EMERGING INFECTIOUS DISEASE THREATS - THE PRICE OF INEQUALITY

Eden V. Wells, MD, MPH, FACPM
MPHA Epidemiology
April 1, 2016
OUTLINE

• The Public Health Issue: Emerging Infectious Diseases (EID)
• Location, Location: Inequalities in EID Emergence
• Public Health Impact: Inequalities in EID Health Outcomes
• Public Health Surveillance and Response: Inequalities in Mitigation
THE PUBLIC HEALTH ISSUE:

Emerging Infectious Diseases (EID)
INFECTIONOUS DISEASES

• Among leading causes of death worldwide
  • 1) emergence of new infectious diseases
  • 2) re-emergence of old infectious diseases
  • 3) persistence of intractable infectious diseases
EMERGING INFECTIOUS DISEASE

- **Emerging diseases** include outbreaks of previously unknown diseases or known diseases whose incidence in humans has significantly increased in the past two decades.

- **Re-emerging diseases** are known diseases that have reappeared after a significant decline in incidence.
EMERGING INFECTIOUS DISEASES

“Emerging infectious diseases" (EIDs) includes newly emerging infections, such as SARS; re-emerging/resurging infections, such as influenza and West Nile virus; and deliberately emerging infections, such as those caused by microbes used for bioterror.
EIDS ARE CATEGORY C AGENTS

Category A
These high-priority agents include organisms or toxins that pose the highest risk to the public and national security because:

• They can be easily spread or transmitted from person to person
• They result in high death rates and have the potential for major public health impact
• They might cause public panic and social disruption
• They require special action for public health preparedness.

Category B
These agents are the second highest priority because:

• They are moderately easy to spread
• They result in moderate illness rates and low death rates
• They require specific enhancements of CDC’s laboratory capacity and enhanced disease monitoring.

Category C
These third highest priority agents include emerging pathogens that could be engineered for mass spread in the future because:

• They are easily available
• They are easily produced and spread
• They have potential for high morbidity and mortality rates and major health impact.

http://www.bt.cdc.gov/bioterrorism/overview.asp
CATEGORY C EXAMPLES

- Nipah and Hendra viruses
- Additional hantaviruses
- Tickborne hemorrhagic fever viruses
  - Bunyaviruses
    - Severe Fever with Thrombocytopenia Syndrome virus (SFTSV), Heartland virus
  - Flaviruses
    - Omsk Hemorrhagic Fever virus, Alkhurma virus, Kyasanur Forest virus
- Tickborne encephalitis complex flaviviruses
  - Tickborne encephalitis viruses
    - European subtype
    - Far Eastern subtype
    - Siberian subtype
    - Powassan/Deer Tick virus
- Yellow fever virus
- Tuberculosis, including drug-resistant TB
- Influenza virus
- Other Rickettsias
- Rabies virus
- Prions
- Chikungunya virus
- Coccidioides spp.
- Severe acute respiratory syndrome associated coronavirus (SARS-CoV), MERS-CoV, and other highly pathogenic human coronaviruses (new in FY 14)
- Antimicrobial resistance, excluding research on sexually transmitted organisms, unless the resistance is newly emerging*
ADDITIONAL EXAMPLES OF EIDS/PATHOGENS

- Acanthamebiasis
- Anaplasmosis (new in FY14)
- Aspergillus (new in FY14)
- Australian bat lyssavirus
- Babesia, atypical
- Bartonella henselae
- BK virus (new in FY14)
- *Borrelia miyamotoi* (new in FY14)
- *Clostridium difficile*
- Cryptococcus gattii (new in FY14)
- Ehrlichiosis
- Enterococcus faecium and faecalis (new in FY14)
- Enterovirus 71
- Enterovirus 68 (new in FY15)
- Hepatitis E (new in FY14)
- Human herpesvirus 8
- Human herpesvirus 6
- JC virus (new in FY14)
- Leptospirosis (new in FY14)
- *Lyme borreliosis*
- Mucormycosis (new in FY14)
- Mumps virus
- *Rubeola* (measles) (new in FY14)
- Streptococcus, Group A
- *Staphylococcus aureus*
Zoonotic Diseases

