

# Outbreaks:

PROTECTING  
AMERICANS FROM  
INFECTIOUS DISEASES

# 2014

ISSUE REPORT



Robert Wood Johnson Foundation

DECEMBER 2014

# Acknowledgements

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TFAH would like to thank RWJF for their generous support of this report.

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## REPORT AUTHORS

### **Jeffrey Levi, PhD.**

*Executive Director  
Trust for America's Health  
and Professor of Health Policy  
Milken Institute School of Public Health at the  
George Washington University*

### **Laura M. Segal, MA**

*Director of Public Affairs  
Trust for America's Health*

### **Dara Alpert Lieberman, MPP**

*Senior Government Relations Manager  
Trust for America's Health*

### **Kendra May, MPH**

*Consultant*

### **Rebecca St. Laurent, JD**

*Health Policy Research Manager  
Trust for America's Health*

## PEER REVIEWERS

*TFAH thanks the following individuals and organizations for their time, expertise and insights in reviewing all or portions of the report. The opinions expressed in the report do not necessarily represent the views of these individuals or their organizations.*

### **John Billington**

*Director of Health Policy  
Infectious Diseases Society of America*

### **James S. Blumenstock**

*Chief Program Officer for Public Health Practice  
Association of State and Territorial Health Officials*

### **Thomas V. Inglesby, MD**

*Director and CEO  
UPMC Center for Health Security*

### **Amanda Jezek**

*Vice President for Public Policy and Government  
Relations  
Infectious Diseases Society of America*

### **Chris N. Mangal, MPH**

*Director of Public Health Preparedness and  
Response  
Association of Public Health Laboratories*

### **Glen P. Mays, PhD, MPH**

*F. Douglas Scutchfield Endowed Professor in  
Health Services and Systems Research  
University of Kentucky School of Public Health*

### **Dennis L. Murray MD, FAAP, FIDSA**

*Professor of Pediatrics  
Chief of the Pediatric Infectious Diseases Division  
Georgia Regents University (GRU); and  
Chair, Section on Infectious Diseases (SOID)  
Executive Committee  
American Academy of Pediatrics*

### **Kathryn Talkington, MPAff**

*Senior Director, Immunization & Infectious  
Disease  
Association of State and Territorial Health Officials*

### **Litjen (L.J.) Tan, MS, PhD**

*Chief Strategy Officer  
Immunization Action Coalition*

### **Eric Toner, MD**

*Senior Associate  
UPMC Center for Health Security*

### **Donna Hope Wegener**

*Executive Director  
National TB Controllers Association*

# Introduction

The Ebola outbreak has been a major wake-up call to the United States — highlighting serious gaps in the country’s ability to manage severe disease outbreaks and contain their spread.

It is alarming that many of the most basic infection disease controls failed when tested. After more than a decade of focus on preparing for public health emergencies in the wake of the September 11 and anthrax tragedies, there have been troubling errors, lapses and scrambles to recreate practices and policies that were supposed to have been long considered and well established.

The country spent more than a decade working to ensure federal, state and hospital readiness so that policies and practices would be in place when an outbreak occurs. Every state has received support to establish fundamental infection control practices. Necessary capabilities include protocols for establishing isolation beds in hospitals and safely disposing of hazardous waste; developing quarantine and monitoring policies based on sound science and different disease contingencies; and effectively communicating with the public during an evolving outbreak without creating unnecessary fear. Significant advances have been made, but many serious gaps remain, particularly as resources have eroded over time.

Infectious disease control requires constant vigilance. This requires having systems in place and conducting continuous training and practice exercises. The Ebola outbreak is a reminder that we cannot afford to let our guard down or grow complacent when it comes to infectious disease threats.

Unless public health preparedness is consistent and maintained, it can

quickly devolve into a flawed and reactionary endeavor that leaves Americans unnecessarily at risk.

The best offense to fighting infectious diseases is a strong and steady defense. The post-2001 investments have led to significant progress in many areas of health emergency preparedness, but they did not lead to a serious modernization of the nation’s approach to infectious disease control.

The current system must be brought up-to-date to better match modern global disease threats, technological advances and a clear, consistent set of baseline capabilities. This should include:

- **Core Abilities:** It is important to rethink the public health system around a core set of abilities — at the federal, state and local levels — that are maintained, sufficiently funded and enhance the ability to adapt to and effectively address changing health threats. Key abilities include:
  - Intensive investigative capabilities — including an expert scientific and medical workforce and comprehensive laboratory capabilities — to quickly diagnose outbreaks;
  - Containment strategies, including medicines, vaccines and other countermeasures;
  - Drilling and training for hospitals so they are prepared to respond quickly, safely and correctly when an unusual infection or circumstance presents itself;

## Infectious Diseases *Policy Report* SERIES

- Improving reporting and implementation of infection control practices, procedures and training in hospitals, healthcare systems and in community health centers;
- Streamlined and effective communication channels so health workers can swiftly and accurately communicate with each other, other front line workers, public health agencies and the public; and

- A strong research capacity able to rapidly develop new vaccines or medical treatments to counter new threats.
- **Healthcare and Public Health Integration:** Gaps must be addressed in the policies and procedures that protect patients, healthcare workers and the public’s health — and to improve the way the systems work together and support each other.

- **Leadership and Accountability:** The current federal structure for handling public health issues is not coordinated and lacks clear, strong leadership. Stronger leadership is needed for a government-wide approach to preparedness at the federal, state and local levels, and there must be increased support for integration and flexibility of programs in exchange for demonstration of capabilities and accountability.

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**Infectious diseases cost the country more than \$120 billion each year, and worldwide, they are the leading cause of death of people under the age of 60.<sup>1, 2, 3</sup>**

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Beyond Ebola, there are many other emerging diseases of concern that health officials are monitoring — MERS-CoV, pandemic flu, Marburg, dengue fever and Enterovirus D68— all of which illustrate that infectious disease threats can arise without notice. Emerging diseases are not just a threat to health, they also have an impact on how Americans live their daily lives. Depending on the severity and scope of a threat, it can impact decisions about sending children to schools, limiting travel, restricting public events and even quarantine activities.

While addressing emerging threats is essential, one major weakness of our system is the tendency to focus on the newest and most alarming threats at the expense of the ongoing and costly illnesses that affect communities nationwide every year. Infectious disease control requires constant attention, but currently in the United States, inadequate and fluctuating resources leave gaps in the ability to quickly detect, diagnose, treat and

contain the spread of illnesses. New emergencies require resources; the government should not pull financial resources from already underfunded, ongoing needs. It is essential to balance our attention and resources to ensure that diseases that sicken countless Americans every year are adequately addressed. Continuing threats, like seasonal flu and healthcare-acquired infections, which are disruptive and have high healthcare and lost labor/wage costs, must become a priority. Millions of Americans could be spared and billions of dollars spent on healthcare could be saved with better infectious disease prevention and control.

The Trust for America’s Health (TFAH) and the Robert Wood Johnson Foundation (RWJF) issue the *Outbreaks: Protecting Americans from Infectious Diseases* report to examine the country’s policies to respond to ongoing and emerging infectious disease threats.

Protecting the country from infectious disease threats is a fundamental role of government, and all Americans have

the right to basic protections no matter where they live. While government is only one partner in the fight against infectious diseases — along with the healthcare sector; pharmaceutical, medical supply and technology companies; community groups, schools and employers; and families and individuals — government at all level has the ability to set policies and establish practices based on the best science available to better protect Americans from infectious disease threats.

To help assess policies and the capacity to protect against infectious disease outbreaks, this report examines a range of infectious disease concerns. The report highlights a series of 10 indicators in each state that, taken collectively, offer a composite snapshot of strengths and vulnerabilities across the health system. These indicators help illustrate the types of policy fundamentals that are important to have in place not just to prevent the spread of disease in the first place but also to detect, diagnose and respond to outbreaks. In addition, the report

examines key areas of concern in the nation's ability to prevent and control infectious diseases and offers recommendations for addressing these gaps.

The *Outbreaks* report provides the public, policymakers and a broad and diverse set of groups involved in public health and the healthcare system with an objective, nonpartisan, independent analysis of the status of infectious disease policies; encourages greater transparency and accountability of the system; and recommends ways to assure the public health and healthcare systems meet today's needs and work across borders to accomplish their goals.



## KEY FINDINGS

- **Preparing for Emerging Threats:** Significant advances have been made in preparing for public health emergencies since the September 11, 2001 and the anthrax attacks, but gaps remain and have been exacerbated as resources have been cut over time.

47 states and Washington, D.C. reported conducting an exercise or utilizing a real event to evaluate the time for sentinel laboratories to acknowledge receipt of an urgent message from the state's laboratory.

Only 27 states and Washington, D.C. met a score equal to or higher than the national average for the Incident and Information Management domain of the National Health Security Preparedness Index.

- **Vaccinations:** More than 2 million preschoolers, 35 percent of seniors and a majority of adults do not receive all recommended vaccinations.

Only 14 states vaccinated at least half of their population against the seasonal flu (from fall 2013 to spring 2014).

Only 35 states and Washington, D.C. met the goal for vaccinating young children against the hepatitis B virus (Healthy People 2020 target is 90 percent of children ages 19 to 35 months receiving at least 3 doses).

- **Healthcare-Associated Infections:** While healthcare-associated infections have declined in recent years due to stronger prevention policies, around one out of every 25 people who are hospitalized each year still contracts a healthcare-associated infection.

Only 16 states performed better than the national standardized infection ratio for central-line-associated bloodstream infections.

Only 10 states reduced the number of central line-associated bloodstream infections between 2011 and 2012.

- **Sexually Transmitted Infections (STI) and Related Disease Treatment and Prevention:**

The number of new HIV infections grew by 22 percent among young gay men, and 48 percent among young Black men (between 2008 and 2010); more than one-third of gonorrhea cases are now antibiotic-resistant; and nearly three million Baby Boomers are infected with hepatitis C, the majority of whom do not know they have it.

37 states and Washington, D.C. require reporting of all (detectable and undetectable) CD4 and HIV viral load data, which are key strategies for classifying stage of disease, monitoring quality of care and preventing further transmission of HIV.

- **Food Safety:** Around 48 million Americans suffer from a foodborne illness each year.

38 states met the national performance target of testing 90 percent of reported *E.coli* O157 cases within four days (in 2011).

## Lessons from the Ebola Outbreak and the Future of U.S. Public Health

### EXPERT COMMENTARIES

## Q&A with Robert Kadlec, MD, MTM&H, MA

### What does the Ebola epidemic and response tell us about the nation's public health preparedness for infectious disease outbreaks?

Well before the Ebola outbreak occurred, we had warning signs about our public health infrastructure. Quite frankly, we're losing a lot of gray haired professionals with extraordinary experience who aren't being replaced. Without adequately supported and expertly trained public health workers, the nation will not have a sustainable and successful public health preparedness system.

While the lack of new personnel is troublesome, we've also seen a declining commitment across the board to fund public health preparedness activities. After 9/11 and the surge of funding from 2002 to 2007, policymakers paid less attention and subsequently resources started to ebb. As a consequence of the 2008 recession and decreases of both federal and state investments, the national public health preparedness capacity was lost.

The incredible efforts and successes of public health professionals nationwide is an additional major contributing factor. We've become complacent within our own borders because public health has been successful in squelching the occasional disease outbreak. However, as we have seen with the ongoing Ebola virus outbreak, deadly diseases that are rare in other parts of the world will show up in America with increased frequency because of travel and trade.

As Ebola is demonstrating so dramatically now, even a few cases in America can be very disruptive to our way of life. And,

as a nation, we waited until the disease got here to get serious and take steps to protect healthcare workers and the American people — that's way too late.

Now we see clearly the vulnerabilities in the public health system.

### What challenges does public health preparedness face in the United States?

One of the challenges we have today is competing priorities and initiatives and fewer dollars. And we have taken for granted for too long that our public health and medical systems have been able to perform at levels that far exceed those of the countries around us.

Overall, we're extraordinarily fortunate. As evidenced by West Africa, we know what happens when a frail healthcare system is tested. But, unfortunately, we saw that it might not take much to poke holes in our own health system.

Now is the time to make the clear and unambiguous point that we must maintain investments in domestic and international public health — so when the next emerging disease comes, we're better prepared with medicines and antivirals and a first-class public health workforce.

### What do leaders need to do to ensure the United States has an effective 24/7 approach to fighting infectious diseases?

Similar to 2002, national leaders have a window in time where they can have an extraordinarily positive impact — most notably by restoring or increasing support and funding to the programs (Hospital Preparedness Program (HPP), Public Health Emergency Preparedness (PHEP)

cooperative agreements, Biomedical Advanced Research and Development Authority (BARDA)) and others that were created over a decade ago to fight infectious diseases and bioterrorism.

But federal grant programs are just one piece of the puzzle. We need to evaluate new approaches to fund preparedness as part of the overall healthcare reimbursement process. There can't be two approaches to support preparedness.

Also, state and local health departments must continue to do more with less. They have to be innovative and nimble. They must look at dual use of funds — for instance, using grants that support diabetes nurses who are also trained to administer flu vaccines or implement disease prevention programs.

These models can be created and partly supported at the national level, but states have to embrace the work and be creative.

Lastly, the public health community must do a better job explaining the costs and downsides of turning a blind eye to infectious disease prevention and control. We know the flu costs the country \$10 billion in medical costs and another \$16 billion in lost earnings every year, and is largely preventable, yet we don't support prevention programs.

### Where are the nation's strengths in fighting infectious diseases? Weakness?

There is a great spirit in the public health workforce. They are committed and dedicated, while, at the same time, underpaid and under-supported. Public health workers in the middle of a crisis work overtime to help their communities,

yet are rarely adequately compensated. And there aren't enough of them. A great weakness of this country is not supporting our public health workers — they are on the front line. But the front line is getting thin. We need to improve their quality of life and recruit more of them.

Another great weakness we have is inconsistent and inadequate funding. Emergency supplemental funds get you through a short period of time but do very little for the next outbreak.

The worry I have is that adequate levels of response both home and abroad cannot be enacted in time, i.e., if we don't continuously support the development of medical countermeasures and training for public health workers on the latest devices and machines, when an emergency occurs, we'll be hopelessly behind. There is no "just in time" preparedness.

### **What should America's role be in strengthening global health security?**

The nation has been a leader, if not the leader, in strengthening global health security. We must continue and enhance this work. Our support goes to building coalitions and improving public health infrastructure in poorer countries — efforts that prevent outbreaks from ever reaching America.

When you look at the money America spends in helping other nations, the point should be: our greatest investments in others is really an investment in our health, quality of life and economy.

We must provide support to purchase equipment and build clinics and hospitals and allocate continued funding to train

people. This all gets back to the core of public health — the people who do the tests, manage programs and save lives.

### **How would you improve the nation's preparedness for infectious disease outbreaks?**

When President Dwight D. Eisenhower created the National System of Interstate and Defense Highways, he did so because an interconnected system would improve security, commerce and prosperity in every corner of the country.

This is what public health should be — interconnected systems that span the clinic and community that seamlessly share information and are manned by well-trained people that can keep the public health "roads" and "vehicles" healthy.

Imagine that every department responsible for protecting the nation's health maintains an element of surge but also manages day-to-day efforts at a high level and can work off the strengths of other parts of the connected system.

As noted, a big part of the blueprint is people, but we also need interoperable information systems and a first-class medical system that is integrated with public health. With effective, well-trained professionals, competent information sharing, and first-class patient management, our public health and clinical systems can better safeguard the health of all Americans.

The country also needs a set of leaders who share the same vision, work toward the same objectives and are distributed across the system. We need professionals at the White House, Centers for Disease Control and Prevention (CDC), U.S.

## **BLUE RIBBON PANEL ON BIODEFENSE**

Former Senator Joe Lieberman and Former Governor Tom Ridge have organized a Blue Ribbon Panel on Biodefense. Panelists include Donna Shalala, Tom Daschle, Jim Greenwood and Ken Wainstein. They are taking a comprehensive look at the state of the nation's preparedness for natural and deliberate biological outbreaks and chemical incidents. As part of this study, they will be holding a series of meetings and workshops on a variety of topics assessing the current status of public health and hospital preparedness. The panel intends to issue a report in the spring of 2015 that recommends specific actions to the new Congress to improve our nation's resilience.

Department of Health and Human Services (HHS), and other government agencies who embrace a common vision and work together.

And, we certainly cannot ignore the world we live in, whether that be preventing new cases of Ebola in Africa, mitigating mosquito-borne diseases in Latin America and the Caribbean or fighting antibiotic resistance in the United States. Our country and the world will continue to be challenged by seen and unforeseen infectious disease agents. Consequently, the vision for public health has to be integral to everything else that is happening in the world.

## Lessons from the Ebola Outbreak and the Future of U.S. Public Health

### EXPERT COMMENTARIES

## Q&A with Tom Inglesby, MD, Chief Executive Officer and Director of the UPMC Center for Health Security

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The country has a highly dedicated public health workforce at the federal, state and local levels. While outbreaks or unmet needs often grab headlines, the truth of the matter is that, for many diseases, the country has seen decreasing incidences of infection.

### How does the Ebola response show strengths and weaknesses of public health in the United States?

The response to the Ebola epidemic has underscored a number of public health strengths.

Starting at the source of the outbreak, CDC has been and continues to be one of the most important organizations in the world in terms of providing aid (response teams, surveillance and epidemiology) and mitigating the spread. CDC's experts in Atlanta have also been relied upon by ministries of health around the world looking for insights on how to contain the outbreak.

In the United States, we have seen that patients treated for Ebola early in their illness have had a very good chance of survival. We've also seen our public health system adapt to strenuous and unforeseen challenges — contact tracing and quarantining operations have been performed at a scale that had not been seen before.

In the past, we have seen a wide gap between clinical and public health communities during emergencies — but that hasn't been the case with Ebola. The public health and clinical healthcare workforce are working closely together on this response.

The Ebola outbreak has also demonstrated weaknesses in our system. We have a limited number of hospitals that can care for highly contagious patients while providing full protection for healthcare workers. Ebola has long been

on the radar as a potentially grave disease, yet, when this outbreak occurred, there was not a widely available diagnostic test. This has changed, but it still takes longer than we would like to get the results back, creating situations where patients are unable to be cared for with state-of-the-art care while results are pending.

For a time during the fall Ebola response, the commentary on the response became politically charged to the detriment of the overall response. The nation does best in addressing infectious disease crises when responses are apolitical and nonpartisan. Once an outbreak develops a political dynamic, it diverts the attention of those working on the outbreak to managing the politics instead of the crisis.

Another major issue is that we don't have a medicine or vaccine for Ebola — an important example of the problems we have developing new medicines and countermeasures to cope with new and emerging infectious diseases.

The good news is that the United States has been a world leader in rapidly initiating clinical trials for Ebola medical countermeasures.

