Gaps and Priorities in US Contribution to Global Disease Challenges

Infectious Disease Panel: Surveillance Section

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1. Definitions and Current Issues
Public Health Surveillance

Ongoing, systematic collection, analysis, and interpretation of health-related data essential to the planning, implementation, and evaluation of public health practice, closely integrated with the timely dissemination of these data to those responsible for preventing and controlling disease and injury

(Stephen Thacker, CDC)
Surveillance and Response are Interlinked

Source: Disease Control Priorities in Developing Countries, World Bank 2006
Public Health Surveillance, Key Requirements

- Strong linkage with public health response
- Competently trained public health personnel at all levels of the health system (both leaders and implementers)
- Multi-disease public health laboratory networks
- Sustained provision of resources
- Frequent evaluations to inform and improve the system
"Usual" Sequence of Events in an Outbreak

First Case
Detection/Reporting
Lab Confirmation
Response
Opportunity for control

DAY
CASES
0 10 20 30 40 50 60 70 80 90
1 4 1 10 13 16 19 22 25 28 31 34 37 40
Ideal Sequence of Events in an Outbreak where Surveillance and Response are Effective

Potential cases prevented
Economic Impact of Selected Infectious Diseases, 1994 - 2006

- Avian Flu: $800 bn worldwide
- SARS: China, Hong Kong, Singapore, Canada ($30-50 bn)
- Foot & Mouth: UK ($25-30 bn)
- BSE UK: $10-13 bn
- Foot & Mouth: Taiwan, $5-8 bn
- Classical Swine Fever: NL, $2.3 bn
- BSE Japan: $1.5 bn
- Nipah, Malaysia: $0.35-0.4 bn
- BSE Canada: $1.5 bn
- BSE U.S.: $3.5 bn
- Avian Flu Asia: $5-10 bn
- Avian Flu, NL: $0.5 bn
- HPAI, Italy: $0.4 bn

Source: Newcomb, J., One World - One Health: An Economic Perspective, 2004, FAZ, 09.11.2005

Source: Lonnie King, CDC
# Selected Significant Epidemics with CDC Involvement over the Last 15 Years

<table>
<thead>
<tr>
<th>Year</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>1993</td>
<td>Hanta virus</td>
</tr>
<tr>
<td>1994</td>
<td>Plague (India)</td>
</tr>
<tr>
<td>1996</td>
<td>Ebola virus (Zaire)</td>
</tr>
<tr>
<td>1996</td>
<td>New Variant of CJD (UK)</td>
</tr>
<tr>
<td>1998</td>
<td>H$_5$N$_1$ influenza (Hong Kong)</td>
</tr>
<tr>
<td>1998</td>
<td>Nipah virus (Malaysia)</td>
</tr>
<tr>
<td>1999</td>
<td>West Nile</td>
</tr>
<tr>
<td>2000</td>
<td>Rift Valley Fever</td>
</tr>
<tr>
<td>2001</td>
<td>Anthrax</td>
</tr>
<tr>
<td>2002</td>
<td>Norwalk-like viruses</td>
</tr>
<tr>
<td>2003</td>
<td>SARS</td>
</tr>
<tr>
<td>2004</td>
<td>Marburg Virus</td>
</tr>
<tr>
<td>2005</td>
<td>H$_5$N$_1$ Influenza</td>
</tr>
<tr>
<td>2006</td>
<td><em>E. coli</em></td>
</tr>
</tbody>
</table>

*Source: Lonnie King, CDC*
2. Current Tools and Strategies for Infectious Disease Surveillance
Global Surveillance Networks

- UNHCR and UNICEF country offices
- WHO collaborating centers/laboratories
- Epidemiology training networks
- Military laboratory networks
- WHO regional and country offices
- Global Public Health Intelligence Network
- Non-governmental organizations
- Internet discussion sites
- Media, press
- National public health authorities

Source: GAO 2001

Formal
Informal
### Disease Specific Infectious Disease Surveillance and Response Efforts Supported by USG

<table>
<thead>
<tr>
<th>Disease Category</th>
<th>Estimated Budget or Funding</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vaccine Preventable Diseases (e.g., polio, measles)</td>
<td>&gt;$100 million</td>
</tr>
<tr>
<td>HIV/AIDS (PEPFAR)</td>
<td>&gt;$15 billion-5yrs</td>
</tr>
<tr>
<td>Malaria (PMI)</td>
<td>&gt;1.2 billion-5yrs</td>
</tr>
<tr>
<td>Influenza (Seasonal and Pandemic preparedness)</td>
<td></td>
</tr>
<tr>
<td>Tuberculosis</td>
<td></td>
</tr>
<tr>
<td>Neglected Tropical Diseases (e.g., schistosomiasis, filariasis, hookworm infections, trachoma)</td>
<td>$350 million</td>
</tr>
</tbody>
</table>
Crosscutting Infectious Disease Surveillance and Response Efforts Supported by USG