- A disease that can be transmitted from animal to human under natural conditions
- Transmission may occur in different ways and settings depending on the agent
- Disease control and prevention guidelines depend on mode of transmission and available treatment and prophylaxis options
EIDS AND ZOONOSES

• In past 30 years, > 30 new organisms identified worldwide
• Many originated at human-animal interface
EIDS AND ZOONOSES:
CDC’S ONE HEALTH APPROACH

- Recognizing the linkage between EIDs and zoonoses
- Health of humans connected to health of animals and environment
- Health approach by working with physicians, ecologists, and veterinarians to monitor and control public health threats

<table>
<thead>
<tr>
<th>Factor (Cause)</th>
<th>Change (Effect)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Human populations are growing and expanding into new geographic areas.</td>
<td>As a result, more people live in close contact with wild and domestic animals. Close contact provides more opportunities for diseases to pass between animals and people.</td>
</tr>
<tr>
<td>The earth has experienced changes in climate and land use, such as deforestation and intensive farming practices.</td>
<td>Disruptions in environmental conditions and habitats provide new opportunities for diseases to pass to animals.</td>
</tr>
<tr>
<td>International travel and trade have increased.</td>
<td>As a result, diseases can spread quickly across the globe.</td>
</tr>
</tbody>
</table>

http://www.cdc.gov/onehealth/about.html
“Work is guided in part by a holistic "One Health" strategy, which recognizes the vital interconnectedness of microbes and the environment.”

“Through a comprehensive approach involving many scientific disciplines, we can attain better health for humans and animals and improve our environment.”
“Approximately 75% of recently emerging infectious diseases affecting humans are diseases of animal origin:”
Introduction

- Animal Health E-Mail List
  Sign up and MDARD will keep you informed of animal health issues that impact livestock owners.

- About Emerging Diseases
  Emerging Infectious diseases that may be transmitted between animals and humans are a concern for all people, no matter what their age, gender, lifestyle, ethnic background, or economic status.

- Why Emerging Diseases?
  Understanding how diseases spread between hosts is of major importance. Emerging diseases are often zoonotic, that is, diseases that may be transmitted between humans and animals.

- Partners in disease eradication and preparedness

Michigan is fortunate to have agencies and organizations jointly participating in the surveillance, control, and/or eradication of diseases concerning humans, wildlife and domestic animals.

Spotlight


http://michigan.gov/emergingdiseases/
LOCATION, LOCATION

Inequalities in EID Emergence
2014 EBOLA

“Thousands of people in these countries are dying because, in the lottery of birth, they were born in the wrong place…”

World Bank President Jim Kim
WHY DO THEY EMERGE?

• Introduction?
• Establishment?
• Dissemination?
GLOBAL EIDS

Emerging and Reemerging infections - 70% vector-borne or zoonotic

http://www.onehealthinitiative.com/
WHERE DO EIDS EMERGE FROM?

FIGURE 5-2 Global examples of emerging and reemerging infectious diseases, some of which are discussed in the main text. Red represents newly emerging diseases; blue, reemerging or resurfacing diseases; black, a “deliberately emerging” disease.

Major factors that underlie disease emergence and reemergence

<table>
<thead>
<tr>
<th>The Microbial Agent</th>
<th>The Human Host</th>
<th>The Human Environment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Genetic adaptation and change</td>
<td>Human susceptibility to infection</td>
<td>Climate and weather</td>
</tr>
<tr>
<td>Polymicrobial diseases</td>
<td>Human demographics and behavior</td>
<td>Changing ecosystems</td>
</tr>
<tr>
<td></td>
<td>International trade and travel</td>
<td>Economic development and land use</td>
</tr>
<tr>
<td></td>
<td>Intent to harm (bioterrorism)</td>
<td>Technology and industry</td>
</tr>
<tr>
<td></td>
<td>Occupational exposures</td>
<td>Poverty and social inequality</td>
</tr>
<tr>
<td></td>
<td>Inappropriate use of antibiotics</td>
<td>Lack of public health services</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Animal populations</td>
</tr>
<tr>
<td></td>
<td></td>
<td>War and famine</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Lack of political will</td>
</tr>
</tbody>
</table>

http://www.plospathogens.org/article/info:doi/10.1371/journal.ppat.1003467
2014 EBOLA - MAJOR DRIVERS