### How do you view the attention Ebola has received?

This is a very unusual and serious disease. As we have seen in West Africa, Ebola has the potential to substantially degrade a healthcare system. It even has the potential to destabilize countries. So, while at times, the specific nature of the media coverage of Ebola has been



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**Ebola mimics other diseases early on, is transmissible person-to-person through contact with bodily fluids and has had a very high fatality rate in Africa. And we have no vaccine or antiviral at hand. It has a doubling time of as little as a few weeks.**

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extreme, the level of attention it has received has been well deserved.

We know what happens when Ebola gets out of control — entire countries and regions are ground to a halt with serious ramifications from disrupted or destructed trade to extreme starvation and stigma to restricted travel. For those reasons, Ebola must be stopped at its source, otherwise it can spread to other nations and wreak havoc on a broader scale with the world's health, economy, commerce and travel.

#### **Are there other infectious disease threats that the United States is not paying enough attention to?**

The domestic attention to Ebola was understandable — it's frightening and new and people saw what it did to West Africa. However, there are also a number of other infectious diseases that could or already are causing severe disruptions and lasting health consequences within the United States.

**Antibiotic-resistant infections:** More than 20,000 Americans die each year as a result of antibiotic-resistant infections. This, sadly, isn't new or emerging, it's here and it's a severe problem. While there is a higher level of awareness, the full recommendations of an Executive Order issued earlier this year have not been implemented yet.

**HIV/AIDS, Hepatitis, TB and STIs:** The nation cannot lose sight of serious and mostly preventable infectious diseases. Around 1 million people contract HIV

every year, and about 1 in 6 don't know it. And there are at least 5.5 million Americans with Hepatitis B virus (HBV) or Hepatitis C virus (HCV), with up to 75 percent unaware they have it.

**Chagas disease:** Chagas is creeping up from the south and there is some preliminary evidence that it is has gotten into the blood supply at a low level in Texas — which could threaten the safety of the blood supply there.

#### **What are other national strengths/weaknesses when it comes to responding to infectious disease outbreaks?**

The country has a highly dedicated public health workforce at the federal, state and local levels. While outbreaks or unmet needs often grab headlines, the truth of the matter is that, for many diseases, the country has seen decreasing incidences of infection.

Unfortunately, the nation's system also has holes and faces incredible challenges every day.

For instance, our vaccination rates are nowhere near where they should be, which puts our children unnecessarily at risk. And when kids are at-risk, they end up serving as the initiator of broader epidemics in communities — widespread outbreaks happen when we don't follow routine vaccine guidance.

Also, in the parts of the country where mosquito-borne illnesses are growing, we have waxing and waning attention and declining and inconsistent

resources given to mosquito abatement. The only way to stop the widespread importation of dengue, chikungunya, West Nile and a whole host of other mosquito-borne illnesses is through strong abatement policies.

For some time, we've known antimicrobial resistance will pose an incredible problem for the country if we don't get it under control. Yet, intravascular infections are increasing in hospitals and becoming infections that are difficult to treat with almost all of our established antibiotics. It has been said, but it bears repeating: if this trend continues, even routine procedures in hospitals will become dangerous because our antibiotics could become ineffective at preventing infections. This sounds like we're going back decades to a period where any surgery was quite deadly and dangerous.

#### **How do you view the country's current plan for research, development and stockpiling of medicines and vaccines?**

We need look no further than the Ebola outbreak to see that there is an important role for the federal government to play in developing or supporting the development of medicines and vaccines for diseases that have no public market. There is a lot of excellent science going on in universities and small companies, but without a dedicated and committed effort from the federal government to fund advanced development, those ideas often die in the petri dish — and they never make it through.

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Quite simply, after the series of emerging infectious disease threats that the country has faced in the last 10 years, it is unacceptable that we don't have adequate, dedicated and consistent funding to support the development pipeline.

We've been relatively fortunate in that Ebola was on the threat list, which means there was some support for the development of vaccines and antiviral compounds. We didn't have to start from zero. But if we had a program dedicated to the advanced development of vaccines and medicines for emerging infectious diseases, we may have been further along in development.

We have a dedicated program (BARDA) that focuses on advanced development of medicines/vaccines for pandemic flu and deliberate biologic threats, but there is nothing within BARDA that effectively supports the creation of countermeasures for other naturally occurring diseases (SARS, MERS, etc.). The antimicrobial resistance programs within BARDA are required to have the primary purpose of responding to a deliberate biological threat. The recent executive order will allow BARDA to expand its efforts.

Quite simply, after the series of emerging infectious disease threats that the country has faced in the last 10 years, it is unacceptable that we don't have adequate, dedicated and consistent funding to support the development pipeline for the most urgent emerging infectious diseases.

**Is there anything different the science and technology communities can do to better prepare the country for infectious disease outbreaks?**

There is room for innovation across the spectrum — from prevention to treatment to infection control to

mosquito abatement. And there are people working in all these areas. However, they need support.

The country needs to improve diagnostic technologies so it's easier to do rapid diagnostics. For instance, with Ebola, it's become as important to rule out the disease as it is to rule it in. Until Ebola is ruled out for a sick patient, they are not going to receive the state-of-the-art care that a typical patient would, because they have to be treated as if they are dangerously contagious.

And, as noted above, the country desperately needs new approaches to managing antimicrobial resistance and a realistic funding strategy for 2015.

**What should America's role be in strengthening global health security?**

The United States has a very important role and is already doing a great deal of work in strengthening global health security. The nation has helped train public health workers in other countries, provided technologies, vaccines, medicines and other supplies and worked to increase the capacity of nations with weak public health infrastructures.

The country also has an important role in persuading other nations that it is in our collective best interest to fight diseases where they occur, which means providing more support to nations that have weak public health systems.

To protect the health and wealth of Americans, it is absolutely vital that our public health system share resources and best practices with other nations.

## SOME MAJOR INFECTIOUS DISEASE THREATS

- **Ebola:** As of December 2014, West Africa has experienced more than 17,000 cases of this viral hemorrhagic fever and more than 6,000 deaths.<sup>4</sup> In October, Congress authorized reallocation from the Pentagon of \$750 million to fight Ebola, in addition to \$88 million in a 2014 continuing resolution.<sup>5</sup> In December 2014, Congress provided an additional \$5.4 billion in emergency supplemental funds to increase efforts to contain the epidemic globally, strengthen domestic preparedness and accelerate development of vaccines and treatments.

- **Enterovirus D68 (EV-D68):** From mid-August to December 4, 2014, more than 1,100 people in 47 states and Washington, D.C. have confirmed respiratory illness caused by EV-D68.<sup>6</sup> EV-D68 has been detected in specimens from 12 patients who died.<sup>7</sup>

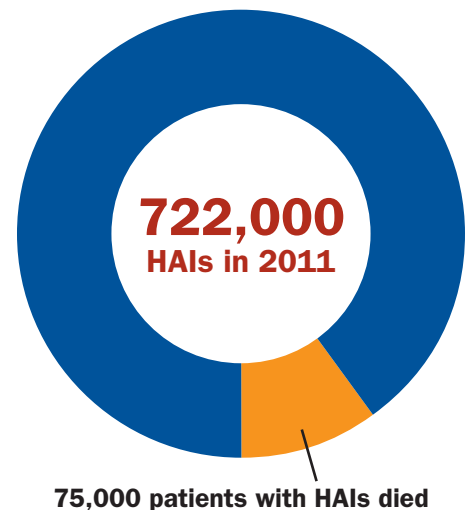
- **Acute Flaccid Myelitis in Children:** Between August and November 2014, 90 children from 1 to 18 years of age in 32 states developed sudden onset of muscle weakness or paralysis, mostly in their arms or legs.<sup>8</sup> CDC does not yet know what causes the illness or if it is spread from person to person. All the children had a fever, most with

symptoms of respiratory illness, about one week before they felt muscle weakness. A little less than half of the children had EV-D68 in their nose secretions.<sup>9</sup>

- **Superbugs and Antibiotic Resistance:** More than two million Americans fall sick from antibiotic-resistant bacteria and more than 23,000 die from those infections each year.<sup>10</sup> Antibiotic resistance costs the country an extra \$20 billion in direct medical costs and at least \$35 billion in lost productivity each year.

- **Healthcare-associated Infections:** Approximately one out of every 25 people who are hospitalized each year contracts a healthcare-associated infection. There were an estimated 722,000 HAIs in 2011 in acute care hospitals and around 75,000 patients with HAIs died during their hospitalizations.<sup>11</sup>

- **Foodborne Illness:** More than 48 million Americans suffer from foodborne illnesses each year. These illnesses result in 128,000 hospitalizations and around 3,000 deaths. In addition, more than 4,100 persons become ill from contaminated drinking water and more than 13,000 persons become ill from recreational water disease outbreaks annually in the United States.<sup>12, 13</sup>



## SOME MAJOR INFECTIOUS DISEASE THREATS

- **The Flu (Influenza):** An average of 62 million Americans — 20 percent of the population — get the flu each year. Annually, more than a quarter of a million people are hospitalized and between 3,000 and 49,000 die from the flu, depending on the severity of that year's strain, leading to economic losses of more than \$10 billion in direct medical expenses and more than \$16 billion in lost earnings.<sup>14, 15</sup>
- **Pandemic Flu:** Experts also warn that flu pandemics — novel strains of the flu virus that humans have little-to-no immunity against — emerge three to four times a century.<sup>16</sup> Since 2012, global health officials have been tracking a new strain of the flu — H7N9, first reported in China — which has led to 175 deaths globally, primarily in East Asia (as of October 2014).<sup>17</sup>
- **Middle East Respiratory Syndrome Coronavirus (MERS-CoV):** As of October 2014, there have been more than 850 laboratory-confirmed cases (including more than 300 deaths) worldwide of a new MERS-

CoV reported to the World Health Organization (WHO).<sup>18</sup>

- **Chikungunya, West Nile Virus (WNV), Malaria, Dengue Fever and Mosquito-borne Illnesses:** Chikungunya, a mosquito-borne illness that causes fever and severe joint pain, emerged in the Americas for the first time in late 2013. Currently, there are more than 780,000 suspected and 15,000 confirmed cases in the Americas and Caribbean — including at least 11 cases in the United States.<sup>19, 20</sup> In the past few years, the United States has experienced the largest outbreak of West Nile Virus in a decade and the highest number of cases of malaria since 1970.<sup>21</sup> Mosquitoes that can transmit dengue fever have been found in 36 U.S. states and are of particular concern along the U.S.-Mexico border, in Puerto Rico and in Hawaii.<sup>22</sup> Recently, multiple cases of locally-acquired dengue fever have been reported in Florida.<sup>23</sup>
- **HIV/AIDS:** More than 1.2 million Americans are living with HIV/AIDS,

and almost one in six do not know they are infected. Since the epidemic began, more than 648,000 Americans have died with AIDS.<sup>24</sup> There is a sharp rise in new infections among gay men — particularly among young gay men — accounting for the majority of the nearly 50,000 new HIV diagnoses in 2010.<sup>25</sup>

- **Hepatitis B and C:** Around 5 million Americans have hepatitis B virus or hepatitis C virus, but between 65 and 75 percent do not know they have it. HBV and HCV put people at risk for developing serious liver diseases and cancer. Two-thirds of Americans infected with HCV are Baby Boomers and one in 12 Asian Americans has HBV.<sup>26</sup>
- **Tuberculosis (TB):** Nearly 10,000 people within the United States were diagnosed with TB disease in 2013 with 63 percent of these cases occurring in persons born outside the United States.<sup>27</sup> An estimated 11 million Americans — 4 percent of the population — have “latent” TB infections.<sup>28</sup>

### > 1.2 million people with HIV/AIDS



**1 in 6 don't know they're infected**

# State by State Indicators

## State-By-State Infectious Disease Prevention and Control Indicators

All Americans deserve to be protected against infectious disease threats, no matter where they live.

CDC has identified strategies and fundamental capabilities that should be in place to fight infectious diseases in a *Framework for Preventing Infectious Diseases: Sustaining the Essentials and Innovating for the Future*. Core elements of the framework include focusing on:

- Strengthening public health fundamentals, including infectious disease surveillance, laboratory detection and epidemiologic investigations;
- Identifying and implementing high-impact strategies — such as vaccinations, infection control, rapid diagnosis of disease and optimal treatment practices — to limit the spread of diseases and systems to reduce the diseases transmitted by animals or insects to humans; and
- Developing and advancing policies such as integrating clinical infectious disease preventive practices into U.S. healthcare systems; educating and working with the public to understand how to limit the spread of diseases; and working with the global health community to quickly identify new diseases and reduce rates of existing diseases.<sup>29</sup>

Infectious disease control and prevention is a concern in every state. However,

policies and programs vary from state-to-state. To help assess infectious disease policies, the *Outbreaks* report examines a series of 10 indicators based on high-priority areas and concerns. It is not a comprehensive review; but collectively, it provides a snapshot of efforts to prevent and control infectious diseases in states and within the healthcare system.

The indicators were selected after consulting with leading public health and healthcare officials. Each state received a score based on these 10 indicators. States received one point for achieving an indicator and zero points if they did not. Zero is the lowest possible score and 10 is the highest. The scores ranged from a high of eight in Maryland, Massachusetts, Tennessee, Vermont and Virginia to a low of two in Arkansas.

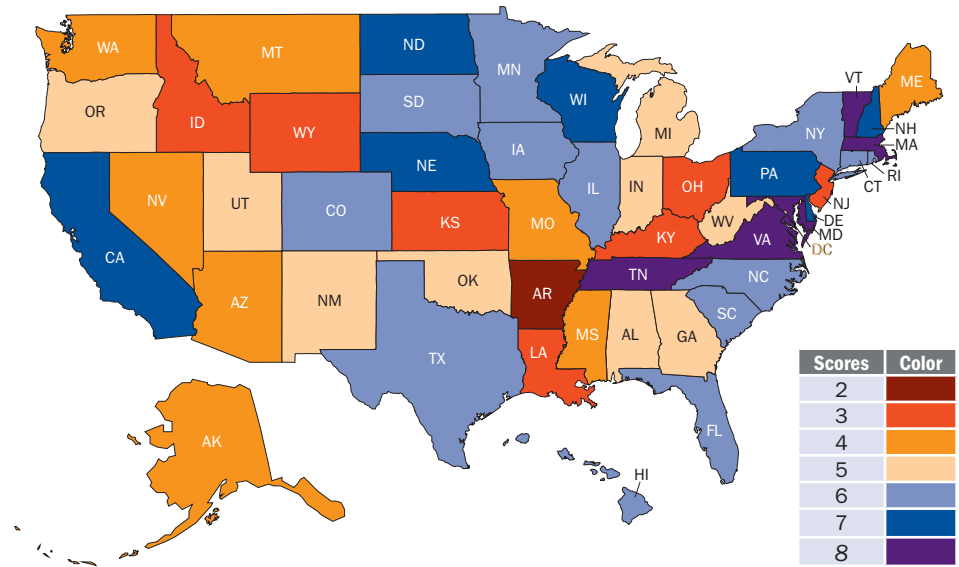
Scores are not intended to serve as a reflection of the performance of a specific state or local health department or the healthcare system or hospitals within a state, since they reflect a much broader context, including resources, policy environments and the health status of a community, so many of the indicators are impacted by factors beyond the direct control of health officials.

## STATE INDICATORS

	(1) Increased or maintained level of funding for public health services from FY 2012-13 to FY 2013-14.	(2) State scored equal to or higher than the national average on the Incident & Information Management domain of the National Health Security Preparedness Index (2014).	(3) Met the Healthy People 2020 target of 90 percent of children ages 19-35 months receiving recommended ≥3 doses of HBV vaccine.	(4) Vaccinated at least half of their population (ages 6 months and older) for the seasonal flu for fall 2013 to spring 2014.	(5) State currently has completed climate change adaptation plans – including the impact on human health.	(6) State performed better than the national SIR for central line-associated bloodstream infections
Alabama		✓	✓			
Alaska			✓		✓	
Arizona	✓	✓				
Arkansas						
California	✓		✓		✓	✓
Colorado		✓		✓		✓
Connecticut	✓		✓	✓	✓	
Delaware	✓	✓	✓	✓		
D.C.		✓	✓			
Florida	✓	✓			✓	
Georgia	✓		✓			
Hawaii	✓			✓		✓
Idaho			✓			✓
Illinois	✓	✓	✓			
Indiana		✓	✓			
Iowa	✓	✓	✓			
Kansas			✓			
Kentucky			✓			
Louisiana			✓			
Maine					✓	
Maryland	✓	✓	✓		✓	
Massachusetts	✓	✓	✓	✓	✓	
Michigan	✓					✓
Minnesota		✓	✓	✓		
Mississippi	✓		✓			
Missouri						✓
Montana	✓		✓			
Nebraska	✓	✓	✓	✓		
Nevada	✓					
New Hampshire	✓	✓	✓		✓	
New Jersey	✓	✓	✓			
New Mexico	✓	✓				
New York		✓	✓		✓	
North Carolina		✓	✓	✓		✓
North Dakota	✓	✓	✓			✓
Ohio						✓
Oklahoma	✓		✓			✓
Oregon	✓				✓	✓
Pennsylvania	✓	✓	✓		✓	✓
Rhode Island		✓	✓	✓		
South Carolina	✓	✓	✓			
South Dakota	✓		✓	✓		✓
Tennessee	✓	✓	✓	✓		
Texas	✓	✓	✓			
Utah		✓	✓			
Vermont	✓	✓	✓	✓	✓	✓
Virginia		✓	✓	✓	✓	
Washington		✓			✓	
West Virginia				✓		✓
Wisconsin			✓		✓	✓
Wyoming						
<b>Total</b>	<b>28</b>	<b>27 + D.C.</b>	<b>35 + D.C.</b>	<b>14</b>	<b>15</b>	<b>16</b>

	(7) Between 2011 and 2012, state reduced the number of central line associated blood stream infections.	(8) From July 1, 2013 to June 30, 2014, public health lab reports conducting an exercise or utilizing a real event to evaluate the time for sentinel clinical laboratories to acknowledge receipt of an urgent message from laboratory.	(9) State requires reporting of all CD4 and HIV viral load data to their state HIV surveillance program.	(10) State met the national performance target of testing 90 percent of reported Escherichia coli (E. coli) O157 cases within four days.	2014 Total Score
Alabama		✓	✓	✓	5
Alaska		✓		✓	4
Arizona		✓	✓		4
Arkansas		✓		✓	2
California	✓	✓	✓		7
Colorado	✓	✓		✓	6
Connecticut		✓		✓	6
Delaware		✓	✓	✓	7
D.C.		✓	✓	✓	5
Florida		✓	✓	✓	6
Georgia	✓	✓	✓		5
Hawaii		✓	✓	✓	6
Idaho		✓			3
Illinois		✓	✓	✓	6
Indiana		✓	✓	✓	5
Iowa		✓	✓	✓	6
Kansas		✓		✓	3
Kentucky		✓		✓	3
Louisiana			✓	✓	3
Maine		✓	✓	✓	4
Maryland	✓	✓	✓	✓	8
Massachusetts		✓	✓	✓	8
Michigan		✓	✓	✓	5
Minnesota		✓	✓	✓	6
Mississippi		✓	✓		4
Missouri		✓	✓	✓	4
Montana		✓	✓		4
Nebraska		✓	✓	✓	7
Nevada	✓	✓		✓	4
New Hampshire		✓	✓	✓	7
New Jersey					3
New Mexico		✓	✓	✓	5
New York	✓	✓	✓		6
North Carolina		✓	✓		6
North Dakota		✓	✓	✓	7
Ohio		✓		✓	3
Oklahoma		✓		✓	5
Oregon		✓	✓		5
Pennsylvania		✓		✓	7
Rhode Island		✓	✓	✓	6
South Carolina	✓	✓	✓		6
South Dakota		✓	✓		6
Tennessee	✓	✓	✓	✓	8
Texas		✓	✓	✓	6
Utah		✓	✓	✓	5
Vermont		✓		✓	8
Virginia	✓	✓	✓	✓	8
Washington			✓	✓	4
West Virginia		✓	✓	✓	5
Wisconsin	✓	✓	✓	✓	7
Wyoming		✓	✓	✓	3
	<b>10</b>	<b>47 + D.C.</b>	<b>37 + D.C.</b>	<b>38 + D.C.</b>	

