Ebola and Beyond

Protecting Americans and the World from Disease Threats

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Director
Centers for Disease Control and Prevention
CDC saves lives, protects people, and saves money through prevention

- Work 24/7 to prepare for, find, and respond to infectious diseases, environmental hazards, injuries, and other health threats and emergencies

- Analyze health information and investigate health threats to protect people in the US and worldwide

- Promote proven methods to prevent disease, improve health, and reduce health costs
CDC protects Americans from threats from this country and around the world.

CDC operates ~150 labs with ~2,500 scientists and other lab staff.

- Infectious diseases (reference, diagnosis, research)
- Environmental health (genetics, nutrition, chemicals, toxins)
- Preparedness and response (bioterrorism, outbreaks, disasters)
- Occupational safety and health (workplace safety)
- Lab standards and science (quality & regulatory compliance)
- Global health (HIV, malaria, TB, emerging diseases)
CDC partnerships around the world

Staff of 1,600+ located in 60+ countries

Global budget of >$1.7 Billion

As of January 2014
We protect America during emergencies

<table>
<thead>
<tr>
<th>Year</th>
<th>Events</th>
</tr>
</thead>
<tbody>
<tr>
<td>2001</td>
<td>World Trade Center Attacks; Anthrax Attacks</td>
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<td>2002</td>
<td>West Nile Virus</td>
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<tr>
<td>2003</td>
<td>Columbia Space Shuttle Disaster; SARS; Monkey Pox; Northeast Blackout; Hurricane Isabel; Domestic Influenza; California Wildfires; Ricin; Tularemia; Anthrax; BSE (Mad Cow Disease)</td>
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<tr>
<td>2004</td>
<td>Avian Influenza; Influenza Vaccine Shortage; Guam Typhoon; Ricin Domestic Response; G8 Summit; Summer Olympics; Democratic National Convention; Republican National Convention; Hurricanes Charley, Frances, Ivan, and Jeanne, Tsunami</td>
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<tr>
<td>2005</td>
<td>Marburg Virus; Hurricanes Katrina, Rita, and Wilma</td>
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<td>2006</td>
<td>Tropical Storm Ernesto; Mumps; E. Coli; E. Coli Spinach; Botulism Carrot Juice; Rhode Island Mycoplasma</td>
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<td>2007</td>
<td>XDR/MDR TB; Hurricane Dean</td>
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<tr>
<td>2008</td>
<td>Satellite Interceptor; Salmonella and E. Coli Outbreaks; Hurricane Doily; Tropical Storm Edouard; Hurricanes Gustav, Hanna, and Ike</td>
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<td>2009</td>
<td>Salmonella Typhimurium Outbreak; H1N1 Influenza</td>
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<tr>
<td>2010</td>
<td>NH Anthrax; Haiti Earthquake; Deepwater Horizon Oil Spill; Haiti Cholera Outbreak</td>
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<tr>
<td>2011</td>
<td>Japan Earthquake and Tsunami; Polio Eradication Response; Hurricane Irene</td>
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<tr>
<td>2012</td>
<td>Polio; Meningitis Outbreak; Hurricane Sandy</td>
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<tr>
<td>2013</td>
<td>H7N9; MERS-CoV</td>
</tr>
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</table>

24/7 outbreak response

Lifesaving vaccines, medicines, and supplies

Emergency Operations

U.S. Department of Health and Human Services
Centers for Disease Control and Prevention

CDC
Global Health Security

Risks
- Emerging organisms
- Drug resistance
- Intentional creation

Opportunities
- Public health framework
- New lab and surveillance tools
- Successful outbreak control

Priorities
- Prevent wherever possible
- Detect rapidly
- Respond effectively
A health threat anywhere is a health threat everywhere

Global aviation network


Note: Air traffic to most places in Africa, regions of South America, and parts of central Asia is low. If travel increases in these regions, additional introductions of vector-borne pathogens are probable.
Global Health Security Agenda timeline
US government and partners
Making the world safer for 4 billion people