Figure 2: Social problems that made the epidemic difficult to manage (percentage of respondents mentioning reason)

- Cultural Practices: 61%
- Religious Practice: 21%
- Lack of awareness: 34%
- Stigmatization: 10%
- Denial/Dishonesty: 74%
- Poor Gov't Response: 14%
- Mistrust from citizens: 17%

Culture, ignorance and attitudes drove the epidemic

Assessing the socio-economic impacts of Ebola Virus Disease in Guinea, Liberia and Sierra Leone

The Road to Recovery

EXAMPLES

• Changes in economic development and land use
• Changes in human demographics and behavior
• Changes in national travel and commerce
• Changing ecosystems
• Human susceptibility
• Hospitals

- Nipah virus and Borrelia burgdorferi - intensification of farming and forest encroachment
- HIV-1 and Hepatitis C virus - sexual activity and intravenous drug use
- SARS Coronovirus
- Hantaviruses
FIGURE 1 EXAMPLES OF EMERGING AND RE-EMERGING INFECTIOUS DISEASES THROUGHOUT THE WORLD.

EXAMPLE: THE TROPICS

“...a region rich in wildlife species and under increasing human pressure.”

Global distribution of relative risk of an EID event. Maps are derived for EID events caused by top left, zoonotic pathogens from wildlife, top right, zoonotic pathogens from nonwildlife, bottom left, drug-resistant pathogens and bottom right, vector-borne pathogens. Green represents the lowest risk level and red the highest.

Credit: Jones et. al., Nature

“Critical perspectives on emerging infections ask how large-scale social forces influence unequally positioned individuals in increasingly interconnected Populations;...”

Paul Farmer, EID, 1998
The increasing predilection for meat of exotic species has exacerbated the risk of exposure to infections not previously encountered, and this situation probably triggered the SARS epidemic.

Global Human-Poultry Population Co-Density

Co-Density INDEX
(Index is the product of human and poultry population densities per km²)

No co-density
Highest co-density

Data Sources: Food and Agriculture Organization of the United Nations (FAO), 2007, Socioeconomic Data and Applications Center (SEDAC), 2005.
PROXIMITY TO THE ANIMAL INTERFACE

Growth in Demand for Poultry Meat 2000 - 2030

Value in kg/sqkm
- < 0
- 0
- 1 - 50
- 51 - 100
- 101 - 250
- 251 - 500
- 501 - 1,000
- > 1,000
- No Data

No individual country data available for Europe.
SOCIO-ECONOMIC FACTORS UNDERLYING GEOGRAPHY

• “Microbes frequently capitalize on situations of ecological, biological and social disturbance.”

• Increases in population size and density, urbanization

• Persistent poverty

• Increased number and movement of political, economic and environmental refugees

• Conflict and warfare
PUBLIC HEALTH IMPACT:
Inequalities in EID Health Outcomes
PUBLIC HEALTH IMPORTANCE

- Magnitude
  - Morbidity
  - Mortality
- Severity
  - Case fatality
- Communicability
- Economic Cost
- Years Potential Life Lost
- Homeland security
### Global PH Impacts - Case Fatality

**Figure 1: Selected Emerging Infectious Diseases Since 1975**

<table>
<thead>
<tr>
<th>Emerging Disease</th>
<th>Year Identified</th>
<th>Estimated Global Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Cases</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Deaths</td>
</tr>
<tr>
<td>Ebola Virus Disease</td>
<td>1976</td>
<td>19,568</td>
</tr>
<tr>
<td></td>
<td></td>
<td>7,653</td>
</tr>
<tr>
<td>Human Immunodeficiency Virus/Acquired Immune Deficiency Syndrome (HIV/AIDS)</td>
<td>1981</td>
<td>78 million</td>
</tr>
<tr>
<td></td>
<td></td>
<td>39 million</td>
</tr>
<tr>
<td>Variant Creutzfeldt-Jakob disease (vCJD or “mad cow disease”)</td>
<td>1996</td>
<td>229</td>
</tr>
<tr>
<td></td>
<td></td>
<td>229</td>
</tr>
<tr>
<td>H5N1 Influenza (“bird flu”)</td>
<td>1997</td>
<td>668*</td>
</tr>
<tr>
<td></td>
<td></td>
<td>393*</td>
</tr>
<tr>
<td>Severe Acute Respiratory Syndrome (SARS)</td>
<td>2003</td>
<td>8096</td>
</tr>
<tr>
<td></td>
<td></td>
<td>774</td>
</tr>
<tr>
<td>H1N1 (2009) Influenza (“swine flu”)</td>
<td>2009</td>
<td>unknown</td>
</tr>
<tr>
<td></td>
<td></td>
<td>&gt;284,500</td>
</tr>
<tr>
<td>Middle East Respiratory Syndrome (MERS)</td>
<td>2012</td>
<td>699</td>
</tr>
<tr>
<td></td>
<td></td>
<td>209</td>
</tr>
<tr>
<td>H7N9 Influenza (“bird flu”)</td>
<td>2013</td>
<td>453</td>
</tr>
<tr>
<td></td>
<td></td>
<td>175</td>
</tr>
</tbody>
</table>