## MAJOR INFECTIOUS THREATS AND KEY FINDINGS



### SCORES BY STATE

8 (5 states)	7 (7 states)	6 (13 states)	5 (9 states & D.C.)	4 (8 states)	3 (7 states)	2 (1 state)
Maryland Massachusetts Tennessee Vermont Virginia	California Delaware Nebraska New Hampshire North Dakota Pennsylvania Wisconsin	Colorado Connecticut Florida Hawaii Illinois Iowa Minnesota New York North Carolina Rhode Island South Carolina South Dakota Texas	Alabama D.C. Georgia Indiana Michigan New Mexico Oklahoma Oregon Utah West Virginia	Alaska Arizona Maine Mississippi Missouri Montana Nevada Washington	Idaho Kansas Kentucky Louisiana New Jersey Ohio Wyoming	Arkansas

### INDICATOR SUMMARY

Indicator	Finding
1. Public Health Funding Commitment	28 states increased or maintained funding for public health from Fiscal Year (FY) 2012 to 2013 to FY 2013 to 2014.
2. Incident and Information Management	27 states met or exceeded the average score for Incident Information and Management in the National Health Security Preparedness Index™ (NHSPI™).
3. Childhood Vaccinations	35 states and Washington, D.C. met the Healthy People 2020 target of 90 percent of children ages 19-35 months receiving the recommended $\geq 3$ doses of HBV vaccine.
4. Flu Vaccination Rates	14 states vaccinated at least half of their population (ages 6 months and older) for the seasonal flu from fall 2013 to spring 2014.
5. Climate Change and Infectious Disease	15 states currently have completed climate change adaptation plans that include the impact on human health.
6. Healthcare-Associated Infection Control	16 states performed better than the 2012 national standard infection ratio (SIR) for central line-associated bloodstream infections.
7. Healthcare-Associated Infection Control	Between 2011 and 2012, the standardized infection ratio (SIR) for central line-associated bloodstream infections decreased significantly in 10 states.
8. Public Health Laboratories – Capabilities During Emergencies or Drills	47 state public health laboratories and Washington, D.C. reported conducting an exercise or utilizing a real event to evaluate the time for sentinel clinical laboratories to acknowledge receipt of an urgent message from the state's laboratory (from July 1, 2013 to June 30, 2014).
9. HIV/AIDS Surveillance	37 states and Washington D.C. required reporting of all (detectable and undetectable) CD4 (a type of white blood cell) and HIV viral load data to their state HIV surveillance program.
10. Food Safety	38 states and Washington, D.C. met the national performance target of testing 90 percent of reported Escherichia coli (E. coli) O157 cases within four days.







The federal government also has authority to isolate or quarantine patients infected with certain diseases who are arriving into the United States from a foreign country, are traveling between states, or who may come into contact with others who are traveling between states when they pose a threat to others or the national interest. This authority derives from the Commerce Clause of the Constitution. The U.S. Secretary of HHS is authorized to take measures to prevent the entry and spread of communicable diseases from foreign countries into the United States and between the states (section 361 of the Public Health Services Act (42 U.S. Code § 264)).<sup>35</sup> CDC has the responsibility for implementing these functions as deemed necessary to protect the public. Although rare, CDC may detain, medically examine and release persons arriving into the United States, people traveling between states or people who may come into contact with others who are traveling between states and are suspected of carrying communicable diseases of public health concern.

Federal isolation and quarantine are currently authorized by Executive Order of the President for cholera, diphtheria, infectious TB, plague, smallpox, yellow fever, viral hemorrhagic fevers like Ebola, severe acute respiratory syndromes and influenza viruses that are causing or have the potential to cause a pandemic.<sup>36</sup> The President can revise the list by Executive Order. It is the duty of U.S. Customs and Coast Guard officers to aid in the enforcement of quarantine rules and regulations.<sup>37</sup> Breaking a federal quarantine order is punishable by fines and imprisonment.<sup>38</sup>

- CDC issued Interim U.S. Guidance for Monitoring and Movement of Persons with Potential Ebola Virus Exposure, recommending individuals arriving into the United States from a West African country with widespread transmission, who meet certain risk factors but are asymptomatic, should be closely monitored for 21 days and, in some cases, have controlled movement and be excluded from public

places and/or the workplace, based on an individual risk assessment.<sup>39</sup> Individuals who are symptomatic and meet risk factors would be subject to rapid isolation and care.<sup>40</sup>

- The Department of Defense (DoD) requires service members returning from Ebola-infected areas to undergo 21 days of isolation and “enhanced monitoring.” However, it cannot legally force civilian DoD employees into the same level of quarantine. Before deployment, civilians can decide that upon their return they will undergo the same military quarantine or they can choose to abide by CDC guidelines that do not require quarantine. Instead, personnel must take their own temperatures twice daily and undergo periodic face-to-face monitoring by a health professional.<sup>41</sup> Officials have noted that civilians deployed to the region — unlike infantry — are likely healthcare workers with experience in infectious disease.<sup>42</sup>

States bear most of the legal responsibility for protecting the health, safety and welfare of their citizens, granted by “police power” functions. States vary in how they are structured and many share different degrees of responsibility with local governments, but still maintain the ultimate power within their borders.<sup>43</sup> This authority “underlie[s] communicable disease laws authorizing surveillance, testing, screening, isolation and quarantine.”<sup>44</sup> Every state has the general public health authority to act to control communicable diseases, but state laws, programs and funding levels vary significantly. For instance, some states have very specific or very broad quarantine laws. In most states, breaking a quarantine law is a criminal misdemeanor.<sup>45</sup> Public health laws can be controversial in terms of

finding an appropriate balance between protecting against the risk to the public versus the rights of an individual or group. In most states, for most conditions, “liberty principles” and “informed consent” allow individuals to decide whether to treat an illness they may have, but this may then lead to required isolation for a patient if the disease can be easily spread and pose a danger to others.<sup>46</sup>

States are able to establish their own quarantine and isolation policies, including for Ebola, and there have been significant variations in their policies with many states choosing to differ from CDC’s recommendations. For example, some states have required mandatory quarantines for 21 days for healthcare workers returning from treating Ebola patients in West Africa even if they were at low risk for exposure and are symptom-free.<sup>47</sup>

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### Therefore, disease outbreaks anywhere are of concern everywhere.

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U.S. infectious disease control strategies are complicated not just by interstate travel, but by international travel and immigration. In many cases, people carrying diseases are often not identified when crossing borders because they may have an infection or illness but are unaware of it, or they may not have developed severe enough symptoms to warrant special notice or attention. And, even in cases where a patient suspected of having a dangerous infectious disease has been identified, carrying out quarantine and isolation laws in a timely manner and across different jurisdictions can present a challenge.

WHO revised a set of International Health Regulations (IHR) in 2005 in the wake of the outbreak of a new deadly disease called SARS to help improve global disease surveillance and detection and encourage the adoption of stronger standardized disease control policies worldwide.<sup>48</sup> IHR sets standards for and requires notification to WHO of any “public health emergency of international concern” or of any significant evidence of public health risks outside their territory that may lead to or cause the international spread of disease. The IHRs are also intended to help prevent countries from taking non-science-based policies on trade or travel restrictions. More than 190 nations have signed onto the IHR.<sup>49</sup>

Even with laws in place, infectious disease prevention and control policies can have major challenges in practice. For instance, the ability of different nations to effectively detect and monitor diseases and institute disease control practices varies significantly. Many countries do not adequately fund public health programs, have large endemic public health crises, do not have strong healthcare systems and do not have a tradition of setting standards for adopting evidence-based disease control practices or for adopting principles of objectivity, fairness and transparency.<sup>50</sup> Efforts like the WHO and CDC’s Global Disease Detection (GDD) program help provide some additional support to less wealthy nations, but there is wide variance and major gaps in public health programs around the world to control outbreaks like Ebola, ongoing threats like HIV/AIDS and malaria and the ability to quickly identify and contain new diseases.

## INDICATOR 1: PUBLIC HEALTH FUNDING COMMITMENT — STATE PUBLIC HEALTH BUDGETS

**Key Finding:** 28 states increased or maintained funding for public health from Fiscal Year (FY) 2012 to 2013 to FY 2013 to 2014.

28 states increased or maintained public health funding from FY 2012 to 2013 to FY 2013 to 2014 (1 point).		22 states and Washington, D.C. cut public health funding from FY 2012 to 2013 to FY 2013 to 2014 (0 points).	
Arizona (8.8%)	Nebraska (0.1%)	Alabama (-8.5%)*	Missouri (-5.1%)^
California (0.2%)	Nevada (5.0%)	Alaska (-1.6%)	New York (-7.8%)*
Connecticut (10.7%)	New Hampshire (0.9%)	Arkansas (-5.5%)^	North Carolina (-7.4%)*
Delaware (0.6%)	New Jersey (1.9%)	Colorado (-1.6%)	Ohio (-0.4%)^
Florida (3.7%)	New Mexico (0.5%)	D.C. (-0.4%)*	Rhode Island (-1.7%)
Georgia (0.7%)	North Dakota (32.8%)	Idaho (-1.8%)*	Utah (-12.6%)
Hawaii (6.1%)	Oklahoma (13.3%)	Indiana (-26.2%)*	Virginia (-4.7%)^
Illinois (5.0%)	Oregon (18.1%)	Kansas (-12.9%)^	Washington (-11.2%)^
Iowa (17.4%)	Pennsylvania (0.7%)	Kentucky (-8.1%)^	West Virginia (-17.9%)^
Maryland (2.5%)	South Carolina (4.5%)	Louisiana (-5.5%)	Wisconsin (-2.5%)*
Massachusetts (0.3%)	South Dakota (6.3%)	Maine (-0.7%)^	Wyoming (-1.1%)*
Michigan (11.2%)	Tennessee (0.6%)	Minnesota (-0.4%)*	
Mississippi (6.2%)	Texas (14.7%)		
Montana (12.5%)	Vermont (8.1%)		

\*Budget decreased for second year in a row

^Budget decreased for third year in a row

This indicator, adjusted for inflation, illustrates a state’s commitment and ability to provide funding for public health programs that support the infrastructure and workforce needed to improve health in each state, including the ability to prevent and control infectious disease outbreaks.

Every state allocates and reports its budget in different ways. States also vary widely in the budget details they provide. This makes comparisons across states difficult. For this analysis, TFAH examined state budgets and appropriations bills for the agency, department, or division in charge of public health services for FY 2012 to 2013 and FY 2013 to 2014, using a definition as consistent as possible across the analyses of the two budget cycles, based on how each state reports data. TFAH defined “public health services” broadly to include all state-level health spending with the exception of Medicaid, CHIP or

comparable health coverage programs for low-income residents.

Based on this analysis, 22 states and Washington, D.C. made cuts in their public health budgets. Seventeen states and D.C. cut their budget for two or more years in a row, and nine made cuts for three or more years in a row. The median spending in FY 2013 to FY 2014 was \$31.06 per capita, down from \$33.71 in FY 2008.

Public health funding is discretionary spending in most states and, therefore, is at high risk for significant cuts during economic downturns. States rely on a combination of federal, state and local funds to support public health activities, including infectious disease prevention, immunization services and preparedness activities. The overall infrastructure of public health programs supports the ability to carry out all of their responsibilities, which includes infectious disease prevention,

immunization services and health emergency preparedness.

It is important to note that several states that received points for this indicator may not have actually increased their spending on public health programs. The ways some states report their budgets, for instance, by including federal funding in the totals or including public health dollars within healthcare spending totals, make it very difficult to determine “public health” as a separate item.

This indicator is limited to examining whether states’ public health budgets increased or decreased; it does not assess if the funding is adequate to cover public health needs in the states, and it should not be interpreted as an indicator or surrogate for a state’s overall performance.

For additional information on the methodology of the budget analysis, please see *Appendix A: Methodology for Select State Indicators*.

27 states met or exceeded the average score for Incident Information and Management in the National Health Security Preparedness Index. (1 point).		23 states were below the average score for Incident Information and Management in the National Health Security Preparedness Index. (0 points).	
Alabama (8.1)	New Jersey (8.8)	Alaska (6.6)	Mississippi (7.8)
Arizona (8.2)	New Mexico (8.5)	Arkansas (8.0)	Missouri (7.2)
Colorado (8.6)	New York (8.5)	California (8.0)	Montana (7.0)
Delaware (8.7)	North Carolina (8.6)	Connecticut (7.9)	Nevada (7.8)
D.C. (N/A)	North Dakota (8.5)	Georgia (7.7)	Ohio (7.4)
Florida (8.4)	Pennsylvania (8.8)	Hawaii (7.7)	Oklahoma (7.6)
Illinois (8.5)	Rhode Island (8.5)	Idaho (6.9)	Oregon (7.9)
Indiana (8.2)	South Carolina (8.9)	Kansas (7.1)	South Dakota (7.5)
Iowa (8.4)	Tennessee (9.0)	Kentucky (7.9)	West Virginia (7.7)
Maryland (9.5)	Texas (8.1)	Louisiana (7.0)	Wisconsin (7.7)
Massachusetts (8.4)	Utah (9.4)	Maine (7.8)	Wyoming (7.8)
Minnesota (8.2)	Vermont (8.9)	Michigan (7.6)	
Nebraska (8.3)	Virginia (9.4)		
New Hampshire (8.9)	Washington (8.2)		

Source: National Health Security Preparedness Index. Washington, D.C. was not included in the NHSPI (since information was not available, D.C. was awarded a point for the indicator).

## INDICATOR 2: INCIDENT INFORMATION AND MANAGEMENT

**Key Finding:** 27 states met or exceeded the average score for Incident Information and Management in the National Health Security Preparedness Index™ (NHSPI™).

The National Health Security Preparedness Index™ was developed as a new way to measure and advance the nation’s readiness to protect people during a disaster — including major infectious disease outbreaks caused by nature or acts of bioterrorism. The NHSPI measures the health security preparedness of the nation by looking collectively at existing state-level data from a wide variety of sources. Uses of the Index include guiding quality improvement, informing policy and resource decisions, and encouraging shared responsibility for preparedness across a community.

The NHSPI was developed by the Association of State and Territorial Health Officials (ASTHO) in partnership with CDC and more than 20 development partners — including TFAH and RWJF — and was first released in 2013. The 2014 version

includes 194 measures from more than 35 sources — and reviews six domains for preparedness, including Health Security Surveillance, Community Planning and Engagement, Incident and Information Management, Healthcare Delivery, Countermeasure Management and Environmental and Occupational Health.

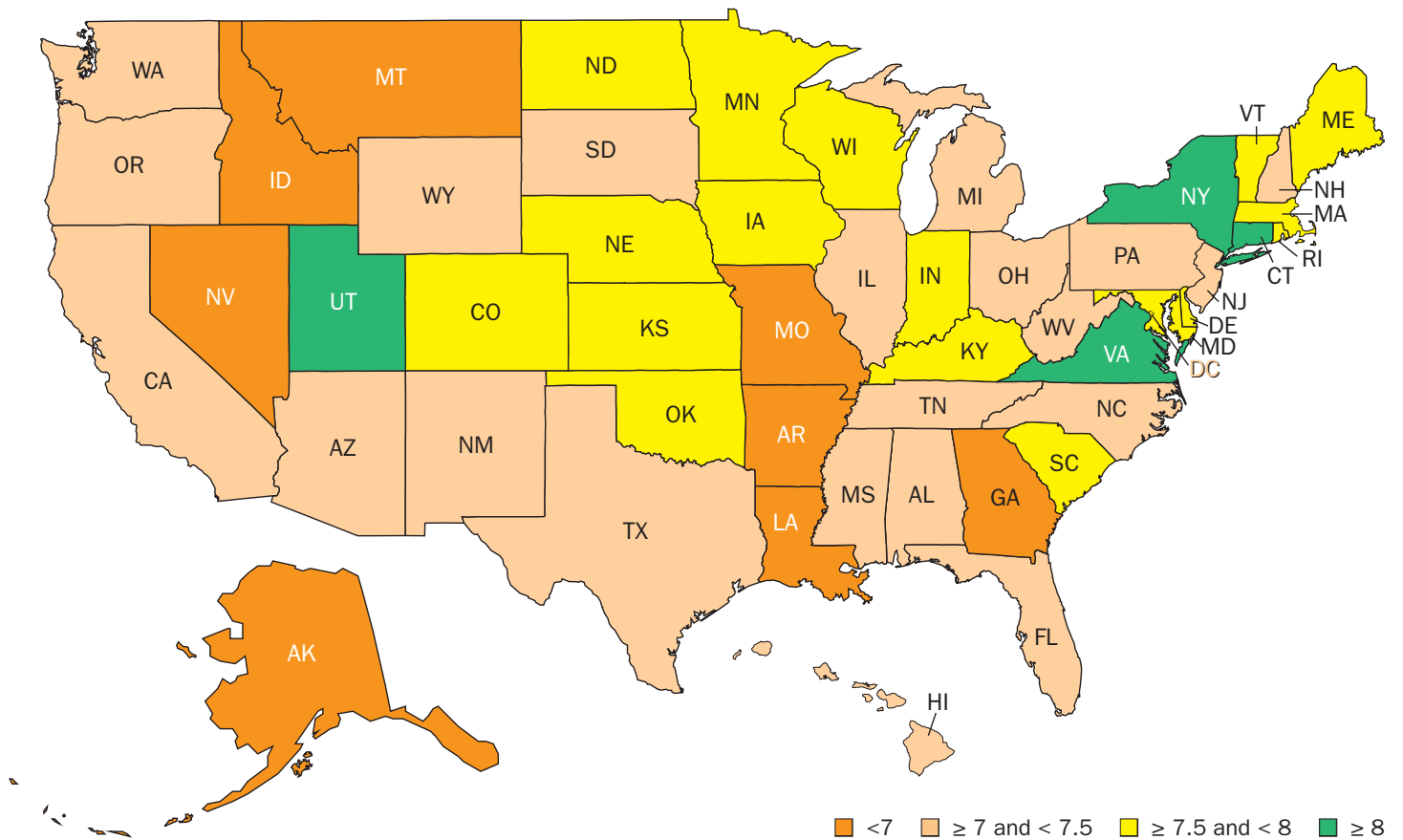
The total national average for the indicators was a 7.4 out of a possible 10. The state scores ranged from 6.5 in Alaska to 8.2 in Utah and Virginia.