Only 16% of countries fully prepared

$40M joint CDC/DoD initiative

Successful pilots in 2 countries

By 2020

$45M to 10 countries (proposed)

$606M+ emergency request budget for Ebola response (proposed)

30 countries with 4 billion people

2012 2013 2014 2015
A safer US and a safer world

US CDC works directly with countries to

**Prevent avoidable catastrophes**
- Biosafety & biosecurity
- Immunization
- Surveillance of zoonotic disease in humans
- Antimicrobial resistance

**Detect threats early**
- Surveillance
- Laboratory
- Information systems
- Disease detectives and other public health staff

**Respond rapidly and effectively**
- Emergency Operations Centers
- Medical countermeasures
- Linking public health and law enforcement
Case fatality rates

- Ebola: 50-70%
- H5N1: 59%
- MERS: 35%
- SARS: 11%
- 1918 Flu: 2%
- 1957 Flu: 0.3%
- 1967 Flu: 0.05%
Ebola: bottom line up front

1. Despite recent progress, the epidemic is severe

2. Core public health interventions can stop it

3. Success requires speed and scale deploying effective prevention and control measures
Overarching principles for response

- **Speed is paramount**
- **Flexibility**
- **Front lines first**
FIVE COMPONENTS OF EFFECTIVE EBOLA RESPONSE

Incident management
- Effective incident management/EOC functioning in the 3 countries and every district within them

Treatment
- Expand isolation and treatment capacity

Burial support
- Rapidly ensure safe burial

Infection control in all health care systems
- Training, supplies, and public health monitoring

Communications
- Communicate clearly, simply, and frankly at all levels to change behaviors
>170 CDC staff deployed

- Most in Guinea, Liberia, Sierra Leone
- Some in Nigeria, Senegal, Mali, and other countries
- Epidemiologists, exit screeners, health communicators, lab technicians, logistics/support, etc.
CDC’s response to Ebola – global

- Stopping Ebola at the source is the only way to eliminate risk for Americans
- Largest global response in CDC history
  - >160 staff deployed in West Africa, 1,000+ total
- CDC has the skills and expertise needed to
  - Detect and respond to outbreaks
  - Prevent and control diseases
  - Address emerging threats to our health
- International efforts support USG & global partners
  - Extensive on-the-ground support in Liberia, Sierra Leone, Guinea
  - Also in Nigeria, Senegal, Mali and other countries
Ebola cases continue to increase in West Africa

- **Guinea**
- **Liberia**
- **Sierra Leone**

*Reported New Cases vs. Month*

- March: Guinea (0), Liberia (0), Sierra Leone (0)
- April: Guinea (0), Liberia (0), Sierra Leone (0)
- May: Guinea (0), Liberia (0), Sierra Leone (0)
- June: Guinea (150), Liberia (200), Sierra Leone (50)
- July: Guinea (200), Liberia (300), Sierra Leone (100)
- August: Guinea (250), Liberia (400), Sierra Leone (150)
- September: Guinea (300), Liberia (500), Sierra Leone (200)
- October: Guinea (350), Liberia (600), Sierra Leone (250)
Ebola cases in West Africa in October alone exceeded all other recorded Ebola outbreaks combined.
Mali Ebola virus transmission

**Polyclinique Pasteur (PC)**

- **#1**: 70 y/o, M, Grand Imam Kouroumale, Guinea
  - Exposure: UNK
  - Onset: 17 Oct
  - Died: 27 Oct
  - Funeral: 28 Oct, Kouroumale, attended by ~20,000 ppl.