**Notes:** Cases and deaths reflect the cumulative number of cases and deaths (as of October 17, 2014). * indicates cumulative cases and deaths from 2003 to present.

GLOBAL PH IMPACTS-PANDEMIC POTENTIAL

- Influenza
- Tuberculosis
- HIV

http://www.flu.gov/pandemic/history/1918/the_pandemic
WHO IS THE AT-RISK POPULATION???

PH IMPACT DIFFERS

- Immunosuppression
- Genetics
- Nutrition
- Crowding
- Sanitation
- Stress
- Lack of healthcare
- Lack of public health infrastructure
DISPARITIES IN HIV PREVALENCE

25.8 million people living with HIV are in sub-Saharan Africa, accounting for 70% of the global total. 1 51% of all people living with HIV do not know that they have the virus. 3

Number of people living with HIV worldwide

- Sub-Saharan Africa: 25,800,000
- Asia & the Pacific: 2,400,000
- Western & Central Europe and North America: 1,700,000
- Latin America: 1,500,000
- Eastern Europe & Central Asia: 280,000
- Middle East & North Africa: 240,000
- The Caribbean: 5,000,000

In 2014, there were roughly 2 million new HIV infections, 220,000 of which were among children. Most of these children live in sub-Saharan Africa and were infected via their HIV-positive mothers during pregnancy, childbirth or breastfeeding. 1

DISPARITIES IN EID INCIDENCE- EBOLA

Ebola — Underscoring the Global Disparities in Health Care Resources
Anthony S. Fauci, M.D.

A

Guinea
506 cases/373 deaths

Sierra Leone
730 cases/315 deaths

Liberia
599 cases/323 deaths

Nigeria
13 cases/2 deaths

B

No. of Cases and Deaths

Cases
Deaths

April 2014
May 2014
June 2014
July 2014

Ebola Virus Cases and Deaths in West Africa (Guinea, Liberia, Nigeria, and Sierra Leone), as of August 11, 2014 (Panel A), and Over Time (Panel B).

Data are from the World Health Organization (www.who.int/csr/don/archive/disease/ebola/en).
EBOLA - INEQUALITIES IN PH IMPACT

### Countries with Widespread Transmission

<table>
<thead>
<tr>
<th>Country</th>
<th>Total Cases (Suspected, Probable, and Confirmed)</th>
<th>Laboratory-Confirmed Cases</th>
<th>Total Deaths</th>
</tr>
</thead>
<tbody>
<tr>
<td>Guinea</td>
<td>3805</td>
<td>3351</td>
<td>2536</td>
</tr>
<tr>
<td>Total</td>
<td>3805</td>
<td>3351</td>
<td>2536</td>
</tr>
</tbody>
</table>

### Countries with Former Widespread Transmission and Current, Established Control Measures

<table>
<thead>
<tr>
<th>Country</th>
<th>Total Cases (Suspected, Probable, and Confirmed)</th>
<th>Laboratory-Confirmed Cases</th>
<th>Total Deaths</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sierra Leone</td>
<td>14122</td>
<td>8704</td>
<td>3955</td>
</tr>
<tr>
<td>Liberia³ (as of May 9)</td>
<td>10666</td>
<td>3151</td>
<td>4806</td>
</tr>
<tr>
<td>Liberia⁴ (after June 28)</td>
<td>6</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>Total</td>
<td>24794</td>
<td>11861</td>
<td>8763</td>
</tr>
</tbody>
</table>