This indicator examines whether a state met the national average for the Incident and Information Management domain — which focuses on the ability to respond to a public health emergency by dispersing resources and information. The Incident and Information Management domain is comprised of three sub domains:

Incident Management and Multi-Agency Coordination, Emergency Public Information and Warning and Legal and Administrative. The domain scores a state’s ability to mobilize resources; establish command, control and coordination within the affected area; provide legal, administrative and logistical support; and exchange public health and medical information, intelligence and plans to more than one jurisdiction.<sup>51</sup>

This includes many basic and central capabilities that are important during outbreaks, such as Ebola or a flu pandemic. Twenty-seven states met or exceeded the national average score of 8.1 for Incident and Information Management. (Washington, D.C. was not included in NHSPI). Scores ranged from a low of 6.6 in Alaska to a high of 9.5 in Maryland.

## National Health Security Preparedness Index™ State-by-State Scores



35 states and Washington, D.C. met the Healthy People 2020 target of 90% of children ages 19-35 months receiving ≥3 doses of HBV vaccine (1 point).		15 states did not meet the Healthy People 2020 target of 90% of children ages 19-35 months receiving ≥3 doses of HBV vaccine (0 points).
Alabama* (89.8%)	Nebraska (94.5%)	Arizona (88.4%)
Alaska (92.7%)	New Hampshire (94.6%)	Arkansas (88.6%)
California (91.1%)	New Jersey (93.2%)	Colorado (84.1%)
Connecticut (96.0%)	New York (92.9%)	Florida (89.0%)
Delaware (93.7%)	North Carolina (94.3%)	Hawaii (88.3%)
D.C. (92.5%)	North Dakota (91.8%)	Maine (84.5%)
Georgia (91.5%)	Oklahoma (90.9%)	Michigan (87.9%)
Idaho (90.7%)	Pennsylvania (92.3%)	Missouri (88.4%)
Illinois* (89.5%)	Rhode Island (96.7%)	Nevada (88.8%)
Indiana (92.0%)	South Carolina (95.0%)	New Mexico (86.0%)
Iowa (96.5%)	South Dakota (92.1%)	Ohio (87.4%)
Kansas (93.8%)	Tennessee (92.2%)	Oregon (88.7%)
Kentucky (90.8%)	Texas* (89.5%)	Washington (89.0%)
Louisiana (93.0%)	Utah* (89.7%)	West Virginia* (85.5%)
Maryland (91.0%)	Vermont (92.0%)	Wyoming (88.9%)
Massachusetts (92.9%)	Virginia (90.8%)	Guam (84.6%) <sup>^</sup>
Minnesota (90.3%)	Wisconsin (94.4%)	
Mississippi (92.8%)		
Montana* (89.9%)		

Source: CDC. \*States with rates at 89.5 percent and above were rounded up to meet the 90 percent threshold. ^ Report includes data when available for Guam.

### INDICATOR 3: CHILDHOOD VACCINATIONS

**Key finding:** 35 states and Washington, D.C. met the Healthy People 2020 target of 90 percent of children ages 19-35 months receiving the recommended ≥3 doses of HBV vaccine.

Vaccines are among the most scientifically effective and cost-effective clinical services to prevent diseases among children and they provide a very high return on investment. Each birth cohort vaccinated with the routine immunization schedule saves 33,000 lives, prevents 14 million cases of disease, reduces direct healthcare costs by \$9.9 billion and saves \$33.4 billion in indirect costs for a total of \$42.4 billion in savings due to vaccinations.<sup>52</sup> Worldwide, vaccinations prevent an estimated 2.5 million childhood deaths annually.<sup>53</sup>

This indicator examines which states met the Healthy People 2020 goal that 90 percent or more children ages 19 to 35 months receive at least three doses of HBV vaccine. The national target was met in 2013 with 90.8 percent coverage — a 1.1 percent increase from 2012 — and 30 states had coverage of 90 percent or greater. Vaccination coverage ranged

from a low of 84.1 percent in Colorado to a high of 96.7 percent in Rhode Island.<sup>54</sup>

CDC estimates there are between 700,000 and 1.4 million individuals chronically infected with HBV in the United States, and 65 percent of these individuals do not know they are infected. In 2012, a total of 44 states submitted 40,599 reports of chronic HBV to CDC, but this is thought to be an underestimate.<sup>55</sup> One in 12 Asian Americans have HBV — and Asian Americans and Pacific Islanders account for 50 percent of chronic HBV cases.<sup>56</sup>

HBV is typically spread from a mother to a baby during childbirth, from direct contact with infected blood. Currently, an estimated 800 to 1,000 newborns are infected with HBV in the United States each year, and they are at the highest risk for developing chronic HBV and of having greatly increased risk of developing serious liver disease

as they get older — around 90 percent of newborns who are infected with HBV during childbirth will develop a chronic infection unless they receive proper preventive care measures. Following recommended screening, treatment and prevention practices could eliminate maternal-child transmissions. For healthy young adults, about 5 percent of HBV infections develop into chronic HBV. It can lead to cirrhosis (scarring of the liver), liver cancer and other liver problems. Some patients will need liver transplants.

Since 1982, an HBV vaccine has been available. More than 90 percent of American children have been vaccinated for HBV and the HBV vaccine has helped cut infection rates by around 80 percent. However, approximately 10 percent of infants are still not vaccinated and many adults were not immunized because they came of age before the vaccine was available in 1982. Those Americans

who came of age before the vaccine was widely available, along with Americans born to mothers who have the disease or are immigrants from other countries where the vaccine is not widely used, are at risk for HBV. Seven medications have been approved for treating HBV

and though they often do not result in a full cure, they can significantly reduce liver damage particularly if treatment is started early. Successful therapy of patients with advanced disease can prevent liver cancer, reduce the need for liver transplants and save lives.<sup>57, 58</sup>

**Infant and Preschooler Immunization Gaps:** Requirements for vaccinations before attending school mean around 95 percent of school-aged children receive a vaccination –but there is a much bigger gap in preschooler vaccination rates. The failure

to vaccinate all preschoolers with all of the recommended immunizations on time leaves more than 2 million young children unnecessarily vulnerable to preventable illnesses.<sup>59</sup>

INFANT VACCINATION GAPS		PRESCHOOLER VACCINATION GAPS	
Recommended Vaccination (by 13 months unless otherwise noted)	% NOT Receiving	Recommended Vaccination (19-to-35 month olds)	% NOT Receiving
Hepatitis B- first doses within 3 days of birth.*	25.8%	Childhood full series 4:3:1:3:3:1:4	27.4%
Measles, mumps, rubella	45.0%	Rotavirus	27.4%
Varicella (chickenpox)	43.2%	Pneumococcal	18.0%
Pneumococcal	12.6%	Diphtheria, tetanus and whooping cough	16.9%
Hib (meningitis, pneumonia, epiglottitis)	10.7%	Hepatitis B – all three doses*	9.2%
Diphtheria, tetanus and whooping cough	10.6%	Varicella (chickenpox)	8.8%
Hepatitis B – three doses	15.4%	Measles, mumps, rubella	8.1%
Polio	6.3%	Polio	7.3%

\*Note: the first vaccination dose of Hepatitis B is recommended to be administered within 3 days of birth; many children receive their first dose after the recommended schedule. By preschool age, there is a recommendation children should receive 3 scheduled doses of the vaccine.

## VACCINE SAFETY

Vaccines go through rigorous review and testing for effectiveness and safety by the Food and Drug Administration (FDA) before they are released to the market. The safety of vaccines is also tracked post-FDA licensure through several monitoring systems to keep track of potential patterns of adverse side effects.

The Vaccine Adverse Event Reporting System (VAERS) is a joint CDC and FDA program that collects reports from manufacturers, healthcare providers, and members of the public about possible adverse events that people experience following vaccinations.<sup>60</sup> In addition, the Vaccine Safety Datalink (VSD) project is

a collaboration between CDC’s Immunization Safety Office (ISO) and nine large managed care organizations to monitor safety and answer scientific questions about health concerns that might be related to vaccines.<sup>61, 62</sup>

There have been numerous independent studies confirming the safety of recommended childhood vaccines. In 2004, the Institute of Medicine (IOM) released its eighth report from the Immunization Safety Review Committee, which concluded vaccines, specifically the MMR vaccine and thimerosal-containing vaccines, do not have any causal link to autism.<sup>63</sup> An updated review published

by the IOM in 2012 re-confirmed their earlier conclusion.<sup>64</sup> Reviews in 2013 in the Journal of Pediatrics and 2014 in Pediatrics, also found no link between childhood vaccines and autism and that serious adverse events are very rare.<sup>65</sup> <sup>66</sup> Researchers from CDC concluded that even when giving multiple vaccinations on the same day, there is no association with any risk of developing autism.<sup>67</sup>

Public health officials and scientific researchers continue to stress the importance of parents vaccinating their children. By choosing to delay or skip vaccinations parents put both their children and others at greater risk of illness and death.<sup>68</sup>



## MEASLES AND WHOOPING COUGH (PERTUSSIS) OUTBREAKS

In recent years, there have been a number of outbreaks of vaccine-preventable diseases among children, including measles and whooping cough.

### Measles

Measles is a highly contagious, viral illness that can lead to health complications, including pneumonia, encephalitis, and eventually death. Prior to routine vaccination, measles infected approximately three to four million Americans each year and killed 400 to 500 individuals. In addition, 48,000 individuals were hospitalized and another 1,000 developed chronic disability from measles encephalitis. Widespread use of measles vaccine has led to a greater than 99 percent reduction in measles cases in the United States compared with the pre-vaccine era.<sup>69</sup>

In 2000, measles was declared virtually eliminated in the United States, with around 60 reported cases each year. Yet, in just the first half of 2014, the

U.S. saw the highest number of cases since 1994. From January through October 2014, more than 600 measles cases were reported in the United States in 22 states—a total of 20 outbreaks according to the CDC.<sup>70</sup> Unvaccinated individuals are far more likely to contract measles than those who have been vaccinated. Because measles is still endemic in many parts of the world, individuals traveling from outside the country continually import the disease, and outbreaks can occur in communities with low vaccination coverage.<sup>71</sup>

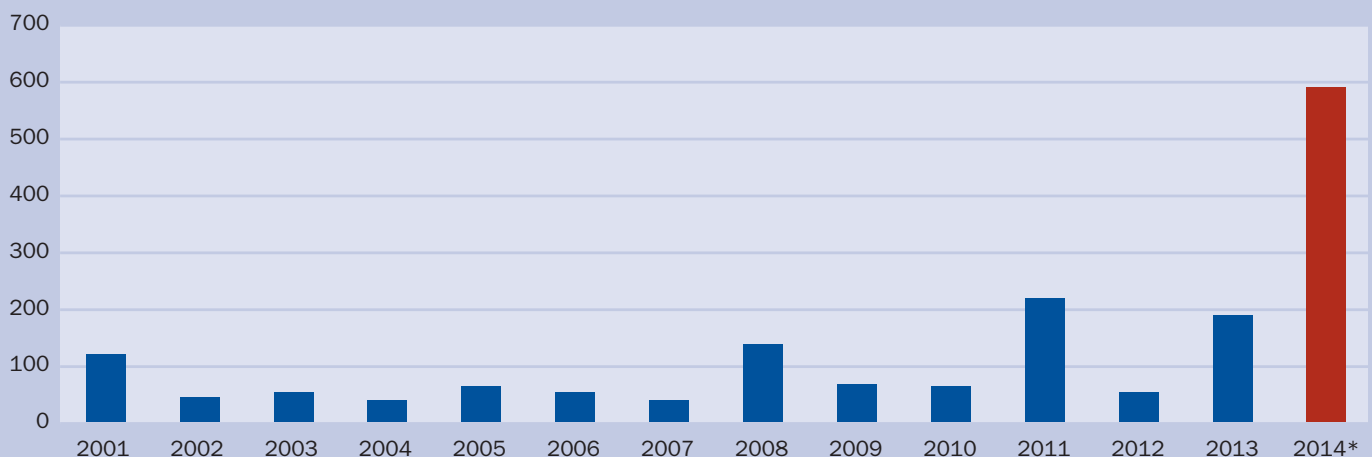
Many cases in the United States in 2014 are associated with travel from the Philippines, which has experienced a serious measles outbreak in 2014.<sup>72</sup>

- Multiple counties in Ohio experienced a measles outbreak in 2014, originating from unvaccinated travelers to the Philippines. A total of 377 cases were reported.<sup>73</sup>

- From January 1 to April 18, California reported 58 cases of measles, nearly all of which were imported from other countries.<sup>74</sup>
- In May 2014, a small outbreak in Washington State was traced to an unvaccinated four year old returning from the Federated States of Micronesia. Fourteen individuals became infected, the majority of which were in the Micronesian community, where many children and adults have no documentation of measles vaccination.<sup>75</sup>

Many clinicians in the United States have never seen a measles case due to our high vaccination rates and rapid response to outbreaks. CDC recommends that providers take specimens from suspected patients and immediately isolate individuals before reporting to their local health department.<sup>76</sup>

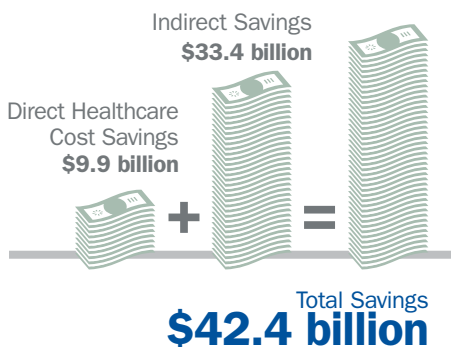
### U.S. MEASLES CASES BY YEAR



\*Provisional data reported to CDC's National Center for Immunization and Respiratory Diseases

The failure to vaccinate all preschoolers with all of the recommended immunizations on time leaves 2.1 million young children unnecessarily vulnerable to preventable illnesses.<sup>58</sup>

#### Childhood Vaccinations are Responsible for Significant Healthcare Cost Savings



## MEASLES AND WHOOPING COUGH OUTBREAKS, CONT.

### Whooping Cough

Pertussis, commonly known as whooping cough, is a highly contagious bacterial respiratory infection that can be fatal in infants. Early symptoms mirror those of a cold, but infection progresses into a severe cough that can affect breathing. The best way to prevent pertussis is through vaccination. Because infants need multiple doses beginning at 2 months through early childhood to achieve adequate protection, the CDC recommends that pregnant women and all individuals who will have contact with a newborn be vaccinated. Most whooping cough deaths are among babies younger than 3 months so creating this “cocoon” of vaccinated caregivers is considered a key prevention strategy.<sup>77</sup>

Pertussis does not only sicken infants. In the past several years, infections have increased in children ages 7 to 10 and in adolescents ages 13 to 14.<sup>78</sup> Observational studies suggest these outbreaks in children and adolescents may be a result of early waning of immunity due to reformulated vaccine in 1997.<sup>79</sup> However, some experts believe that reduced vaccination rates may also be a contributing factor. A 2013 study by the FDA found that acellular pertussis vaccines licensed by the FDA are effective in preventing the clinical manifestations of the disease, but they may not actually prevent infection. People with such asymptomatic infections may still be able to spread infections to other people, especially those who have not been vaccinated.<sup>80</sup>

The number of cases reported in 2013 was nearly half of those reported in

2012 — from 48,277 cases and 20 deaths to 24,231 cases and nine deaths.<sup>81</sup> The states with the highest incidence of pertussis in 2013 were Montana, Alaska, Utah and New Mexico.<sup>82</sup> An outbreak occurred in the summer of 2013 in Columbia, Florida in a large, religious community averse to healthcare and vaccinations. Only 15 percent of students were immunized against pertussis and a total of 109 individuals contracted the disease.<sup>83</sup>

In 2014, from January 1 to August 16, 17,325 cases of pertussis were reported to CDC — a 30 percent increase compared with the same time period in 2013.<sup>84</sup>

- As of September 2014, California has reported 8,278 cases of pertussis — the greatest numbers in Los Angeles and San Diego.<sup>85</sup>
- Since the 2014 to 2015 school year began, 38 cases of whooping cough have been reported in Montgomery County, Maryland.<sup>86</sup>
- In Idaho, there were 241 reported cases in the first seven months of 2014 compared with 122 cases in the same period in 2013.<sup>87</sup>
- As of October 2014, Colorado has reported 116 cases.<sup>88</sup>
- In Washington State, there have been a total of 358 cases reported statewide as of October 4, 2014.

In communities facing an outbreak, reports have shown the response is far more costly than preventive action would have been, costing a local health department over \$2,000 per case, compared to a few dollars spent per dose of vaccine.<sup>89, 90</sup>

## INDICATOR 4: FLU VACCINATION RATES

**Key Finding:** 14 states vaccinated at least half of their population (ages 6 months and older) for the seasonal flu from fall 2013 to spring 2014.

14 states vaccinated at least half of their population (ages 6 months and older) for the seasonal flu from fall 2013 to spring 2014 (1 point).	34 states and Washington, D.C. did not vaccinate half of their population (ages 6 months and older) for the seasonal flu from fall 2013 to spring 2014 (0 points).	
Colorado (51.8%)	Alabama (48.3%)	Montana (41.9%)
Connecticut (51.8%)	Alaska (41.7%)	Nevada (36.4%)
Delaware (50.0%)	Arizona (38.5%)	New Hampshire (48.0%)
Hawaii (54.4%)	Arkansas (49.7%)	New Jersey (46.1%)
Massachusetts (53.3%)	California* (N/A)	New Mexico (46.6%)
Minnesota (51.7%)	D.C. (47.3%)	New York (48.4%)
Nebraska (51.0%)	Florida (37.5%)	North Dakota (48.9%)
North Carolina (51.0%)	Georgia (39.3%)	Ohio (44.7%)
Rhode Island (56.9%)	Idaho (37.9%)	Oklahoma (46.7%)
South Dakota (57.4%)	Illinois (43.4%)	Oregon (42.2%)
Tennessee (52.7%)	Indiana (41.5%)	Pennsylvania (46.3%)
Vermont (50.0%)	Iowa (48.6%)	South Carolina (44.3%)
Virginia (50.4%)	Kansas (47.0%)	Texas (45.2%)
West Virginia (52.6%)	Kentucky (46.9%)	Utah (41.5%)
	Louisiana (44.6%)	Washington (48.4%)
	Maine (47.8%)	Wisconsin (42.3%)
	Maryland (48.9%)	Wyoming (37.6%)
	Michigan (42.9%)	
	Mississippi* (N/A)	
	Missouri (48.3%)	

\*California and Mississippi excluded due to incomplete data. As of the latest data available on FluVax, in November 2013, California's vaccination rate was 42.6 percent, and in February 2014, Mississippi's vaccination rate was 37.8 percent.