- **#3**: 25 y/o, M, HCW
  - Exposure: 25-27 Oct
  - Onset: 02 Nov
  - Died: 10 Nov, PC

- **#4**: M, HCW ultrasound
  - Exposure: 25-27 Oct
  - Onset: 6 Nov
  - In-treatment ETU

- **#2**: M, friend of case #1
  - Exposure: 25-27 Oct (HH & PC)
  - Died: 10 Nov, Gabriel Toure Hospital (DOA)

- **#5**: Cousin of #2
  - Exposure: 25-27 Oct
  - Onset: ?
  - Died: 13 Nov

- **#6**: Son of case #5
  - Exposure: ?
  - Onset: ?
  - Died: 14 Nov, Home
Mali Ebola investigation as of 13 November

- Mali
  - 8 contact tracing cohorts (1 Kouremale, 7 Bamako)
  - At least 256 contacts identified

- Guinea
  - 3 contact tracing cohorts (1 Kouremale, 1 Siguiri, 1 Gueckedou)
  - 110 current contacts identified
Border Health Measures

Key components of Global Health Security

Sierra Leone

Nigeria

Guinea

Liberia
### Preparedness status of priority countries

(Updated 11/4/2014)

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Benin</th>
<th>Burkina Faso</th>
<th>Cameroon</th>
<th>Cote d'Ivoire</th>
<th>Gambia</th>
<th>Ghana</th>
<th>Guinea-Bissau</th>
<th>Mali</th>
<th>Mauritania</th>
<th>Niger</th>
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<td>Infection control in general health care system</td>
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<td>Health protection awareness</td>
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<td>Participated – USAID workshop</td>
<td>Yes</td>
<td>Yes</td>
<td>Ongoing</td>
<td>Yes</td>
<td>Yes</td>
<td>Not</td>
<td>going</td>
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<td>CDC Country Office</td>
<td>Yes**</td>
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Only listing here 6 of 13 indicators from CDC checklist of “critical elements.”
- Responses received from Benin, Cameroon, Cote d’Ivoire, Guinea-Bissau and Nigeria
- The remaining table based on CDC International Task Force assessments

**President’s Malaria Initiative Assignee only
Ebola survivor returns to her community after being discharged from the Firestone Ebola Treatment Unit
CDC’s response to Ebola – domestic

- Screening and monitoring of travelers
  - Exit screening in affected countries
  - Entry screening in the US
  - Active monitoring of all returning travelers, including CARE kits, 24/7 hotline, quarantine if needed, and safe transport and care in case of illness

- Health care system support
  - Infection control
  - Laboratory networks
  - Technical assistance
Health care preparedness

- Deploy Rapid Ebola Preparedness (REP) teams
  - Deploy to any hospital with a lab-confirmed case
  - Rapidly manage patient safely and effectively
  - Handle triage and clinical management
  - Help identify hospitals best suited to care for patients
  - Help hospitals assess and develop comprehensive Ebola-specific infection control plans
  - Provide technical assistance and guidance

- Initial REP team deployment
  - Near airports with enhanced entry screening (JFK, Newark, Dulles, O’Hare, Hartsfield-Jackson)
  - Where active public health response efforts involve large numbers of contacts of cases (e.g., Texas, Ohio)
  - Areas with high concentrations of travelers returning from Sierra Leone, Guinea, or Liberia
FY 2015 emergency budget request: $1.83 billion to fight Ebola on all fronts (included in $6.2 billion total USG request)

CDC’s ongoing, increasingly intensive domestic & international response shows that substantial additional investments must be made

**Goals**

- Stop Ebola epidemic at its source
- Support immediate and decisive response to any domestic case
- Prepare for and respond to disease threats around the world – prevent the next Ebola or other emerging health threat

**FY 2015 CDC Emergency Request**

- Global Health Security $606M
- International Ebola Response $603M
- Domestic Preparedness and Ebola Response $621M

