>
<td>India, Mexico, Cambodia Vibrio cholerae</td>
<td>49</td>
<td>2.8</td>
<td>India, Indonesia, Nicaragua, Haiti</td>
</tr>
<tr>
<td>India, Mexico, Cambodia Enterotoxigenic Escherichia coli</td>
<td>38</td>
<td>2.2</td>
<td>India, Indonesia, Nicaragua, Haiti</td>
</tr>
<tr>
<td>India, Mexico, Cambodia Vibrio cholerae</td>
<td>27</td>
<td>1.6</td>
<td>India, Indonesia, Nicaragua, Haiti</td>
</tr>
<tr>
<td>India, Mexico, Cambodia Enterotoxigenic Escherichia coli</td>
<td>18</td>
<td>1.0</td>
<td>India, Indonesia, Nicaragua, Haiti</td>
</tr>
<tr>
<td>India, Mexico, Cambodia Vibrio cholerae</td>
<td>11</td>
<td>0.6</td>
<td>India, Indonesia, Nicaragua, Haiti</td>
</tr>
<tr>
<td>India, Mexico, Cambodia Enterotoxigenic Escherichia coli</td>
<td>8</td>
<td>0.5</td>
<td>India, Indonesia, Nicaragua, Haiti</td>
</tr>
<tr>
<td>India, Mexico, Cambodia Vibrio cholerae</td>
<td>5</td>
<td>0.3</td>
<td>India, Indonesia, Nicaragua, Haiti</td>
</tr>
<tr>
<td>India, Mexico, Cambodia Enterotoxigenic Escherichia coli</td>
<td>3</td>
<td>0.2</td>
<td>India, Indonesia, Nicaragua, Haiti</td>
</tr>
<tr>
<td>India, Mexico, Cambodia Vibrio cholerae</td>
<td>2</td>
<td>0.1</td>
<td>India, Indonesia, Nicaragua, Haiti</td>
</tr>
<tr>
<td>India, Mexico, Cambodia Enterotoxigenic Escherichia coli</td>
<td>1</td>
<td>0.0</td>
<td>India, Indonesia, Nicaragua, Haiti</td>
</tr>
</tbody>
</table>

### Results

**Top 10 Travel Related Diagnoses in 93 Children <13 years**

<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abdominal Pain</td>
<td>8</td>
</tr>
<tr>
<td>Malaria</td>
<td>7</td>
</tr>
<tr>
<td>P. falciparum</td>
<td>(5)</td>
</tr>
<tr>
<td>Cutaneous Larva Migrans</td>
<td>5</td>
</tr>
<tr>
<td>Skin and soft-tissue infection</td>
<td>5</td>
</tr>
<tr>
<td>Dientamoeba fragilis</td>
<td>4</td>
</tr>
<tr>
<td>Cutaneous leishmaniasis</td>
<td>4</td>
</tr>
<tr>
<td>Giardia</td>
<td>4</td>
</tr>
<tr>
<td>Febrile illness unspecified &lt;3 wks</td>
<td>4</td>
</tr>
<tr>
<td>Acute Diarrhea</td>
<td>3</td>
</tr>
<tr>
<td>Superficial fungal infection</td>
<td>3</td>
</tr>
</tbody>
</table>

### Mycobacterium tuberculosis

- Latent TB
- Pulmonary
- Extrapulmonary
- CNS/Meningitis
- Disseminated
- MDR or XDR

### Results

**Patient Type**

- Inpatient
- Outpatient
- Unknown
Results - Top 10 Inpatient Diagnoses

<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>N</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>M. tuberculosis (N=128 active)</td>
<td>66</td>
<td>51.6</td>
</tr>
<tr>
<td>Malaria (N=94)</td>
<td>40</td>
<td>42.5</td>
</tr>
<tr>
<td>Pneumonia (N=31)</td>
<td>20</td>
<td>64.5</td>
</tr>
<tr>
<td>Adverse drug reaction (N=26)</td>
<td>18</td>
<td>69.2</td>
</tr>
<tr>
<td>Enteric fever (N=36)</td>
<td>13</td>
<td>36.1</td>
</tr>
<tr>
<td>Bacteremia / Sepsis (N=11)</td>
<td>9</td>
<td>81.8</td>
</tr>
<tr>
<td>Dengue fever (N=61)</td>
<td>5</td>
<td>8.2</td>
</tr>
<tr>
<td>Acute UTI (N=30)</td>
<td>5</td>
<td>16.6</td>
</tr>
<tr>
<td>Acute Brucellosis (N=7)</td>
<td>4</td>
<td>57.1</td>
</tr>
<tr>
<td>Acute bacterial diarrhea (N=102)</td>
<td>4</td>
<td>3.9</td>
</tr>
</tbody>
</table>