Vaccination is the best prevention against the seasonal flu. CDC recommends all Americans ages 6 months and older get vaccinated, yet fewer than half of Americans ages 6 months and older were vaccinated against the flu in the last three flu seasons (2011 to 2012, 2012 to 2013 and 2013 to 2014).<sup>91</sup>

In addition to protecting Americans from the seasonal flu, establishing a cultural norm of annual flu vaccinations can help ensure the country has a strong mechanism in place to be better able to vaccinate all Americans quickly during a new pandemic or unexpected disease outbreak.

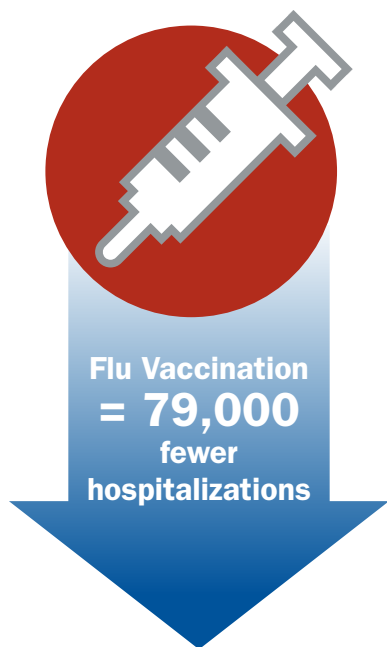
This indicator examines if at least half (50 percent) of a state's population (ages 6 months and older) was vaccinated against the seasonal flu in 2013 to 2014. HHS has set a goal for states to vaccinate

70 percent of their population as part of the Healthy People 2020 initiative.<sup>92</sup>

The highest vaccination rate was in South Dakota at 57.4 percent and the lowest was in Nevada at 36.4 percent. Fourteen states vaccinated 50 percent of their population or higher and 43 states and D.C. vaccinated 40 percent or higher. Nationally, 46.2 percent of Americans ages 6 months and older were vaccinated.<sup>93</sup>

Rates are significantly higher for children (58.9 percent) compared to adults (42.2 percent). The numbers are the lowest among adults ages 18 to 64 at just 36.7 percent.<sup>94</sup>

Traditionally, there has been a much stronger focus on encouraging seniors and children to get vaccinated, since they often have more severe reactions to the flu and have more interaction with the healthcare system.



Experts note that vaccination rates need to generally be above 70 percent for “herd immunity” effects — which limit the spread and protect those without immunity — to become apparent. If all seniors received a newly available high-dose version of the flu shot, flu cases among this vulnerable population could drop 25 percent.<sup>95</sup>

Each year, an average of 62 million — or 20 percent of — Americans get the flu. Between 3,000 and 49,000 Americans die each year from the flu and 226,000 are hospitalized.<sup>96,97</sup>

Between 2004 and 2012, 830 children between 6 months and 18 years old died from flu complications; 43 percent of these children were completely healthy otherwise.<sup>98</sup> In the 2013 to 2014 flu season, there were 108 influenza-associated pediatric deaths.<sup>99</sup>

In addition to its health effects, flu has a serious impact in terms of healthcare and worker absenteeism costs. Seasonal flu can often result in a half day to five days of work missed, which affects both the individual and his or her employer. Annually, the flu leads to approximately \$10.4 billion in direct costs for hospitalizations and outpatient visits, and \$76.7 million in indirect costs.<sup>100</sup>

Nearly one-quarter (24.8 percent) of healthcare workers were not vaccinated against the flu during the 2013 to 2014 season.<sup>101</sup> Rates were higher among healthcare professionals whose employers required (88.8 percent) or recommended (70.1 percent) that they be vaccinated compared to only 44.3 percent among those whose

employers did not have a flu vaccination policy. Rates were low for healthcare professionals who were assistants and aides (57.7 percent) or non-clinical personnel (68.8 percent).

CDC estimates that during the 2012 to 2013 flu season, vaccination resulted in 79,000 fewer hospitalizations than otherwise would have occurred. Overall, 17.3 percent of adverse health outcomes associated with influenza were prevented.<sup>102</sup> By preventing hospitalizations, influenza immunizations can save \$80 per year, per person vaccinated.<sup>103</sup>

The historically low demand for seasonal vaccinations has translated into making flu vaccine development a low priority — without a steady demand, incentives to manufacture and research new influenza vaccines are reduced.

Under the Affordable Care Act (ACA), all vaccines routinely recommended by the Advisory Committee on Immunization Practices (ACIP), including flu shots, are covered when provided by in-network providers in group and individual health plans and for the Medicaid expansion population with no co-payments or cost sharing, but states are still able to determine coverage and cost-sharing for their traditional Medicaid population. As of 2010, 38 states required Medicaid coverage of flu shots with no-copay for beneficiaries under the age of 65, while 12 states and Washington, D.C. required a co-pay.<sup>104</sup> Medicare Part B covers annual flu vaccinations for beneficiaries with no co-pay.

15 states currently have climate change adaptation plans that are completed (1 point).	35 states and Washington D.C. do not currently have complete climate change adaptation plans (0 points).	
Alaska	Alabama	Missouri
California	Arizona**	Montana
Connecticut	Arkansas	Nebraska
Florida	Colorado**	Nevada
Maine	Delaware*	New Jersey*
Maryland	D.C.**	New Mexico
Massachusetts	Georgia	North Carolina**
New Hampshire	Hawaii*	North Dakota
New York	Iowa**	Ohio
Oregon	Idaho	Oklahoma
Pennsylvania	Illinois	Rhode Island*
Vermont	Indiana	South Carolina**
Virginia	Kansas	South Dakota
Washington	Kentucky	Tennessee
Wisconsin	Louisiana	Texas
	Michigan**	Utah**
	Minnesota*	West Virginia
	Mississippi	Wyoming

Source: Center for Climate and Energy Solutions \*Plans in progress \*\*Adaptation Plan Recommended in the Climate Action Plan

## INDICATOR 5: CLIMATE CHANGE AND INFECTIOUS DISEASE

**Key Finding:** 15 states currently have completed climate change adaptation plans that include the impact on human health.

This indicator examines which states have comprehensive climate adaptation plans, which includes a plan by a governmental body that has at least two sections. These can include planning for changing risk of emerging and reemerging infectious diseases due to changing temperatures and weather patterns, and issues such as vector control, air quality and food and water safety.

According to reviews by the Center for Climate and Energy Solutions (C2ES), 15 states currently have comprehensive climate adaptation plans, and four additional states have plans in progress.<sup>105</sup> While the existence of a plan does show consideration of concerns by a state, it does not necessarily mean a state is currently following or has invested in supporting the plan.

Depending on the region’s specific needs, adaptation plans can focus on a variety of issues, including sea-level rise and associated flooding, drought mitigation and water insecurity, hurricanes and other severe weather

and extreme heat events.<sup>106</sup> Climate change will require enhanced monitoring of potential disease vectors and outbreaks. Factors like potential changes in water quantity and quality, air quality, extreme temperatures and insect control are all important public health concerns. According to a review by the Georgetown Climate Center, states’ plans vary significantly in terms of scope and goals.<sup>107</sup> Its review also found that California and New York have demonstrated the most progress in carrying out aspects of their plans, achieving 14 percent of stated goals.

According to the Environmental Protection Agency (EPA), as the environment changes, Americans will be at higher risk for a range of health threats. A 2003 IOM report, *Microbial Threats to Health: Emergence, Detection, and Response*, listed climate and weather, changing ecosystems, and land use as factors contributing to the emergence of new diseases or the reemergence or spread of diseases that were nearly

eradicated or thought to be under control.<sup>108, 109</sup> The President issued an Executive Order in 2013 to prepare for the effects of climate change, including how increases in excessively high temperatures, heavy downpours, wildfires, severe droughts, permafrost thawing, ocean acidification and sea-level rise affect communities and public health.<sup>110</sup> In addition, the EPA released draft Climate Change Adaptation Implementation Plans for public review and comment in early 2013. The Implementation Plans aim to protect public health and the environment by integrating climate adaptation planning into EPA programs, policies, rules and operations.<sup>111</sup> Most recently, the Federal Emergency Management Agency (FEMA) incorporated climate preparedness into its September 2014 draft *State Mitigation Plan Review Guide*. In order for states to continue receiving federal disaster preparedness funding, FEMA may require them to “[assess] future risk in light of a changing climate and changes in land use and

development. This will ensure that the mitigation strategy addresses risks and takes into consideration possible future conditions in order to identify, prioritize, and implement actions to increase statewide resilience.<sup>112, 113</sup>

Certain zoonotic and vector-borne diseases, as well as food and waterborne diseases, may increase and spread as changes in temperature and weather patterns allow pathogens to expand into different geographic regions. For instance:

- The presence and number of rodents, mosquitoes, ticks and other insects and animals that can carry infectious diseases rise in warmer temperatures, so as temperatures rise and stay warmer for longer periods of times, the patterns of diseases ranging from West Nile virus to Lyme and other tick-borne diseases to encephalitis are expected to shift.<sup>114</sup>
- Large-scale climate change may have an effect on the timing of migration of wild birds. Wild birds are a concern for public health because they can be infected by a number of microbes that can be transmitted to humans. In addition, birds migrating across national and intercontinental borders can become long-range carriers of any bacteria, virus or parasite they harbor. Birds are the source of the rapid spread of West Nile virus after it was first identified in 1999, and by 2012 the virus had been reported in humans, mosquitoes, and birds in 48 states. In addition to West Nile virus, migratory birds were reported to be one possible source of the 2006 global outbreak of the H5N1 avian influenza virus.<sup>115</sup>
- Annual influenza epidemics occur primarily during cold weather, while meningococcal meningitis is associated with dry climates. Changing weather patterns puts people in different regions at increased risk for both diseases.
- The rise in extreme weather events and natural disasters also leads to a more fertile environment for the spread of infectious diseases and germs. For instance, cryptosporidiosis outbreaks — which cause diarrheal disease — are associated with heavy rainfall, which can overwhelm sewage treatment plants or cause lakes, rivers and streams to become contaminated by runoff containing waste from infected animals. Experts also believe that an El Niño occurrence may have contributed to increases of cholera.<sup>116</sup> Communities recovering from a disaster may see food or waterborne illnesses associated with power outages or flooding, as well as infectious disease transmission in emergency shelters.

To help prepare for the health impact of extreme weather incidents and climate change, CDC's Climate-Ready States and Cities Initiative awarded \$4.5 million in grants to 16 states and two cities to build resilience to the health impacts of climate change in FY2014.<sup>117</sup> CDC will assist awardees in developing and using models to more accurately anticipate health impacts, monitor health effects, and identify the most vulnerable areas in their region. Awardees include departments of health in Arizona, California, Florida, Illinois, Maine, Maryland, Massachusetts, Michigan, Minnesota, New Hampshire, New York City, New York State, North Carolina, Oregon, Rhode Island, San Francisco, Vermont and Wisconsin.<sup>118</sup>

In 2012, 16 states performed better than the national SIR for central line-associated bloodstream infections (1 point).	34 states and D.C. performed similar to or worse than the national SIR for central line-associated bloodstream infections in 2012 (0 points).	
	Similar to national SIR	Worse than national SIR
California		
Colorado		
Hawaii		
Idaho		
Michigan		
Missouri		
North Carolina		
North Dakota		
Ohio		
Oklahoma		
Oregon		
Pennsylvania		
South Dakota		
Vermont		
West Virginia		
Wisconsin		
	Arkansas	Alabama
	Delaware	Alaska
	Florida	Arizona
	Illinois	Connecticut
	Iowa	D.C.
	Kansas	Georgia
	Maryland	Indiana
	Massachusetts	Kentucky
	Minnesota	Louisiana
	Montana	Maine
	Nevada	Mississippi
	New Hampshire	Nebraska
	New Mexico	New Jersey
	Rhode Island	New York
	Tennessee	South Carolina
	Texas	
	Utah	
	Virginia	
	Washington	
	Wyoming	

Note: In 2012, all but three states (Alaska, Maine and Mississippi) performed better than the 2008 national baseline SIR for central line-associated bloodstream infections

## INDICATORS 6 AND 7: REDUCTIONS IN CENTRAL LINE-ASSOCIATED BLOODSTREAM INFECTIONS

**Indicator 6 Key Finding:**  
16 states performed better than the 2012 national standard infection ratio (SIR) for central line-associated bloodstream infections. Note: Only three states performed worse than the 2008 national SIR baseline.

Between 2011 and 2012, 10 states reduced the number of central line associated blood stream infections (1 point).	40 states and Washington, D.C. had either the same or more central line associated blood stream infections between 2011 and 2012 (0 points).	
California	Alabama	Missouri
Colorado	Arkansas	Montana
Georgia	Alaska	Nebraska
Maryland	Arizona	New Hampshire
Nevada	Connecticut	New Jersey
New York	Delaware	New Mexico
South Carolina	D.C.	North Carolina
Tennessee	Florida	North Dakota
Virginia	Hawaii	Ohio
Wisconsin	Idaho	Oklahoma
Puerto Rico <sup>^</sup>	Illinois	Oregon
	Indiana	Pennsylvania
	Iowa	Rhode Island
	Kansas	South Dakota
	Kentucky	Texas
	Louisiana	Utah
	Maine	Vermont
	Massachusetts	Washington
	Michigan	West Virginia
	Minnesota	Wyoming
	Mississippi	

Source: CDC. <sup>^</sup> Report includes data for Puerto Rico when available

**Indicator 7 Key Finding:** Between 2011 and 2012, the standardized infection ratio for central line-associated bloodstream infections decreased significantly in 10 states.

Approximately 1 out of every 25 hospitalized patients will contract a healthcare-associated infection, which is an infection patients can get while receiving medical treatment in a healthcare facility.<sup>119</sup> Healthcare-associated infections not only happen in hospitals but can also occur in outpatient surgery centers, nursing homes and other long-term care facilities, rehabilitation centers, community clinics or physicians' offices.

These indicators examine the status of one form of HAI — central line associated blood stream infections (CLABSI) according to the CDC's National and State Healthcare-Associated Infections Progress Report.<sup>120</sup> They examine: 1) whether states were above or below the national standard infection ratio for the number of CLABSI — 16 were above the national ratio, and 2) whether states saw a reduction in their number of CLASBIs from 2011 to 2012 — 10 states saw reductions. A central line is a tube that is typically inserted in a patient's large vein, usually in the neck, chest, arm or groin, to give important medical treatment. When not put in correctly or kept clean, central lines can become a freeway for germs to enter the body and cause deadly infections in the blood.

These infections are usually serious, often resulting in prolonged hospital stays and increased cost and risk of mortality.<sup>121</sup> Nationally, the number of CLABSI infections was 44 percent lower in 2012 than the national baseline in 2008, and the national standardized infection ratio was 0.56.<sup>122</sup>

A person's risk for a HAI, which includes a range of antibiotic-resistant infections, increases if they are having invasive surgery, if they have a catheter in a vein or their bladder, or if they are on a ventilator or are on a prolonged course of antibiotics as part of their care.<sup>123, 124</sup> In 2011, there were an estimated 722,000 HAIs and 75,000 patients with HAIs died during their hospitalizations in the United States.<sup>125</sup> Of the infections, 157,500 were from pneumonia; 157,500 from surgical site infections; 123,100 from gastrointestinal illness; 93,300 from urinary tract infections; 71,900 from primary bloodstream infections; and 118,500 from other types of infections.

Prevention and education efforts have been helping to decrease the rates of HAIs. CDC, the Centers for Medicare and Medicaid Services (CMS), states and medical providers have launched a series of provider education and

prevention initiatives.<sup>128, 129</sup> In addition, in 2008, Medicare provided an incentive to reduce infections by adopting a "no pay" rule for infections acquired during a hospital stay, requiring the hospitals themselves to cover any costs incurred by these infections.<sup>130</sup> According to a 2012 survey, 80 percent of infection-control professionals believe the rules have resulted in a greater focus on reducing HAIs. The ACA also requires in-patient hospitals to report certain infections to National Healthcare Safety Network (NHSN) in order to receive their full payment updates, and the information will be available on CMS' Hospital Compare website.<sup>131</sup> The NHSN is the largest healthcare-associated infection reporting system in the United States, serving more than 14,000 healthcare facilities of all types, or through other established systems.<sup>132</sup>

Many states are seeing decreases in HAIs. Between 2008 and 2012, there were 44 percent fewer central line-associated bloodstream infections and 20 percent fewer surgical site infections related to 10 surgical procedures in in-patient healthcare settings.<sup>133, 134</sup> There were an estimated 30,800 fewer invasive MRSA infections in the United States from 2005 to 2011, with hospital-onset MRSA decreasing by more than 50 percent.<sup>135</sup>

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HAIs cost the country \$28 to \$33 billion in preventable healthcare expenditures each year.<sup>126</sup> According to CDC, if 20 percent of these infections were prevented, healthcare facilities could save nearly \$7 billion, and reducing infections by 70 percent could result in \$23 billion in savings.<sup>127</sup>



## INDICATOR 8: PUBLIC HEALTH LABORATORIES — CAPABILITIES DURING EMERGENCIES OR DRILLS

**Key Finding:** 47 state public health laboratories and Washington, D.C. reported conducting an exercise or utilizing a real event to evaluate the time for sentinel clinical laboratories to acknowledge receipt of an urgent message for the state’s laboratory (from July 1, 2013 to June 30, 2014).

47 state public health laboratories and Washington, D.C. reported conducting an exercise or utilizing a real event to evaluate the time for sentinel clinical laboratories to acknowledge receipt of an urgent message for the state’s laboratory from July 1, 2013 to July 30, 2014 (1 point).

3 state public health laboratories reported they did not conduct an exercise or utilize a real event to evaluate the time for sentinel clinical laboratories to acknowledge receipt of an urgent message for the state’s laboratory from July 1, 2013 to July 30, 2014 (0 points).

Alabama	Montana	Louisiana
Alaska	Nebraska	New Jersey
Arizona	Nevada	Washington
Arkansas	New Hampshire	
California	New Mexico	
Colorado	New York	
Connecticut	North Carolina	
Delaware	North Dakota	
D.C.	Ohio	
Florida	Oklahoma	
Georgia	Oregon	
Hawaii	Pennsylvania	
Idaho	Rhode Island	
Illinois	South Carolina	
Indiana	South Dakota	
Iowa	Tennessee	
Kansas	Texas	
Kentucky	Utah	
Maine	Vermont	
Maryland	Virginia	
Massachusetts	West Virginia	
Michigan	Wisconsin	
Minnesota	Wyoming	
Mississippi	Puerto Rico <sup>^</sup>	
Missouri		

Source: Association of Public Health Laboratories (APHL) 2014 Survey of State Public Health Laboratories.  
<sup>^</sup> Report includes data for Puerto Rico when available.

This indicator examines whether a state’s public health laboratory reported that they evaluated how quickly urgent messages were received as part of the larger laboratory network during a real event or exercise, from July 1, 2013 to July 30, 2014. Forty-seven states and Washington, D.C. reported meeting this objective.