- Revised International Health Regulations (led by WHO)
- Integrated Disease Surveillance and Response (for all African States, led by WHO-AFRO)
- Global Disease Detection Regional Centers (Kenya, Egypt, Guatemala, Central Asia, China)
- Field Epidemiology (and Laboratory) Training Program (>27 countries)
- Global Emerging Infections Surveillance and Response System (DOD, Egypt, Kenya, Peru, Thailand)
Four U.S.-Supported Programs to Build Overseas Capacity for Surveillance of Infectious Disease

- **Global Disease Detection**
  - China, Egypt, Guatemala, Kenya, and Thailand

- **Field Epidemiology Training Program**
  - Brazil, Central America, Central Asia, China, Egypt, Ghana, India, Jordan, Kenya, Pakistan, South Africa, Sudan, Thailand, Uganda, and Zimbabwe

- **Integrated Disease Surveillance and Response**
  - Burkina Faso, Ethiopia, Ghana, Guinea, Kenya, Mali, Sudan, Tanzania, Uganda, and Zimbabwe

- **Global Emerging Infections Surveillance and Response System**
  - Egypt, Kenya, Indonesia, Peru, and Thailand
Field Epidemiology (and Laboratory) Training Program
FETPs and Allied Programs, 2007
Field Epidemiology (and Laboratory) Training Program [FE(L)TP]

- Modeled after CDC’s Epidemic Intelligence Service
- Two-year, full-time public health leadership postgraduate training program
- May also train laboratory scientists with field epidemiologists
- Closely supervised, on-the-job, competency-based training
- About 25% class work, 75% field placement
- Trainees assigned to positions that provide epidemiologic and public health service to MOH
- Graduates may receive a certificate or degree
- Aims at developing public health systems
Global Disease Detection Centers

- Developed to make early detection and containment of diseases a reality worldwide
- 5 centers in China, Egypt, Guatemala, Kenya, Thailand
- Networked with a GDD Operations Center in Atlanta
- Provide immediate support for implementing the new IHR requirements
- Influenza and Emerging Infections components provide immediate enhanced detection and response capacity, and the FE(L)TP section provides public health capacity development for future implementation
Integrated Disease Surveillance and Response

A strategy to improve availability and use of surveillance and laboratory data at the district level for control of priority infectious diseases in Africa, began in 1998.

Specific goals:

- Strengthen district-level surveillance and response
- Integrate surveillance with laboratory support
- Translate surveillance and laboratory data into specific timely public health action
**IDSR: Integration of 19 Diseases**

<table>
<thead>
<tr>
<th>Epidemic prone diseases</th>
<th>Other diseases</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Cholera</td>
<td>- AIDS</td>
</tr>
<tr>
<td>- Shigellosis</td>
<td>- Diarrhea with dehydration &lt;5 yr old</td>
</tr>
<tr>
<td>- Measles</td>
<td>- Malaria</td>
</tr>
<tr>
<td>- Meningitis</td>
<td>- Pneumonia &lt;5 yr old</td>
</tr>
<tr>
<td>- Plague</td>
<td>- Onchocerciasis</td>
</tr>
<tr>
<td>- Viral hemorrhagic fevers</td>
<td>- Sexually transmitted infections</td>
</tr>
<tr>
<td>- Yellow fever</td>
<td>- Trypanosomiasis</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Diseases for elimination/eradication</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>- Acute flaccid paralysis/poliomyelitis</td>
<td>- Tuberculosis</td>
</tr>
<tr>
<td>- Dracunculiasis</td>
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<tr>
<td>- Leprosy</td>
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<tr>
<td>- Neonatal tetanus</td>
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</tr>
</tbody>
</table>
# USG Investments 4 Crosscutting Surveillance Programs 2004-2006

**Table 1: U.S. Obligations for Programs Supporting Capacity Building for Infectious Disease Surveillance, 2004-2006**

<table>
<thead>
<tr>
<th>Program</th>
<th>Agency</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
<th>Amounts provided only as 2004-2006 aggregates</th>
</tr>
</thead>
<tbody>
<tr>
<td>GDD</td>
<td>CDC</td>
<td>$6</td>
<td>$11</td>
<td>$14</td>
<td></td>
</tr>
<tr>
<td>FETP</td>
<td>CDC²</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>FETP</td>
<td>USAID</td>
<td>2</td>
<td>3</td>
<td>1</td>
<td>$6</td>
</tr>
<tr>
<td>IDSR²</td>
<td>USAID³</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>GEIS</td>
<td>DOD</td>
<td>NA²</td>
<td>5</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Additional capacity-building activities*</td>
<td>USAID</td>
<td>4</td>
<td>4</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>$17</strong></td>
<td><strong>$28</strong></td>
<td><strong>$25</strong></td>
<td><strong>$14</strong></td>
</tr>
</tbody>
</table>