Results (N=349)

Blood-Borne Infections

- Hepatitis B 59.9%
- Hepatitis C 34.4%
- Hepatitis B 59.9%
- HIV 6.4%
- HTLV-1/2 0.9%

Hepatitis B
Hepatitis C
HIV
HTLV-1/2
Immigrants over-represented (p<0.001)

Results (N=271)

Vaccine Preventable Diseases

- Hepatitis B 77.1%
- Influenza 13.3%
- Varicella 0.4%
- Measles 0.4%
- Enteric fever 0.4%
- JE 0.4%
- Cholera 0.4%

Hepatitis B
Influenza
Varicella
Measles
Enteric fever
JE
Cholera
Immigrants over-represented (p<0.001)
Enteric Fever

- Most likely acquired in South Central Asia (p<0.0001)
- Over-represented among those traveling for the purpose of VFR (p<0.0001)
- 52% of cases of S. Typhi or Paratyphi occurred in VFRs

Vaccine preventable diseases in ill returned travelers

Number of Cases

Vaccinate Preventable Disease

Enteric Fever
Acute Hepatitis A
Influenza
Acute Hepatitis B
Malaria
Meningococcal Disease
Meningitis
Neonatal Septicemia
Poliomyelitis
Poliomyelitis Outbreak
Tick-Borne Encephalitis
Yellow Fever
Japanese Encephalitis

Results (N=94)

Malaria

P. falciparum 63.6%
P. vivax 19.3%
P. ovale 5.7%
P. malariae 2.3%
Severe 5.7%
Cerebral 3.4%

P. falciparum
P. vivax
P. ovale
P. malariae
Severe
Cerebral

Results

- Malaria Demographic & Region of Exposure:
  - Over-represented among males (p=0.00019)
  - Over-represented among those traveling to Sub-Saharan Africa - 76.6% (p<0.0001)

Travel Reason - Malaria

- Tourism 12.8%
- Immigration 11.7%
- Business 5.3%
- VFR 36.2%
- Missionary 10.6%
- Student 5.3%
- Other 23.4%

Over-represented among VFRs and business travelers (p<0.001)
### MALARIA AND VFRS

<table>
<thead>
<tr>
<th>Country of Exposure</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>India</td>
<td>5</td>
</tr>
<tr>
<td>Cameroon</td>
<td>4</td>
</tr>
<tr>
<td>Cameroon</td>
<td>4</td>
</tr>
<tr>
<td>Guinea</td>
<td>3</td>
</tr>
<tr>
<td>Nigeria</td>
<td>3</td>
</tr>
<tr>
<td>Uganda</td>
<td>2</td>
</tr>
<tr>
<td>Ghana</td>
<td>2</td>
</tr>
<tr>
<td>Congo, The Democratic Republic Of The</td>
<td>2</td>
</tr>
<tr>
<td>Senegal</td>
<td>2</td>
</tr>
<tr>
<td>Mozambique</td>
<td>1</td>
</tr>
<tr>
<td>Congo</td>
<td>2</td>
</tr>
<tr>
<td>Mali</td>
<td>1</td>
</tr>
<tr>
<td>Niger</td>
<td>1</td>
</tr>
<tr>
<td>Guinea</td>
<td>2</td>
</tr>
<tr>
<td>Cote d’Ivoire</td>
<td>2</td>
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### BUSINESS TRAVELERS AND MALARIA

Of 22 with malaria, 15 had received pre-travel advice.