Communications during exercises and responding to real events is important to gauge how well emergency plans will work during actual events, and to evaluate strengths and areas of vulnerabilities to improve on.

One key aspect of responding to an emergency is ensuring that public health departments and laboratories, and other aspects of government, will be able to continue to function during a time of stress, such as a mass disease outbreak or bioterrorism event. Laboratories and most agencies have continuity plans, but

without knowing how they will hold up during an actual incident or simulated drill, it is hard to evaluate where there may be gaps in the plan.

FEMA stresses that individual agencies should be able to continue to perform during a wide range of emergencies and disruptive events, including localized acts of nature, accidents and technological or attack-related emergencies.<sup>136</sup> Aspects of a continuity of operations (COOP) plan include: essential functions; orders of succession; delegations of authority; continuity facilities; continuity communications; vital records management; human capital; tests, training and exercises; devolution of control and direction; and reconstitution.

- In addition, according to the APHL survey, all 50 states and Washington, D.C. reported having the capacity to assure the timely transportation — for delivery and

receipt — of laboratory samples 24 hours a day, 7 days a week, 365 days a year to an appropriate Public Health Laboratory Response Network during the time period from July 1, 2013 to July 30, 2014. This can include a state-operated courier, use of a private delivery company such as FedEx, or a contract courier service. Each state should have the capacity to test samples of potential infectious disease threats during major new outbreaks — or have arrangements to get the samples to labs where they can quickly be tested. For infectious diseases or food- or water-borne outbreaks, timeliness is often of the essence to confirm needed treatments and to contain a problem. This can include getting the samples to and from a particular lab or being able to transport a specimen to a lab with the technology required to test for a particular threat as part of the nation’s Laboratory Response Network (LRN).

## LABORATORY RESPONSE NETWORK

Since 2001, public health labs have created networks to be more efficient and effective, so that every state has a baseline of capabilities but does not have to invest the resources required to maintain every type of state-of-the-art equipment or staffing expertise. Samples can be shipped to facilities with the needed expertise as quickly and safely as possible.

The Laboratory Response Network for Biological Threat Preparedness (LRN-B) includes labs with a hierarchy of different capabilities, so labs with increased capabilities provide support for other labs, consisting of:<sup>137</sup>

- National laboratories — including those operated by CDC, U.S. Army Medical Research Institute for Infectious Diseases (USAMRIID), and

the Naval Medical Research Center (NMRC) — are responsible for specialized strain characterizations, bioforensics, select agent activity and handling highly infectious biological agents;

- Reference laboratories, which are responsible for investigation and/or referral of specimens. They are made up of more than 100 state and local public health, military, international, veterinary, agriculture, food- and water-testing laboratories; and
- Sentinel laboratories, which provide routine diagnostic services, rule-out and referral steps in the identification process. While these laboratories may not be equipped to perform the same tests as LRN Reference laboratories, they can test samples.

Labs not only help detect and diagnose problems, the information they provide help public health officials track the emergence and spread of different outbreaks and are an essential part of monitoring disease threats and understanding how to control them.

In 2010, CDC began funding 57 state, local and territorial health departments to encourage increased electronic reporting of lab results to help make reporting faster and more complete.<sup>138</sup> Data collected since then shows various improvements. By the end of July 2013, 54 of the 57 jurisdictions were getting some laboratory reports through Electronic Laboratory Reporting (ELR), and 62 percent of laboratory reports were being received through ELR compared to 54 percent in 2012.<sup>139</sup>

## EPIDEMIOLOGY AND LABORATORY CAPACITY FOR INFECTIOUS DISEASES

CDC's Epidemiology and Laboratory Capacity for Infectious Diseases (ELC) Cooperative Agreements provide state, local and territorial health department grantees with financial and technical resources to strengthen epidemiological, laboratory and health information systems to detect, prevent and control infectious diseases. The ELC cooperative agreements totaled \$93.5 million in FY 2014.<sup>140</sup>

## LABORATORY SAFETY LAPSES

In 2014, safety lapses in the handling of dangerous pathogens were identified at multiple federal laboratories. In March, at a CDC influenza laboratory, a culture of relatively harmless avian influenza was accidentally cross-contaminated with the highly pathogenic H5N1 strain and shipped to a BSL-3 lab operated by the U.S. Department of Agriculture (USDA).<sup>141</sup> In June, staff at another CDC lab used inadequate procedures to inactivate (kill) anthrax samples for use in a BSL-2 lab, resulting in potentially live and infectious samples being used by numerous researchers not wearing appropriate personal protective equipment (PPE). As a result of these incidents, CDC issued an internal moratorium on the movement of biological materials from its BSL-3 or BSL-4 facilities and implemented additional measures to improve laboratory

safety at the agency.<sup>142</sup> Less than a month later, six sealed vials of smallpox virus from the 1950s were found in a cold storage room in an FDA lab on the National Institutes of Health (NIH) campus. Upon further inspection, 12 boxes and 327 vials were discovered with labels indicating a variety of pathogens, including dengue, influenza and Q fever.<sup>143</sup> While no staff were sickened with anthrax and no one became exposed to H5N1 or the pathogens discovered in the FDA storage room, these incidents and their potential for harm is troubling. They highlight a lack of oversight, failures of safety protocol by individuals, and also in the case of the storage room, an alarming unawareness of the over 60-year presence of dangerous pathogens on-site — stored in a manner inconsistent with current safety procedures.

## INDICATOR 9: HIV/AIDS SURVEILLANCE

**Key Finding:** 37 states and Washington D.C. required reporting of all (detectable and undetectable) CD4 (a type of white blood cell) and HIV viral load data to their state HIV surveillance program.

37 states and D.C. require reporting of all (detectable and undetectable) CD4 and HIV viral load data (1 point).		13 states do not require reporting of all (detectable and undetectable) CD4 and HIV viral load data (0 points).
Alabama	Montana	Alaska**
Arizona*	Nebraska	Arkansas
California	New Hampshire	Colorado**
Delaware	New Mexico	Connecticut
D.C.	New York	Idaho
Florida	North Carolina	Kansas
Georgia	North Dakota	Kentucky
Hawaii	Oregon	Nevada
Illinois	Rhode Island	New Jersey
Indiana	South Carolina	Ohio
Iowa	South Dakota	Oklahoma
Louisiana	Tennessee	Pennsylvania
Maine	Texas	Vermont
Maryland	Utah	
Massachusetts	Virginia	
Michigan	Washington	
Minnesota	West Virginia	
Mississippi	Wisconsin	
Missouri	Wyoming	

Source: CDC's Prevention Status Report \*Based on information provided by the state \*\*States provided updated information after publication saying they require full reporting.

More than 1.2 million Americans are living with HIV/AIDS, and about one in six do not know they are infected. Since the epidemic began, more than 648,000 Americans have died with AIDS.<sup>144</sup> Recently, there has been an alarming rise in new HIV infections, particularly among young gay men (ages 13 to 24).<sup>145</sup> There are around 50,000 new HIV diagnoses each year. Between 2008 and 2010, there was a 22 percent increase in new infections among young men who have sex with men (MSM) overall, and a 48 percent increase among young Black men.<sup>146</sup> According to CDC, half of young people with HIV do not know they are infected.

This indicator examines whether a state requires reporting of all CD4 and HIV viral load results (detectable and undetectable) to the state HIV surveillance program — 37 states and Washington, D.C. have this

requirement.<sup>147</sup> CDC and CSTE recommend reporting both detectable and undetectable viral loads. Viral load data can be used to identify cases, classify stage of disease and diagnosis and monitor disease progression. They can also be used to assess HIV testing and prevention efforts, inform treatment and unmet healthcare needs and measure viral load suppression. National analyses to monitor progress against HIV is only effective if all HIV-related CD4 and viral load test results are reported by every state and jurisdiction.

These tests are used to assess stage of disease and response to treatment. An HIV viral load test measures the amount of virus in a person's blood, while a CD4 lymphocyte test measures his or her immune function and can determine the stage of HIV infection. Its results are often used to monitor disease progression and guide timing for clinical care.<sup>148</sup>

More recently, health departments have begun using these data to assess whether people diagnosed with HIV are receiving medical care and to re-engage those who have dropped out of care.

These viral load data are critical to the health of people living with HIV, because they help ensure that individuals are linked to HIV medical care and retained in care.<sup>149</sup> In order to assure the best health outcomes, people living with HIV need to be engaged in care and treatment, with the goal of achieving viral suppression. When the HIV virus is suppressed, individuals are healthier and, quite importantly from a public health standpoint, are also less likely to transmit HIV. Nationally, CDC estimates that only 30 percent of those living with HIV are virally suppressed.<sup>150</sup> Jurisdictions where high rates of viral load suppression are achieved have seen declines in infection rates, in contrast to national trends.

## HIV SCREENING AND MEDICAID COVERAGE

According to a survey conducted by the Kaiser Family Foundation's Commission on Medicaid and the Uninsured, published in February 2014, 34 states and Washington, D.C. reported coverage of routine HIV screening under their Medicaid programs, while 16 states reported coverage of testing only when it is considered "medically necessary."<sup>151</sup> Routine HIV screening is required in states participating in Medicaid expansion.

The U.S. Preventive Services Task Force (USPSTF) and CDC recommend routine HIV screening for all adolescents and adults. HIV screening is considered particularly important so those who may not know they are infected can receive

treatment as soon as possible and can take action to prevent spreading the infection to others. An estimated 49 percent of new HIV infections are from the 20 percent of people living with HIV who are unaware of their infection.<sup>152, 153</sup>

Experts believe that providing screening services for Medicaid beneficiaries is particularly important since these Americans include many of the lowest-income and most vulnerable in terms of quality of health and risk for HIV infection. More than 20 percent of individuals diagnosed with HIV are covered by Medicaid in 30 states, and more than 30 percent of individuals with HIV are covered by Medicaid in 12 states.<sup>154</sup>

## Do you know how to stay healthy?

### IF YOU DON'T HAVE HIV



Stay that way by choosing less risky sexual behaviors like oral sex and reducing your number of partners.



Practice prevention methods like consistently using condoms and consider taking medicine to prevent getting HIV (called PrEP).

**LEARN MORE WAYS TO PROTECT YOURSELF AT**  
Start Talking. Stop HIV.  
[www.cdc.gov/actagainstaids](http://www.cdc.gov/actagainstaids)

### IF YOU DO HAVE HIV



Get HIV medical care and medicines (called ART) to lower the amount of virus in your body and protect your health. These medicines will also help prevent transmitting the virus to others.



Try to find a doctor who specializes in HIV treatment, stay in medical care, take ART as directed and find support.

**LEARN MORE ABOUT TREATMENT AND HOW TO STAY HEALTHY AT**  
HIV Treatment Works  
[www.cdc.gov/hivtreatmentworks](http://www.cdc.gov/hivtreatmentworks)

Source: U.S. Centers for Disease Control and Prevention

## INDICATOR 10: FOOD SAFETY

**Key Finding:** 38 states met the national performance target of testing 90 percent of reported *Escherichia coli* (*E. coli*) O157 cases within four days.

38 states met the national performance target of testing 90 percent of reported <i>E. coli</i> O157 cases within four days. (1 point).		12 states did not meet the national performance target of testing 90 percent of reported <i>E. coli</i> O157 cases within four days. (0 points).
Alabama (100%)	Missouri (98.8%)	Arizona (40%)
Alaska (100%)	Nebraska (90.0%)	California (77.7%)
Arkansas (93.8%)	Nevada (100%)	Georgia (82.4%)
Colorado (93.8%)	New Hampshire (100%)	Idaho (88.9%)
Connecticut (100%)	New Mexico (100%)	Mississippi (80.0%)
D.C. (N/A)	North Dakota (100%)	Montana (71.4%)
Delaware (100%)	Ohio (100%)	New Jersey (71.4%)
Florida (92.9%)	Oklahoma (96.9%)	New York (88.0%)
Hawaii (100%)	Pennsylvania (97.6%)	North Carolina (71.4%)
Illinois (92.6%)	Rhode Island (100%)	Oregon (80.7%)
Indiana (94.6%)	Tennessee (92.5%)	South Carolina (50.0%)
Iowa (94.4%)	Texas (92.5%)	South Dakota (71.4%)
Kansas (92.0%)	Utah (95.5%)	
Kentucky (100%)	Vermont (93.8%)	
Louisiana (100%)	Virginia (98.2%)	
Maine (100%)	Washington (90.9%)	
Maryland (92.9%)	West Virginia (100%)	
Massachusetts (97.2%)	Wisconsin (90.3%)	
Michigan (90.2%)	Wyoming (100%)	
Minnesota (92.2%)		

Source: CDC's Prevention Status Report \*Data were not available for Washington, D.C.; they were awarded a point for the indicator.

Annually, around 48 million Americans suffer from foodborne illnesses.

Around one million of those who are stricken in a given year will suffer from long-term chronic complications.<sup>155</sup> Foodborne illnesses are responsible for around 128,000 hospital visits and kill approximately 3,000 individuals each year.<sup>156</sup> Virtually all of these illnesses could be prevented if stronger measures were taken to improve the U.S. food safety system.

This indicator examines how quickly states test reported cases of *Escherichia coli* (*E. coli*) O157 — one of the most common foodborne illnesses in the United States — and report them to CDC. Thirty-eight states met CDC's national performance target of testing 90 percent of reported *E. coli* O157 cases within four days. Ten states tested between 60 percent and 89.9 percent of reported cases and two states tested

fewer than 60 percent.<sup>157</sup> Quickly detecting *E. coli* O157 contamination serves as a marker for the ability of states to protect their populations and the nation from foodborne illness.

*E. coli* is a diverse group of bacteria that live harmlessly in the guts of humans and animals. However, some pathotypes of *E. coli* can cause acute gastro-intestinal illness. Most reported outbreaks are caused by Shiga toxin-producing *E. coli* O157, which is primarily transmitted through the fecal-oral route. People can be sickened by consuming contaminated leafy greens, raw dairy products, and undercooked meat.<sup>158</sup> In the spring of 2014, 12 people in four states fell ill from contaminated beef.<sup>159</sup>

CDC's Prevention Status Reports highlight practices recommended by the Council to Improve Foodborne

According to USDA's Economic Research Service, *E. coli* costs the country over \$271 million a year.<sup>161</sup>

Outbreak Response that can help states prevent or reduce foodborne illness. One practice is increasing the speed of pulsed-field gel electrophoresis (PFGE) testing (DNA fingerprinting) of reported *E. coli* O157 cases. According to the CDC, "Speed of PFGE testing is defined as the annual proportion of *E. coli* O157 PFGE patterns reported to CDC...within four working days of receiving the isolate in the state public health PFGE lab."<sup>160</sup> Detecting outbreaks quickly not only prevents new cases of illness, but can help the food industry identify gaps and minimize adverse economic impact.

# National Issues & Recommendations

## National Issues and Recommendations

Ebola has shown how much the rest of the world respects and turns to the United States — relying on world-class leadership, expertise and research from CDC, NIH and medical and public health experts — to help manage serious outbreaks and contain their spread.

Yet, while the United States has continued to maintain an elite but limited set of infectious disease experts, the core of the nation's public health system has not kept pace, and in many areas has eroded.

The Ebola outbreak demonstrated that the nation's ability to contain a novel emerging infectious disease threat is fundamentally flawed — and makes the case for fundamental change. For instance:

- Unless basic policies and procedures — like quarantine guidelines and drills for a potential mass outbreak — are consistently maintained and are flexible enough to respond to different possible contingencies and threats, they are not battle-ready when a new infectious disease threat emerges;
- Much of the nation's approach to fighting infectious disease has not been modernized in decades, with particularly severe lags in disease surveillance and research and development of new vaccines, diagnostics, antiviral medications and antibiotics; and
- Limited funding and cuts to existing programs have undermined many fundamental public health capabilities and these capabilities are inconsistent around the country.

It is time to rethink key aspects of the country's public health defenses. The IOM, the Transforming Public Health

Project funded by the RWJF and other leading public health groups have called for reenergizing the public health system around foundational capabilities that ensure basic abilities are maintained and sufficiently funded — while policies, programs, training and technologies can adapt to meet changing threats.<sup>162, 163</sup>

Prioritizing foundational capabilities would help ensure the country maintains a consistent baseline for protecting the public against both emerging and ongoing health threats. This means focusing on the fundamental, proven practices of infectious disease control — and implementing them well. Achieving this goal will require restructuring public health programs — exploring new funding and business models that can assure consistent resources are devoted to support these foundational capabilities. This can be achieved through new funding mechanisms or by giving states and localities more flexibility in exchange for increased demonstration of capabilities and accountability. Modernizing business practices and finding efficiencies may require exploring innovative approaches such as regionalization, increased healthcare and public health integration, public-private partnerships, resource-sharing and working with Accountable Care Organizations (ACOs), or within new capitated care structures and global health budgets.

Since the 1940s, tremendous advances in infectious disease prevention efforts, vaccines and antibiotics, and other medical treatments have saved countless lives. These successes, however, may have contributed to a sense of complacency around infectious disease threats.

It also means updating systems — investing in state-of-the-art equipment, integrating legacy surveillance systems, ending the current overuse of existing medications, especially antibiotics, partnering with other countries and health agencies around the globe and incentivizing research and development of medical countermeasures.

Fighting infectious diseases requires detecting, treating and containing them as quickly and effectively as possible. Public health systems and practices must be upgraded to match the modern infectious disease threats we face.

Each year, millions of Americans develop illnesses that result in billions of dollars of healthcare costs — most of which could be prevented. Further, emerging and reemerging diseases pose not only a threat to health but also a global security threat with major implications for economics and trade. According to the National Intelligence Council, “these diseases will endanger U.S. citizens at home and abroad, threaten U.S. armed forces deployed overseas, and exacerbate social and political instability in key countries and regions in which the U.S. has significant interests.”<sup>164</sup>

Fighting infectious diseases necessitates having the tools, resources and policies in place to detect and contain new or reemerging threats — such as Ebola,

Enterovirus D68, dengue, antibiotic resistant superbugs, MERS-CoV and measles; tackle ongoing outbreaks — such as HIV/AIDS, bacterial infections in hospitals and foodborne illnesses; and even monitor for potential bioterror threats — such as smallpox or anthrax.