*Total request: $1.83 billion*
<table>
<thead>
<tr>
<th></th>
<th>Global Health Security</th>
<th>Stopping the Ebola Epidemic</th>
</tr>
</thead>
<tbody>
<tr>
<td>PREVENT</td>
<td>Promote bio-safety</td>
<td>Infection control training and supplies for health care facilities</td>
</tr>
<tr>
<td></td>
<td>Reduce outbreaks</td>
<td>Safe burial</td>
</tr>
<tr>
<td></td>
<td>Minimize zoonotic diseases impact on human populations</td>
<td>Reduce contact with bats and unsafe handling of bush meat</td>
</tr>
<tr>
<td>DETECT</td>
<td>Disease surveillance</td>
<td>Improve disease &amp; syndrome reporting</td>
</tr>
<tr>
<td></td>
<td>Lab testing</td>
<td>Diagnostics and specimen transport</td>
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<tr>
<td></td>
<td>Trained workforce</td>
<td>Staff to find/trace contacts &amp; manage outbreak detection/response (e.g., Field Epidemiology Training Programs; paid, supervised, &amp; supported health/public health staff)</td>
</tr>
<tr>
<td>RESPOND</td>
<td>Emergency Operations Centers</td>
<td>Emergency Operations Centers in each country and each area within the country experiencing Ebola outbreak</td>
</tr>
<tr>
<td></td>
<td>Receive &amp; deploy countermeasures</td>
<td>Isolation units with trained staff &amp; uninterrupted supply of personal protective equipment &amp; other supplies</td>
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</tbody>
</table>
Advanced Molecular Detection
Enhancing CDC’s capabilities to find and stop infectious disease outbreaks
Advanced Molecular Detection saves lives, time, and money

- AMD includes new lab technologies that revolutionize how CDC investigates and controls outbreaks
- Enables CDC to detect outbreaks sooner & respond more effectively – saving lives, time, and money

Detects pathogens in just *hours* or *days*

Improving public health through AMD technologies

- Earlier case recognition/reporting
- Faster, more targeted outbreak response
- Potential cases prevented

Adapted from WHO
Advanced Molecular Detection combines cutting-edge approaches.

- Traditional epidemiology
- Genomic sequencing
- Bioinformatics

Advanced Molecular Detection
Advanced Molecular Detection
5-year initiative to enhance CDC’s microbiology & bioinformatics capabilities to find and stop infectious disease outbreaks

1. Improve pathogen identification & detection
2. Adapt new diagnostics to meet evolving public health needs
3. Help states meet future reference testing needs in coordinated manner
4. Implement enhanced, sustainable, and integrated laboratory information systems
5. Develop prediction, modeling, and early recognition tools

$30M provided in FY 14; $30M requested in FY 15; $150M total planned over 5 years
Advanced Molecular Detection will allow CDC to detect outbreaks sooner, respond more effectively, saving lives and reducing cost.

**IMPROVED DETECTION**
Enhanced recognition of emerging microbial threats and antimicrobial resistance

**IMPROVED SURVEILLANCE**
Improved surveillance information on the transmission of infections and the extent and spread of outbreaks

Better targeting of proven prevention strategies and development of new ones

Faster, more effective control efforts
Detect and Protect Against Antibiotic Resistance

CDC’s Initiative to Outsmart this Threat

- C. difficile
- CRE
- MDR N. gonorrhoeae
- ESBL
- MDR Salmonella
- MRSA
- MDR Pseudomonas
Estimated minimum number of illnesses and deaths caused annually by antibiotic resistance*:

At least

2,049,442 illnesses

23,000 deaths

*bacteria and fungus included in this report
Modern medicine is at risk

- Loss of effective antibiotic treatment could make routine infections deadly
  - Pneumonia
  - Urinary tract infections
  - Wound infections
- Patients who receive specialized care will be at highest risk
  - Cancer chemotherapy
  - Complex surgery
  - Joint replacements
  - Organ transplants
  - Chronic conditions (e.g., rheumatoid arthritis)
  - Dialysis
Cancer treatments are at risk

>600,000 patients will receive chemotherapy in 2014*

~60,000 cancer patients will be hospitalized with neutropenia and infections†

1 in 14 of these will die from this complication†

† Projections from Cagigano et al., Cancer, 2005.
Taking aim: 7 antibiotic-resistant threats