### Previously Affected Countries

<table>
<thead>
<tr>
<th>Country</th>
<th>Total Cases (Suspected, Probable, and Confirmed)</th>
<th>Laboratory-Confirmed Cases</th>
<th>Total Deaths</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nigeria</td>
<td>20</td>
<td>19</td>
<td>8</td>
</tr>
<tr>
<td>Senegal</td>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Spain</td>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>United States</td>
<td>4</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>Mali</td>
<td>8</td>
<td>7</td>
<td>6</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Italy</td>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>36</td>
<td>34</td>
<td>15</td>
</tr>
</tbody>
</table>

Coping with income declines from Ebola reduces future household welfare.
The toll of EVD in West Africa is greater on women than men.

As in many public health emergencies, adolescent girls and young women are among the most marginalized and at-risk populations when outbreaks occur. For example, African women have been disproportionately affected by the HIV/AIDS epidemic because of the caregiving burden placed on them by culture and traditions in the early years. Similarly, women were especially affected by the Ebola outbreaks in Congo, Gabon, and Uganda.
Deaths Related to 2009 Pandemic Influenza A (H1N1) Among American Indian/Alaska Natives -- 12 States, 2009

What is already known on this topic?

Increased rates of influenza-related morbidity and mortality among indigenous populations in other parts of the world have been reported during the current H1N1 pandemic.

What is added by this report?

This report demonstrates that American Indian/Alaska Natives (AI/ANs) in the participating 12 states had an H1N1 mortality rate that was four times higher than the rate for all other racial/ethnic groups combined.

What are the implications for public health practice?

Health professionals and agencies should expand community education regarding the risk for influenza mortality, ensure access to and early empiric use of influenza antiviral medication, promote H1N1 vaccination, and investigate factors contributing to a higher influenza-related mortality rate among AI/ANs.
TB- ANOTHER RACE DISPARITY EXAMPLE

FIGURE 1. Tuberculosis rates, by race/ethnicity† — United States, 1993–2010

- Asian/Pacific Islander
- Black or African-American
- Hispanic
- American Indian/Alaska Native
- White

* Cases per 100,000 population, from the U.S. Census Bureau's Federated Research Review, Extra, and Tabulation too (DataFerrett version 1.3.3, available during 2006–2010).
† All races are non-Hispanic. In 2003, the Asian/Pacific Islander category included persons who reported race as Asian only and/or Native Hawaiian or Other Pacific Islander only. Updated on July 21, 2011.

http://www.cdc.gov/mmwr/pdf/other/su6203.pdf
PUBLIC HEALTH SURVEILLANCE AND RESPONSE:

Inequalities in Mitigation
Emerging norms for the control of emerging epidemics

Christopher W McDougall, Ross EG Upshur, Kumanan Wilson

Volume 86, Number 8, August 2008, 643-645

Table 1. The normative continuum from principle through actions during SARS to new international law

<table>
<thead>
<tr>
<th>Normative themes/principles</th>
<th>Representative interview extracts with regard to responses to SARS</th>
<th>Representative IHR (2005) articles¹</th>
</tr>
</thead>
<tbody>
<tr>
<td>Security, equity and reciprocity support enhancing access and assistance</td>
<td>“...it's the responsibility of the international community to make sure [developing] countries develop the ability to comply with the new laws, but... I think there is a real sense of complacency in the wealthier countries about the state of health in the world...”</td>
<td>Improved international “collaboration and assistance” (A44 p.31) is urged. States Parties are to “undertake to collaborate” with each other, particularly for “the mobilization of financial resources to facilitate implementation” (A44.1.c). They are also engaged by the obligation to provide “technical cooperation and logistical support, particularly in the development, strengthening and maintenance of the public health capacities required” (A44.1.b).</td>
</tr>
</tbody>
</table>

Adapted from Table 1
SURVEILLANCE AND PH RESPONSE

- Ability to
  - Detect cases
    - Isolate
  - Find Exposed
    - Quarantine
  - Assess for prophylaxis
  - Assess for treatment
H1N1 PANDEMIC SURVEILLANCE-SEVERITY INITIALLY UNCLEAR

- March 2009 in La Gloria, Veracruz
- Outpatient versus hospital cases

Four-year-old could hold key in search for source of swine flu outbreak

Case confirmed in village in south-eastern Mexico where 60% of residents fell ill

“Due to inadequate disease surveillance capacities in the region, WHO estimates that actual cases may be two to four times higher than reported.”