In this section TFAH examines a set of top concerns in the country’s infectious disease policies and recommendations for improvements, including:

**A. Increased Attention and Resources to Maintain and Modernize Public Health Capabilities and Have Consistent and Science-Based Policies Across the Country**

- Innovation Priority Areas: Modernizing Biosurveillance, Medical Countermeasure Research and Development, Climate Change and Infectious Disease Outbreaks

**B. Health System Preparedness — Enhancing Surge Capacity and Infection Control**

**C. Changing Healthcare and Public Health Norms to Increase Vaccinations and Combat Antibiotic Resistance**

**D. Additional Persistent — Under Addressed — Infectious Disease Threats**

- Priority Areas: Sexually Transmitted Infections, TB and Food Safety



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## KEY INFECTIOUS AND EMERGENCY RESPONSE COMPONENTS

Requirements for an effective 24/7 approach to combat infectious disease threats include:

- Strong surveillance to identify and monitor ongoing and emerging infectious disease outbreaks;
- Intensive investigative capabilities — including an expert scientific and medical workforce and comprehensive laboratory capabilities — to quickly diagnose outbreaks;
- Containment strategies, including medicines and vaccines to prevent and stop the spread of a disease and isolation and quarantine when necessary;
- Streamlined and effective communication channels so health workers can swiftly and accurately communicate with each other, other front-line workers and the public about 1) the nature of the disease threat; 2) the risk of exposure and how to seek treatment when needed; and 3) any actions they or their families should take to protect themselves;
- A focused and effective response strategy, including targeted communications, to address the concerns of at-risk populations, such as children, the elderly, pregnant women and groups or areas that are particularly susceptible to a particular threat;
- Coordination and partnership with the healthcare sector, to ensure people in need have access to and receive the best available treatment at any stage of an outbreak — including surge capacity for mass outbreaks when necessary;
- An informed and engaged public that can provide material and moral support to professional responders, and can render aid when necessary to friends, family, neighbors and associates; and
- A strong research capacity that is able to rapidly develop new vaccines or medical treatments to counter new threats.

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## CDC's Epidemic Intelligence Service

Since 1951, over 3,500 Epidemic Intelligence Service (EIS) officers have responded to requests for assistance within the United States and throughout the world. EIS officers serve as CDC's "disease detectives," professionals who are trained to conduct epidemiologic investigations, research and public health surveillance. The EIS program is a two-year post-graduate training program comprised of 75 to 78 new officers each year. EIS attracts candidates from diverse backgrounds — physicians, nurses, veterinarians and PhD-trained scientists.

EIS officers currently are assigned to states across the country and to global partners to help address ongoing or urgent problems. EIS officers interact closely with epidemiologists in affected states — many of whom are former EIS officers themselves — illustrating the network and extended reach of the program.

Some notable examples of epidemiologic investigations conducted recently by EIS officers include:

- EIS officers and other staff responded to a multistate cluster of rare *Salmonella*;
- The EIS officer assigned to the California

Department of Public Health investigated a fatal outbreak of hantavirus infections among visitors to Yosemite National Park, discovering that a particular type of tent cabin was susceptible to infestation by rodents that carried the virus;

- EIS officers responded to a ten-fold increase in the incidence of pertussis in Washington State, assisting state health authorities with characterization and control of the outbreak; and
- EIS officers assisted the Missouri health department with investigation of an *E. coli* O157 outbreak possibly linked to a regional grocery chain.



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## Global Health Security Agenda

The Global Health Security Agenda (GHSA) was launched in February 2014 to bring together nations to work on prioritizing the prevention, detection and response to infectious disease outbreaks before they become epidemics. In September, President Obama and top U.S. officials met with international organizations and senior leaders from 44 nations to work toward concrete commitments to implement the GHSA, including assisting West Africa in developing health security capacity within three years. Working together, countries developed 11 Action Packages that outline tangible, measurable steps required to prevent outbreaks, detect threats in real time, and rapidly respond. These include addressing antibiotic resistance, zoonotic diseases,

biosafety and biosecurity, immunization, national laboratory systems, real-time surveillance, disease reporting, workforce development, emergency operations centers, public health law, multi-sector rapid response, medical countermeasures and personnel deployment.

The United States has committed to assist at least 30 countries over five years to achieve the objectives of the GHSA and has prioritized U.S. actions toward strengthening national laboratory systems, combating antibiotic resistant bacteria, addressing zoonotic diseases, promoting real time surveillance, improving biosafety and biosecurity on a global basis, workforce development and preventing bioterrorism.<sup>165 166</sup>



Photo: ChameleonsEye / Shutterstock.com

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## CDC's Global Disease Detection Program

The GDD is a CDC program intended to develop and strengthen global health security in order to rapidly detect, accurately identify, and promptly contain emerging infectious disease and intentional bioterrorist threats that occur.<sup>167</sup> GDD helps countries with limited resources develop essential detection and infection control capacities. Currently, CDC has GDD coverage in all WHO regions with GDD Centers in Bangladesh, China, Egypt, Georgia, Guatemala, India, Kazakhstan, Kenya, South Africa and Thailand.<sup>168</sup> Six core capacities were established by various GDD stakeholders to effectively identify and control emerging infectious diseases including:<sup>169</sup>

### 1. Emerging infectious disease detection

**and response:** Identify and respond to emerging infections through disease surveillance, prevention and control.

### 2. Training in field epidemiology and laboratory methods:

Train scientists and public health practitioners in field epidemiology and laboratory methods.

### 3. Pandemic influenza preparedness

**and response:** Develop influenza surveillance capacity, including improving and expanding global surveillance networks, increasing virus isolation

and epidemiological data collection, increasing quick identification, reporting and response to outbreaks.

### 4. Zoonotic disease investigation and control:

Include veterinary expertise in detecting and responding to zoonotic diseases.

### 5. Health communication and information technology:

Improve communication with affected populations during outbreaks, and ensure public health responses are culturally, technologically and scientifically appropriate.

### 6. Laboratory systems and biosafety:

Ensure appropriate facilities, equipment, policies, security precautions and occupational health programs.

During the 2014 West Africa Ebola outbreak, GDD centers have been deploying staff to the region to support response operations, contact tracing and laboratory diagnostics. Staff from these centers have also assisted their host countries outside of the region in preparing for possible Ebola importation and infection control.

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## World Health Organization

WHO directs and coordinates health within the United Nations system — providing leadership on global health matters, helping to define evidence-based policy options, setting norms and standards and providing technical support and monitoring of health trends and concerns.<sup>170</sup> There are more than 190 member states of WHO, including the United States. It is funded through support from member nations as well as private philanthropic support.

WHO has been helping lead the global response to the Ebola outbreak and supports surveillance, community engagement case management, laboratory services, contact tracing, infection control, logistical support and training and

assistance with safe medical procedures and burial practices.<sup>171</sup> In August 2014, WHO released a roadmap to scale up and recruit additional international attention and resources to help fight Ebola in West Africa to help contain and limit wider spread of the disease.<sup>172</sup> A number of philanthropies have contributed additional support to help with the Ebola response. For instance, in September, Bill Gates announced that the Bill and Melinda Gates Foundation would donate \$50 million to fight Ebola in West Africa, while Facebook founder Mark Zuckerberg announced in October that he is donating \$25 million to the CDC Foundation's efforts.<sup>173</sup>



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## Public Health Emergency Preparedness Cooperative Agreement Program

The PHEP cooperative agreement program awards funds to states, territories and urban areas to build and sustain public health preparedness capabilities that enhance their ability to respond to public health emergencies. PHEP awards funds to 62 public health departments nationwide, including the 50 states; four large metropolitan areas — Chicago, Los Angeles County, New York City and Washington, D.C.; and eight U.S. territories and freely associated states — American Samoa, Guam, U.S. Virgin Islands, Northern Mariana Islands, Puerto Rico, Federated States of Micronesia, Republic of the Marshall Islands and the Republic of Palau.<sup>174</sup> The distribution of PHEP funds is calculated using a formula that includes a base amount for each awardee plus population-based funding, with possible additional funds based on significant unmet needs or high degree of risk.<sup>175</sup>

PHEP focuses on 15 key capability areas, including community preparedness; community recovery; emergency operations coordination; emergency public information and warning; facility management; information sharing; mass care; medical countermeasure dispensing; medical materiel management and distribution; medical surge; non-pharmaceutical interventions; public health laboratory testing; public health surveillance and epidemiological investigations; responder safety and health; and volunteer management. PHEP also supports the Cities Readiness Initiative (CRI) to help cities and large metropolitan areas prepare to dispense medicine quickly and on a large scale.<sup>176</sup>

The cooperative agreements require the development of all-hazards preparedness and response plans, which should include the development of policies to mount an effective response, including isolation and quarantine guidelines for different scenarios.

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## STRATEGIC NATIONAL STOCKPILE (SNS) — SUPPLY AND EXPIRATION CONCERNS

The SNS is a national repository of antibiotics, chemical antidotes and other medicines and medical supplies for use during a major disease outbreak, bioterror or chemical attack, or other public health emergency. The program focuses on responding quickly to a large-scale event in a large city or metropolitan area (where more than half of the country's population lives). The first line of support can come from either "12-hour Push Packages," which contain over 50 tons of medicines, antidotes and medical supplies designed to provide rapid immediate help, even when the cause of an attack or incident is uncertain, or may come from Managed Inventory when the cause of the incident is known. Push Packages are kept in secure warehouses across the country, ready for rapid deployment to a designated city or site. SNS also has further supplies, designed to arrive within 24 to 36 hours, if necessary.<sup>177</sup>

Quantities in the SNS change based on national planning guidance and prioritization, modeling scenarios, standard inventory management procedures and funding.

The SNS maintains a variety of critical pharmaceuticals and medical supplies such as antibiotics like ciprofloxacin and doxycycline, chemical nerve agent antidotes like atropine and pralidoxime, antiviral drugs, pain management drugs like morphine, vaccines for agents like smallpox, and radiological countermeasures like Prussian blue and diethylenetriamine pentaacetate (DTPA), a treatment to radiation exposure. In addition to pharmaceuticals, the SNS contains supportive care supplies like endotracheal tubes and IV supplies, burn and blast supplies such as sutures and bandages, ventilators, personal protective equipment such as N-95 respirators, gloves and other life-saving medical materiel.

The federal government also can work with partners in the public sector to strengthen

the deployment of countermeasures. For instance, CDC worked with private pharmaceutical distribution companies and pharmacies to distribute vaccines during the H1N1 outbreak.

There are concerns that many of medications and vaccinations in the SNS procured after September 11 and the anthrax tragedies have exceeded their shelf life (beyond shelf life extensions) — and that equipment and supplies, such as respirators, used during the H1N1 pandemic have not been replenished. CDC uses cost management to estimate the annual costs over the life of a product to help plan procurement and replacement/restocking costs over a five-year budget cycle.

During the H1N1 pandemic, the U.S. government distributed both antivirals and personal protective equipment from the SNS to state and local health departments. As of the most recent publicly available data in June 2010, the total quantity of antiviral flu drugs in the stockpile was 68 million treatment courses. CDC reports that the antiviral drugs, including pediatric formulations, have been replenished and increased. The Public Health Emergency Medical Countermeasures Enterprise (PHEMCE) is currently evaluating how to replenish supplies used during the H1N1 pandemic, including N-95 respirators and surgical masks, and will develop a strategy to address the gap that includes stockpiling goals.

In 2013, the National Preparedness and Response Science Board (NPRSB) issued a statement recommending ways to improve and measure the nation's SNS by 2020, which included:<sup>178</sup>

- Using science as a key strategy and management tool;
- Moving to a single appropriation model to boost fiscal management;
- Articulating an SNS vision for 2020;
- Tailoring surge capacity;

- Enhancing critical review processes;
- Using cost-benefit decisions as management components;
- Making greater use of computational modeling and simulation.
- Recognizing SNS and BARDA as the sole purchaser and SNS as sole distributor of certain countermeasures;
- Improving coordination among federal, state and local public health partners; and
- Applying lab science and animal models to guide SNS requirements.

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The federal Shelf Life Extension Program (SLEP), administered by the Department of Defense and FDA, extends the expiration dates on qualifying drugs and other materiel in federal stockpiles.<sup>179</sup> The shelf life of drugs and other medical products may be longer than their stated expiration date, and SLEP aims to reduce replacement costs of stockpiled drugs by extending their useful life.

The program was established in 1986 through an interagency agreement between DoD and FDA to extend the shelf life of U.S. Air Force drug stockpiles.<sup>180</sup> Now, more federal agencies have entered into a memorandum of agreement with the DoD to participate in SLEP, including other branches of the military, the SNS, the Department of Veterans Affairs (VA), the U.S. Postal Service, the Federal Bureau of Investigation, the Bureau of Federal Prisons and several other federal agencies.<sup>181</sup>

SLEP is currently available only for federally-maintained stockpiles. An interagency workgroup that included FDA, DoD, CDC and the VA determined that including state antiviral stockpiles in SLEP is not possible to implement at the present time.<sup>182</sup>

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## FDA and Biomedical Infectious Disease Research, Development and Safety

FDA plays a significant role during infectious disease outbreaks, including providing advice on medical product development, authorizing the emergency use of new diagnostic tools, and quickly enabling access to investigational therapies. FDA can expedite the development and availability of medical products — treatments, vaccines, diagnostic tests and PPE — with the potential to help bring an epidemic under control as quickly as possible. It

works to clarify regulatory requirements, provides input on manufacturing and pre-clinical and clinical trial designs and expedites the regulatory review of data as it is received. Under its Emergency Use Authorization (EUA) authority, FDA can allow the use of an unapproved medical product — or an unapproved use of an approved medical product — for a larger population during emergencies, when there is no adequate, approved and available alternative.<sup>183</sup>

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## Department of State and Global Health

The Department of State (DoS) is the lead foreign affairs agency for the United States and it provides considerable foreign assistance investments to fight HIV/AIDS, TB and malaria globally. Within DoS, the office of Global Health Diplomacy supports Ambassadors and health teams on the ground to strengthen the diplomatic engagement needed to build sustainable country-owned health systems that effectively improve the health status of their populations.<sup>184</sup> It supports the work of other federal agencies' programs like U. S. Agency for International Development (USAID), CDC, the Peace Corps and DoD. Key departmental counterparts include the Office of the Global AIDS Coordinator, which leads the U.S. response to the

HIV pandemic through the President's Emergency Plan for AIDS Relief (PEPFAR), and the bureaus of International Organization Affairs (IO), and Oceans and International Environmental and Scientific Affairs (OES).<sup>185</sup>

During foreign infectious disease outbreaks, DoS issues warnings for citizens to avoid non-essential travel to infected regions.<sup>186</sup> DoS also provides a free service — the Smart Traveler Enrollment Program — to allow U.S. citizens and nationals traveling abroad to enroll their trip with the nearest U.S. Embassy or Consulate in order to receive safety information and help the Embassy and loved ones get in touch during an emergency.<sup>187</sup>



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## Department of Homeland Security and Disease Threats

The Department of Homeland Security (DHS) has the broad mission to ensure a safe, secure and resilient nation. DHS is home to several entities that support the fight against infectious disease. The National Bio and Agro-Defense Facility (NBAF) works closely with USDA's Agriculture Research Service (USDA-ARS) and Animal Plant Health Inspection Service, Veterinary Services (USDA-APHIS-VS) on medical countermeasure development.

The Institute for Infectious Animal Diseases (IIAD) — founded in 2004 as a Science and Technology Center of Excellence — focuses on research, education and outreach to prevent, detect, mitigate and recover from exotic animal, emerging and/or zoonotic diseases, which may be introduced intentionally or through natural processes.<sup>188</sup>

U.S. Customs and Border Protection (CBP) works to limit entry of infectious disease at our borders. CBP personnel observe, in the course of their routine duties, all travelers entering the United States for general overt signs of illnesses (visual observation, questioning and notification to CDC as appropriate) at all U.S. ports of entry. Currently, DHS has instituted additional screening and protective measures for travelers from Ebola-affected countries: All persons traveling to the United States from West African countries where there is widespread transmission of Ebola must enter the U.S. through New York's Kennedy, Newark's Liberty, Washington's Dulles, Chicago's O'Hare, or Atlanta's Hartsfield-Jackson airports and undergo enhanced Ebola screening.<sup>189</sup>



Photo: ChameleonsEye / Shutterstock.com

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## Department of Defense and Fighting Infectious Threats

DoD, while primarily responsible for the health and protection of its service members, contributes to global disease surveillance, training, research and response to emerging infectious disease threats.<sup>190</sup> For instance, within DoD, the United States Army Medical Research Institute of Infectious Diseases (USAMRIID) researches and develops medical countermeasures (MCMs) — vaccines, drugs, diagnostics and information — to protect service members from biological threats. USAMRIID has Biosafety Level 3 and Level 4 laboratories, expertise in the generation of biological aerosols for testing candidate vaccines and therapeutics, and fully accredited animal research facilities.<sup>191</sup> USAMRIID was involved in

the discovery of Ebola-Reston. It was found lethal to monkeys, but harmless to humans. Researchers from USAMRIID have been in West Africa since 2006 working on diagnostic tests for Lassa fever. In response to the Ebola outbreak, they have helped set up diagnostic labs in Liberia and Sierra Leone.<sup>192</sup>

In addition, the Defense Threat Reduction Agency (DTRA) — DoD's official Combat Support Agency for countering weapons of mass destruction across the entire Chemical, Biological, Radiological, Nuclear and high-yield Explosives (CBRNE) spectrum — has been active in the Ebola response.<sup>193</sup> Its programs include basic and applied research and development as well as operational support. Since 2003, DTRA and

United States Strategic Command Center for Combating Weapons of Mass Destruction has invested over \$300 million to develop MCMs for hemorrhagic fever viruses. DTRA contracts — along with support from NIH and BARDA — helped fund the development of the drug ZMapp, a monoclonal antibody therapeutic cocktail discovered in January of 2014, in collaboration with USAMRIID, Mapp Biopharmaceutical Inc., Defyrus LLC, and the Public Health Agency of Canada.<sup>194</sup> ZMapp was given to seven Ebola patients, five of whom survived. It is expected to enter clinical trials in early 2015.<sup>195</sup> In late October 2014, DTRA posted a Broad Agency Announcement (BAA) to solicit Ebola-related science and technology proposals.<sup>196</sup>

## A. Increased Attention and Resources to Maintain and Modernize Public Health Capabilities and Have Consistent and Science-Based Policies Across the Country

Funding to support the nation's public health system is insufficient to adequately protect Americans, according to a range of analyses.<sup>197</sup>

Stable, sufficient, dedicated funding is essential to assure that states and communities around the country have the basic capabilities needed to prevent and contain disease outbreaks. Infectious disease control requires constant vigilance — and inadequate and fluctuating resources leave gaps in the ability to quickly detect, diagnose, treat and contain the spread of illnesses.

The country has a history of responding after a new high-profile threat has emerged — including the requests for emergency supplemental funds to support the Ebola response — and expecting emergency supplemental funds to be able backfill basic infrastructure needs that have long deteriorated. The country fails to regularly designate resources to ensure that these systems are kept in place to fight new threats, nor are we ever able to make significant headway into combatting persistent high-impact threats, like the flu and food safety.

Thirteen years ago, the nation had a big wake-up call — the September 11th and anthrax tragedies, which pointed out major weaknesses in the country's ability to respond to health emergencies. These events helped inspire a series of smart and strategic investments to bolster basic capabilities in our system. TFAH's annual *Ready or Not? Protecting the Public's Health from Diseases, Disasters and Bioterrorism* report documented considerable progress that had been made in the past decade to more effectively prepare for and

respond to public health emergencies of all kinds — including major infectious disease outbreaks and bioterrorism. Since 2001, investments have led to significant accomplishments in preparedness planning and coordination; public health laboratories; vaccine manufacturing; the SNS; pharmaceutical and medical equipment distribution and administration; surveillance; communications; legal and liability protections; increasing and upgrading public health staffing trained to prevent and respond to emergencies; and limited improvements in medical surge capacity. While many improvements have been achieved, resources have been insufficient to support all of the goals. And, over the past decade, preparedness funding has been repeatedly cut.