- C. difficile
- CRE
- MDR N. gonorrhoeae
- ESBL
- MDR Salmonella
- MRSA
- MDR Pseudomonas
Detect and protect against antimicrobial resistance

**Detect**
Track AR in real time; uncover outbreaks quickly; identify new, emerging resistant organisms

**Respond**
Stop outbreaks early

**Prevent**
Prevent spread of resistant organisms & emergence of new resistance; scale up proven interventions; preserve effectiveness of current antibiotic treatments

**Innovate**
Design new interventions
Detect and Protect – FY15 proposal

A down payment to improve our country’s ability to start tackling our biggest drug-resistant threats

The FY 2015 President’s Budget requests $30 million/year for 5 years to:

- Speed-up outbreak detection through regional labs and support development of new antibiotics and diagnostics
- Improve infection prevention and antibiotic prescribing
AR Initiative begins to address gaps in knowledge of antibiotic resistance

Enhances state/federal capacity to detect and respond to emerging antibiotic resistance threats

Resistant-bacteria bank makes available isolates to pharmaceutical, biotech, and diagnostic companies to speed development of new antibiotics and diagnostics

Public data portal shows national trends and variations among states in prescribing and resistance

Scale up interventions to improve antibiotic prescribing

Understand the effect antibiotics given to children have on their future health problems
AR Initiative: key activities

- New AR regional lab network
- New resistant-bacteria bank (AR Isolate Library)
- Prevent infections and improve antibiotic prescribing in health care facilities
- Target community threats
- Improve antibiotic prescribing in the community
AR Initiative could achieve reductions in many infections

Anticipated reduction rate (%)

- C. difficile: DOWN 50%
- CRE: DOWN 50%
- MDR Pseudomonas: DOWN 30%
- Invasive MRSA: DOWN 30%
- MDR Salmonella: DOWN 25%

Type of germ

C. difficile  CRE  MDR Pseudomonas  Invasive MRSA  MDR Salmonella
Projected burden of healthcare-associated invasive MRSA, healthcare-associated CDI, healthcare-associated CRE, and hospital-onset MDR *Pseudomonas* infections

Over 5 years prevention results in:
- 619,000 MDR-infections averted
- 37,000 MDR-infection attributable deaths averted
- $7.7B in medical costs saved

Maintaining status quo

Aggressive multisectoral intervention

Attributable medical costs ($ in billions)
Antibiotic stewardship program key elements

- Commitment
- Single leader
- Tracking
- Clinician education
- Reporting
- Implementation
Antibiotic stewardship is an effective strategy to prevent AMR

<table>
<thead>
<tr>
<th>Facility benefits</th>
<th>Antibiotic best practices</th>
<th>Antibiotic stewardship programs are a “win-win”</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Decrease antibiotic resistance</td>
<td>• Ensure all orders have dose, duration, and indications</td>
<td>• A University of Maryland study showed one antibiotic stewardship program saved $17M over 8 years</td>
</tr>
<tr>
<td>• Decrease <em>C. difficile</em> infections</td>
<td>• Get cultures before starting antibiotics</td>
<td>• Antibiotic stewardship helps improve patient care and shorten hospital stays</td>
</tr>
<tr>
<td>• Decrease costs</td>
<td>• Take an “antibiotic timeout,” reassessing antibiotics after 48-72 hours</td>
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<tr>
<td>• Improve patient outcomes</td>
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</table>
National Healthcare Safety Network

- 12,000 facilities report public data
  - CLABSI, CAUTI, and SSI NHSN data on CMS’s Hospital Compare website
  - Adding MRSA and *C. diff* data
- 1,000+ facilities now electronically report at least one event type
  - Work with CMS to offer incentives to electronic reporting
  - Provide vendor portal to improve access to tools and resources needed to integrate with NHSN
- Strengthening collaborations with CMS broadly
Stop the ticking time bomb...

It’s a big problem, and one that’s getting worse. *But it’s not too late.*

We can delay, and even in some cases reverse, the spread of antibiotic resistance.