Sources: GAO analysis of CDC data, USAID grant awards, DOD project reports.
3. Critical Gaps in Infectious Disease Surveillance
Five Critical Gaps for Crosscutting Infectious Disease Surveillance Programs -- 1/2

1. Inadequate funding
   - Compare $84 million invested in crosscutting programs to several billion in disease-specific programs
   - Compare $84 million for surveillance to $30-50 billion economic impact of SARS in 4 countries

2. Surveillance strategy
   - Most systems are mainly reactive (e.g., responding to SARS or Ebola)
   - Some systems conduct ongoing surveillance then response
   - Very few systems are predictive or protective-based
   - Most systems are only based on human cases
Five Critical Gaps for Crosscutting Infectious Disease Surveillance Programs -- 2/2

3. Limited leveraging of the disease-specific programs for multi-disease surveillance and response
4. Minimal private sector participation
5. Inadequate public health workforce both in the leadership and the implementers
4. Suggestions for Solutions for Infectious Disease Surveillance

New Models which are Crosscutting Leveraged, Integrated, Holistic, Train the Public Health Workforce, and are Networked
### Possible Solutions and Priorities 1/2

- **Provide increased and sustained funding to crosscutting surveillance efforts**
  - Donors should fund crosscutting surveillance systems explicitly including the new IHR

- **Leverage disease-specific funding to create multi-disease public health surveillance and response systems including multi-disease public health laboratories**

- **Use an integrated human, animal, environmental-based approach for better prediction of upcoming threats**

- **Encourage involvement of private sector in public health (we are all people)**
Promote prediction/preventive-surveillance-response-evaluate-based systems for infectious (and other) diseases

Focus on training the public health workforce that will sustain the public health system
  – More FE(L)TPs and allied programs

Create and sustain regional networks of the FELTPs (e.g., African Field Epidemiology Network—funded by USAID and CDC)

Create multi-disease Regional Centers of Excellence based on the GDD model
Thank You
Backup Slides
Conceptual Framework for Public Surveillance and Response

## Competencies Required to Operate an Integrated Disease Surveillance and Response System

(source Perry et al, BMC Medicine 2007)

<table>
<thead>
<tr>
<th></th>
<th>1.0 Identify</th>
<th>2.0 Report</th>
<th>3.0 Analyze and Interpret</th>
<th>4.0 Investigate</th>
<th>5.0 Respond</th>
<th>6.0 Provide Feedback</th>
<th>7.0 Evaluate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Community</td>
<td></td>
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<tr>
<td>Health Facility</td>
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<tr>
<td>District, State, Province</td>
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<tr>
<td>National</td>
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<tr>
<td>WHO</td>
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</tbody>
</table>
Multi-Disease Public Health Laboratory Concept

DISEASES OF PUBLIC HEALTH IMPORTANCE (Drivers)

- Training/Retention
- Strengthen Laboratory Capacity
- Linked Referral Services
- Logistics and Commodities Management
- Facility & Equipment Maintenance
- Quality Assurance

CROSS-CUTTING STREAMS

TIERED LABORATORY SERVICES

- Malaria
- HIV
- TB
- Polio, Influenza, etc

National Strategic Plans Should Integrate Major Diseases

Source: John Nkengasong, CDC
The Convergence: A New Public Health Kaleidoscope
Emphasizing One Health

Animal and Human Health Form a Continuum With the Environment

Source: Lonnie King, CDC
# Critical Outcomes for FE(L)TPs within 5-10 years of Inception

<table>
<thead>
<tr>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Functional and robust public health surveillance systems (starting with notifiable diseases -- e.g., IDSR)</td>
</tr>
<tr>
<td>2. Timely and effective response to public health emergencies (including outbreaks)</td>
</tr>
<tr>
<td>3. Culture of evidence-based decision making in public health</td>
</tr>
<tr>
<td>4. Strengthen public health workforce (leaders and implementers)</td>
</tr>
<tr>
<td>5. Contribution to reduction in morbidity and mortality from priority diseases</td>
</tr>
</tbody>
</table>
Incorporated in 2005, the African Field Epidemiology Network is a non-profit organization and networking alliance dedicated to helping Ministries of Health in Africa build strong, effective and sustainable programs and capacity to improve public health systems.

Five member programs - Ghana, Kenya, S. Africa, Uganda & Zimbabwe FE(L)TPs

Four associate members – MoHs of Nigeria, Tanzania, South Sudan, and the MDSC in Burkina Faso