CDC Officer Greg Raczniak (far right) sits down with members of Sierra Leone’s Armed Forces to talk about efforts to contain Ebola.
RESOURCE INEQUALITIES

• 2009 Pandemic Preparedness
  • N-95 masks-
  • Antivirals-
    • India and China factories to produce generic forms
    • Ensure a strategic stockpile available for WHO’s distribution to countries in need during a pandemic
  • Vaccine
HEALTHCARE-EBOLA 2014

UNITED STATES-
AMBER VINSON WALKING
ONTO THE PLANE IN DALLAS

LIBERIA-
DEAD IN THE STREET: PEOPLE
GATHER AROUND A MAN
SUSPECTED OF DYING FROM
EBOLA IN MONROVIA

teams-pile-bodies-shallow-grave-middle-night-locals-refused-permission-use-land.html#ixzz3rtUU9E1G
THE FRONTLINES

MASS MOVEMENT OF HUMAN POPULATIONS
2014 UN REFUGEE AGENCY

DISEASE PROFILE
Proportion of all consultations

5,457,943 Total number of consultations in 25 countries

- Communicable diseases (5,001,940) 91.6%
- Mental Health (91,840) 1.7%
- Non-communicable diseases (246,535) 4.5%
- Injuries (117,628) 2.2%
As fighting in Yemen intensifies, more flee to Djibouti
Some 3,300 people a day still arriving on Lesvos
Immigration and Nationality Act (INA) mandates that all refugees and applicants for US immigration undergo a medical screening examination, performed by an authorized physician, for inadmissible conditions. Refugees undergo the examination overseas, whereas immigrants are examined in the United States or overseas depending on their place of residence.

Most immigrants are not required to undergo any health screening following arrival in the United States, although there are systems for certain groups who will routinely undergo a new-arrival medical examination (such as refugees). These new-arrival screenings may be carried out by any qualified health professional.
War and Infectious Diseases: Challenges of the Syrian Civil War

Sima L. Sharara¹, Souha S. Kanj²a

¹ Curriculum in Global Studies, University of North Carolina, Chapel Hill, Chapel Hill, North Carolina, United States of America, ² Department of Internal Medicine, Division of Infectious Diseases, American University of Beirut Medical Center, Beirut, Lebanon

Table 1

Reported cases of communicable diseases per year between 2011 and 2014 in Syria, Lebanon, and Jordan.

<table>
<thead>
<tr>
<th></th>
<th>Syrian Arab Republica</th>
<th>Lebanese Republicb</th>
<th>Syrian Refugees in Lebanon²</th>
<th>Hashemite Kingdom of Jordana</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pneumonia</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Measles</td>
<td>n/a</td>
<td>13</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>Cutaneous Leishmaniasis</td>
<td>n/a</td>
<td>52,982</td>
<td>n/a</td>
<td>5</td>
</tr>
<tr>
<td>Hepatitis A</td>
<td>n/a</td>
<td>2203</td>
<td>n/a</td>
<td>484</td>
</tr>
<tr>
<td>Typhoid Fever</td>
<td>n/a</td>
<td>1129</td>
<td>n/a</td>
<td>362</td>
</tr>
</tbody>
</table>

¹ Data obtained from the Syrian Ministry of Health website in the Quarterly Report of Communicable Diseases [30].
² Data obtained from the Global Polio Eradication Initiative website [16].
³ Data obtained from the Epidemiologic Surveillance Department of the Lebanese Ministry of Public Health [26].
⁴ Data obtained from the Communicable Diseases System on the Jordan Ministry of Health Website [25].
⁵ 2014 Data last reported on 08/13/14 from the Global Polio Eradication Initiative website [16].
⁶ 2014 Data last reported on 08/01/14 from the Epidemiologic Surveillance Department of the Lebanese Ministry of Public Health [26].
QUESTIONS?

Vectors or Victims? Docs Slam Rumors That Migrants Carry Disease

by MAGGIE FOX