### Results (N=61)

#### Travel Reason - Dengue

- **Tourism**: 52.5%
- **VFR**: 13.1%
- **Missionary**: 16.4%
- **Student**: 3.3%
- **Business**: 14.8%

### Results - Dengue

- **Dengue Region of Exposure**
  - Over-represented among those traveling to the Caribbean - 27.9% (p=0.00313)
  - Over-represented among those traveling to Southeast Asia - 21.3% (p=0.00335)

### Results (N=43)

#### Sexually Transmitted Diseases (Excluding HIV and HBV)

- **Syphilis**: 37.2%
- **Scabies**: 32.6%
- **HSV**: 16.3%
- **STD NOS**: 9.3%
- **Molluscum**: 2.3%
- **Chlamydia**: 2.3%

### Results - STDs

- **Tourism**: 50.0%
- **Immigration**: 12.5%
- **Student**: 3.3%
- **Missionary**: 5.0%
VFRs

- Proportion of VFR travelers requiring inpatient management of their travel acquired illness was double that of non-VFR travelers (p<0.0001) [10.6% vs 5.1%]
- VFRs had the lowest proportionate uptake of pre-travel consult among all non-immigrant travelers (p<0.0001) [21% vs 34%]
- VFRs traveled for longer periods of time compared to non-VFR travelers (31 versus 19 days; p<0.001)

Outline

- GeoSentinel Surveillance Network
- CanTravNet
- First Surveillance Summary of CTN
  - Methods
  - Results
  - Limitations
  - Conclusions
- Questions / Discussion

Limitations

- Travellers with mild or self-limited illnesses or illnesses with short or long incubation periods may have sought care in different settings
- Study does not capture illnesses for which care was sought during travel
- Ill travellers returning from destinations perceived to be low-risk may be under-represented in the database

Limitations

- While VFRs constituted 11.4% of the entire cohort, they accounted for 36.2% of cases of malaria
- VFRs accounted for almost 52% of cases of enteric fever due to S. Typhi or S. Paratyphi
- The single case of measles in this cohort was imported by a VFR to India

Limitations

- Population analyzed represents only ill returned travelers presenting to CTN sites → conclusions may not extend to all ill returned travelers
  - Top countries of exposure for ill returned non-immigrant travelers paralleled top countries visited by traveling Canadians in general, with Mexico, Cuba, Dominican Republic, and China as top 10 destinations for both this cohort and the general Canadian population
  - Top 3 source countries for new immigrants to Canada (Philippines, China, and India) were also represented among top 4 source countries for ill returned immigrant travelers in this cohort

Limitations

- Data do not permit estimation of incidence rates or destination-specific numerical risks for particular diseases
- Inter-site variation in screening protocols for new immigrants and refugees may have led to over- or under-contributions of particular diagnoses from individual sites
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Conclusions

- Synthesized Canada-specific surveillance data will necessarily inform provincial and national level policy and strategic initiatives around defining, monitoring, and preventing travel-acquired illness
- Surveillance data constitute a Canada-specific epidemiologic roadmap of diseases and syndromes, which will inform clinical decision-making by front line Canadian practitioners

Conclusions

- Serious and potentially fatal infections common and demonstrate epidemiologic preponderances
  - Travelers with malaria proportionately more likely to require inpatient management vs those with alternate diagnoses (44% versus 5%)
  - Of 94 cases of malaria, 60% caused by Pf, and 8.5% severe or complicated
  - Malaria → SSA source region in 77%
  - Dengue → travel to Caribbean and SEAsia
  - Enteric fever → South Central Asia

Conclusions

- Highly feared travel-acquired illnesses (Ebola, Lassa, YF, meningococcal meningitis) not observed, but cosmopolitan and vaccine-preventable diseases present
  - Single case of measles in this cohort was imported by a VFR to India
  - Cases of highly communicable influenza (N=21) and varicella (N=1) reported
  - Case of JE occurred in tourist to Thailand

Conclusions

- VFRs constitute a particular high risk group of travelers
  - VFRs constituted 11.4% of cohort, but accounted for 36.2% of malaria and 52% of enteric fever
  - Double the proportion of VFRs required inpatient management of their illness and they traveled for a longer period of time compared to other non-VFR travelers

Conclusions

- An accurate knowledge of the health problems that are faced by international travelers in different geographical destinations provides a robust evidence base for physicians to deliver effective preventative advice, immunizations, and prophylactic medications to travellers
- This profile further informs post-travel diagnosis and therapy, as well as prioritization of pre-travel intervention strategies for the most significant illnesses
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