The reports have also tracked persistent areas of vulnerability, including in biosurveillance, the ability to provide mass care in emergencies, maintaining a stable MCM strategy to continue research and development of vaccines, antiviral medications and antibiotics, and helping communities become more resilient to cope with and recover from emergencies.

And, over time, the country has let its guard down and investments have experienced a series of cuts, and the result is that many protections Americans expect and take for granted have eroded — leaving the nation unnecessarily vulnerable.

- Currently, there is a shortfall in baseline support for public health at the federal, state and local levels. Analyses by the IOM, CDC, Government Accountability Office (GAO), and other experts have found that public health departments at all levels of government have been chronically underfunded for decades.<sup>198</sup> A review by The New York Academy of Medicine (NYAM) estimates that an additional \$20 billion per year would be required for public health departments to meet their mandated responsibilities.<sup>199</sup>
- Federal funding for public health has remained at a relatively flat level for years. CDC's budget was cut by almost 12 percent between FY 2006<sup>200</sup> and FY 2014<sup>201</sup> (adjusting for inflation). Federal spending on public health through CDC averages \$21.67 per person.
  - PHEP Cooperative Agreement Funding has dropped from a high of nearly \$1 billion in 2006 to a low of \$640 million in 2014.
  - The SNS does not have enough funds to replenish expiring items against a variety of threats.
  - The HPP has experienced almost yearly cuts, from a high of \$515 million in fiscal year 2004 to just \$255 million in FY 2014, a cut of more than 50 percent. The HPP provides grants and leadership to develop coalitions of healthcare facilities to improve medical surge capacity and enhance community and hospital preparedness.

• Health departments in 48 states, two U.S. territories and Washington, D.C. have reported budget cuts, and state and local health departments have lost 19 percent of their workforce — or 51,000 jobs — since 2008.<sup>202</sup>

In November 2014, the Administration requested emergency funding of \$6.18 billion to support the Ebola outbreak. In December 2014, Congress provided \$5.4 billion of that request. The emergency funds included: \$1.77 billion for CDC, including international

response and preparedness, state and local preparedness, training and other needs; \$733 million for the Public Health and Social Services Emergency Fund (PHSSEF), including BARDA and Assistant Secretary for Preparedness and Response (ASPR); \$238 million for NIH for vaccine and treatment trials; \$25 million for FDA; \$2.5 billion for DoS, including the response in Africa; \$112 million for the DoD research and procurement; and a \$1.54 billion contingency fund to enable rapid response as the crisis develops.<sup>203</sup>

Emergency requests acknowledge ongoing gaps and vulnerabilities in the system. However, while emergency funds are important, they cannot backfill all problems, such as supporting ongoing expert, trained staff or capacities, or address problems quickly enough to keep pace with a new threat as it unfolds. It is essential to provide sufficient and sustained funding on a continued basis to make sure that capabilities are in place, established and well-tested when threats arise.

## Key Federal Infectious Disease Program Funding

CDC—INFECTIOUS DISEASES										
	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010 <sup>1</sup>	FY 2011 <sup>1</sup>	FY 2012 <sup>1</sup>	FY 2013 <sup>1</sup>	FY 2014 <sup>2</sup>	FY 2015
Immunization and Respiratory Diseases	\$519,858,000	\$585,430,000	\$684,634,000	\$716,048,000	\$721,180,000	\$748,257,000	\$778,947,000	\$678,935,000	\$744,700,000	\$798,405,000
HIV/AIDS, Viral Hepatitis, STI and TB Prevention <sup>^</sup>	\$963,133,000	\$1,002,513,000	\$1,002,130,000	\$1,006,375,000	\$1,118,712,000	\$1,115,995,000	\$1,109,934,000	\$1,048,374,000	\$1,072,834,000	\$1,117,609,000
Emerging and Zoonotic Infectious Diseases*	\$212,165,000	\$221,643,000	\$217,771,000	\$225,404,000	\$281,174,000	\$304,193,000	\$304,226,000	\$291,073,000	\$339,300,000	\$404,990,000

\* In 2011 CDC integrated two existing national centers: the National Center for Preparedness, Detection, and Control of Infectious Diseases and the National Center for Zoonotic, Vector-Borne, and Enteric Diseases to create the National Center for Emerging and Zoonotic Infectious Diseases.

<sup>^</sup> Viral Hepatitis was added in 2007

<sup>1</sup> FY10-FY14 numbers reflect total budget authority and include PPHF funding for Immunization and Respiratory Diseases, HIV/AIDS and Emerging and Zoonotic Infectious Diseases

<sup>2</sup> FY2014 numbers are enacted levels. Beginning in FY14, CDC moves funds from each budget line to the Working Capital Fund for business services, resulting in different operating budgets from enacted levels. Source: <http://www.cdc.gov/fmo/topic/wcf/index.html>

### Immunization and Respiratory Diseases

Source FY 2015: <http://rules.house.gov/sites/republicans.rules.house.gov/files/113-1/PDF/113-HR83sa-ES-G.pdf>

Source FY 2014: <http://docs.house.gov/billsthisweek/20140113/113-HR3547-JSOM-G-I.pdf>

Source FY 2012-2013: [http://www.cdc.gov/fmo/topic/Budget%20Information/appropriations\\_budget\\_form\\_pdf/FY2013\\_CDC\\_Full-Year\\_CR\\_Operating\\_Plan.pdf](http://www.cdc.gov/fmo/topic/Budget%20Information/appropriations_budget_form_pdf/FY2013_CDC_Full-Year_CR_Operating_Plan.pdf)

Source FY 2009-2011: [http://www.cdc.gov/fmo/topic/Budget%20Information/appropriations\\_budget\\_form\\_pdf/FY2014\\_CJ\\_CDC\\_FINAL.pdf](http://www.cdc.gov/fmo/topic/Budget%20Information/appropriations_budget_form_pdf/FY2014_CJ_CDC_FINAL.pdf), pg. 52

Source FY 2008: [http://www.cdc.gov/fmo/topic/Budget%20Information/appropriations\\_budget\\_form\\_pdf/FY2013\\_CDC\\_CJ\\_Final.pdf](http://www.cdc.gov/fmo/topic/Budget%20Information/appropriations_budget_form_pdf/FY2013_CDC_CJ_Final.pdf), pg. 41

Source FY 2007: [http://www.cdc.gov/fmo/topic/Budget%20Information/appropriations\\_budget\\_form\\_pdf/FY2012\\_CDC\\_CJ\\_Final.pdf](http://www.cdc.gov/fmo/topic/Budget%20Information/appropriations_budget_form_pdf/FY2012_CDC_CJ_Final.pdf), pg. 51

Source FY 2006: [http://www.cdc.gov/fmo/topic/Budget%20Information/appropriations\\_budget\\_form\\_pdf/FY2011\\_CDC\\_CJ\\_Final.pdf](http://www.cdc.gov/fmo/topic/Budget%20Information/appropriations_budget_form_pdf/FY2011_CDC_CJ_Final.pdf), pg. 53

### HIV/AIDS, Viral Hepatitis, STI and TB Prevention

Source FY 2015: <http://rules.house.gov/sites/republicans.rules.house.gov/files/113-1/PDF/113-HR83sa-ES-G.pdf>

Source FY 2014: <http://docs.house.gov/billsthisweek/20140113/113-HR3547-JSOM-G-I.pdf>

Source FY 2012-2013: [http://www.cdc.gov/fmo/topic/Budget%20Information/appropriations\\_budget\\_form\\_pdf/FY2013\\_CDC\\_Full-Year\\_CR\\_Operating\\_Plan.pdf](http://www.cdc.gov/fmo/topic/Budget%20Information/appropriations_budget_form_pdf/FY2013_CDC_Full-Year_CR_Operating_Plan.pdf)

Source FY 2009-2011: [http://www.cdc.gov/fmo/topic/Budget%20Information/appropriations\\_budget\\_form\\_pdf/FY2014\\_CJ\\_CDC\\_FINAL.pdf](http://www.cdc.gov/fmo/topic/Budget%20Information/appropriations_budget_form_pdf/FY2014_CJ_CDC_FINAL.pdf), pg. 74

Source FY 2008: [http://www.cdc.gov/fmo/topic/Budget%20Information/appropriations\\_budget\\_form\\_pdf/FY2013\\_CDC\\_CJ\\_Final.pdf](http://www.cdc.gov/fmo/topic/Budget%20Information/appropriations_budget_form_pdf/FY2013_CDC_CJ_Final.pdf), pg. 60

Source FY 2007: [http://www.cdc.gov/fmo/topic/Budget%20Information/appropriations\\_budget\\_form\\_pdf/FY2012\\_CDC\\_CJ\\_Final.pdf](http://www.cdc.gov/fmo/topic/Budget%20Information/appropriations_budget_form_pdf/FY2012_CDC_CJ_Final.pdf), pg. 70

Source FY 2006: [http://www.cdc.gov/fmo/topic/Budget%20Information/appropriations\\_budget\\_form\\_pdf/FY2011\\_CDC\\_CJ\\_Final.pdf](http://www.cdc.gov/fmo/topic/Budget%20Information/appropriations_budget_form_pdf/FY2011_CDC_CJ_Final.pdf), pg. 73

### Emerging and Zoonotic Infectious Diseases

Source FY 2015: <http://rules.house.gov/sites/republicans.rules.house.gov/files/113-1/PDF/113-HR83sa-ES-G.pdf>

Source FY 2014: <http://docs.house.gov/billsthisweek/20140113/113-HR3547-JSOM-G-I.pdf>

Source FY 2012-2013: [http://www.cdc.gov/fmo/topic/Budget%20Information/appropriations\\_budget\\_form\\_pdf/FY2013\\_CDC\\_Full-Year\\_CR\\_Operating\\_Plan.pdf](http://www.cdc.gov/fmo/topic/Budget%20Information/appropriations_budget_form_pdf/FY2013_CDC_Full-Year_CR_Operating_Plan.pdf)

Source FY 2009-2011: [http://www.cdc.gov/fmo/topic/Budget%20Information/appropriations\\_budget\\_form\\_pdf/FY2014\\_CJ\\_CDC\\_FINAL.pdf](http://www.cdc.gov/fmo/topic/Budget%20Information/appropriations_budget_form_pdf/FY2014_CJ_CDC_FINAL.pdf), pg. 108

Source FY 2006-2008: [http://www.cdc.gov/fmo/topic/Budget%20Information/appropriations\\_budget\\_form\\_pdf/FY2011\\_CDC\\_CJ\\_Final.pdf](http://www.cdc.gov/fmo/topic/Budget%20Information/appropriations_budget_form_pdf/FY2011_CDC_CJ_Final.pdf), pg. 99

## Key Federal Infectious Disease Program Funding

CDC OFFICE OF PUBLIC HEALTH PREPAREDNESS AND RESPONSE FUNDING TOTALS AND SELECT PROGRAMS														
	FY 2002	FY 2003	FY 2004	FY 2005	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014 <sup>^</sup>	FY 2015 <sup>^^</sup>
CDC Total*	\$1,747,023,000	\$1,533,474,000	\$1,507,211,000	\$1,622,757,000	\$1,631,173,000	\$1,472,553,000	\$1,479,455,000	\$1,514,657,000	\$1,522,339,000	\$1,415,416,000	\$1,329,479,000	\$1,231,858,000	\$1,323,450,000	\$1,352,551,000
State and Local Preparedness and Response Capability**	\$940,174,000	\$1,038,858,000	\$918,454,000	\$919,148,000	\$823,099,000	\$766,660,000	\$746,039,000	\$746,596,000	\$760,986,000	\$664,294,000	\$657,418,000	\$623,209,000	\$655,750,000	\$661,042,000
SNS	\$645,000,000	\$298,050,000	\$397,640,000	\$466,700,000	\$524,339,000	\$496,348,000	\$551,509,000	\$570,307,000	\$595,661,000	\$591,001,000	\$533,792,000	\$477,577,000	\$535,000,000	\$534,343,000

\* CDC Total also includes CDC Preparedness and BioSense

\*\* May include Public Health Emergency Preparedness (PHEP) cooperative agreements, All Other State and Local Capacity, Centers for Public Health Preparedness, Advanced Practice Centers (FY2004-09), Cities Readiness Initiative, U.S. Postal Service Costs (FY 2004), and Smallpox Supplement (FY 2003).

<sup>^</sup> FY2014 numbers are enacted levels. Beginning in FY14, CDC moves funds from each budget line to the Working Capital Fund for business services, resulting in different operating budgets from enacted levels. Source: <http://www.cdc.gov/fmo/topic/wcf/index.html>

<sup>^^</sup> Totals do not include Ebola funding

Source FY 2015: <http://rules.house.gov/sites/republicans.rules.house.gov/files/113-1/PDF/113-HR83sa-ES-G.pdf>

Source FY 2014: <http://docs.house.gov/billsthisweek/20140113/113-HR3547-JSOM-G-I.pdf>

Source FY 2012-13: [http://www.cdc.gov/fmo/topic/Budget%20Information/appropriations\\_budget\\_form\\_pdf/FY2013\\_CDC\\_Full-Year\\_CR\\_Operating\\_Plan.pdf](http://www.cdc.gov/fmo/topic/Budget%20Information/appropriations_budget_form_pdf/FY2013_CDC_Full-Year_CR_Operating_Plan.pdf)

Source FY 2010-11: U.S. Centers for Disease Control and Prevention. "2011 Operating Plan." [http://www.hhs.gov/asfr/ob/docbudget/2011operatingplan\\_cdc.pdf](http://www.hhs.gov/asfr/ob/docbudget/2011operatingplan_cdc.pdf)

Source FY 2002-09: <http://www.cdc.gov/phpr/publications/2010/Appendix3.pdf>

NATIONAL INSTITUTES OF HEALTH (NIH)—INFECTIOUS DISEASE														
	FY 2002	FY 2003*	FY 2004	FY 2005	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015 <sup>^^</sup>
National Institute of Allergy and Infectious Diseases	\$2,367,313,000	\$3,706,722,000	\$4,304,562,000	\$4,402,841,000	\$4,414,801,000	\$4,417,208,000	\$4,583,344,000	\$4,702,572,000	\$4,818,275,000	\$4,775,968,000	\$4,486,473,000	\$4,230,080,000	\$4,392,670,000	\$4,358,541,000

\* In 2003 NIAID added biodefense and emerging infectious diseases (BioD)

<sup>^^</sup> Totals do not include Ebola funding

Source FY 2015: <http://rules.house.gov/sites/republicans.rules.house.gov/files/113-1/PDF/113-HR83sa-ES-G.pdf>

Source FY 2013-2014: [http://officeofbudget.od.nih.gov/pdfs/FY15/FY2015\\_Supplementary\\_Tables.pdf](http://officeofbudget.od.nih.gov/pdfs/FY15/FY2015_Supplementary_Tables.pdf)

Source FY 2012: [http://officeofbudget.od.nih.gov/pdfs/FY14/POST%20ONLINE\\_NIH.pdf](http://officeofbudget.od.nih.gov/pdfs/FY14/POST%20ONLINE_NIH.pdf)

Source FY 2002-2011: <http://officeofbudget.od.nih.gov/pdfs/FY12/Approp.%20History%20by%20IC%292012.pdf>

OFFICE OF ASSISTANT SECRETARY FOR PREPAREDNESS AND RESPONSE FUNDING TOTALS AND SELECT PROGRAMS														
	FY 2002	FY 2003	FY 2004	FY 2005	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015 <sup>^^</sup>
ASPR Totals	--	--	--	--	\$632,000,000	\$694,280,000	\$632,703,000	\$788,191,000	\$891,446,000	\$913,418,000	\$925,612,000	\$897,104,000	\$1,054,375,000	\$1,045,580,000
HPP <sup>^</sup>	\$135,000,000	\$514,000,000	\$515,000,000	\$487,000,000	\$474,000,000	\$474,030,000	\$423,399,000	\$393,585,000	\$425,928,000	\$383,858,000	\$379,639,000	\$358,231,000	\$254,555,000	\$254,555,000
BARDA <sup>**</sup>	--	--	--	\$5,000,000	\$54,000,000	\$103,921,000	\$101,544,000	\$275,000,000	\$304,948,000	\$415,000,000	\$415,000,000	\$415,000,000	\$415,000,000	\$415,000,000
BioShield Special Reserve Fund	--	--	\$5,600,000,000*	--	--	--	--	--	--	--	--	--	\$255,000,000	\$255,000,000

\* One-time Funding

<sup>^</sup> HPP moved from HRSA to ASPR in 2007

\*\* BARDA was funded via transfer from Project BioShield Special Reserve Fund balances for FY2005-FY2013

<sup>^^</sup> Totals do not include Ebola funding

Source FY 2015: <http://rules.house.gov/sites/republicans.rules.house.gov/files/113-1/PDF/113-HR83sa-ES-G.pdf>

Source FY 2014: <http://www.hhs.gov/budget/fy2015/fy2015-public-health-social-services-emergency-budget-justification.pdf>

Source FY 2013: <http://www.hhs.gov/budget/fy2015/fy2015-public-health-social-services-emergency-budget-justification.pdf>

Source FY 2012: <http://www.hhs.gov/budget/safety-emergency-budget-justification-fy2013.pdf>

Source FY 2010-11: [http://www.hhs.gov/asfr/ob/docbudget/2011operatingplan\\_phsssef.pdf](http://www.hhs.gov/asfr/ob/docbudget/2011operatingplan_phsssef.pdf)

Source FY 2008-09: <http://www.hhs.gov/asfr/ob/docbudget/2010phssef.pdf>, p. 8

Source FY 2007: <http://www.hhs.gov/budget/09budget/budgetfy09cj.pdf>, p. 288

Source FY 2006: <http://www.hhs.gov/asfr/ob/docbudget/2008budgetinbrief.pdf>, p. 109

Source BARDA FY 2005-06: <http://www.hhs.gov/asfr/ob/docbudget/2010phssef.pdf>, p. 45.

Source HPP FY 2005: <http://archive.hhs.gov/budget/07budget/2007BudgetInBrief.pdf>, p. 20

Source HPP FY 2004: <http://archive.hhs.gov/budget/06budget/fy2006BudgetInBrief.pdf>, p. 16

Source HPP FY 2003: <http://archive.hhs.gov/budget/05budget/fy2005bibfinal.pdf>, p. 16

Source HPP FY 2002: <http://archive.hhs.gov/budget/04budget/fy2004bib.pdf>, p. 14



## RECOMMENDATIONS: Public Health — Leadership, Foundational Capabilities and Funding

The public health system — comprised of federal, state and local departments — must be modernized and funded at a level that allows it to fight both ongoing and newly emerging infectious disease threats.

Currently, there are key elements of the system that are outdated or need increased support to be able to function more effectively.

To achieve a more effective, efficient and modern approach to combatting infectious disease threats, TFAH recommends that health departments at the federal, state and local levels establish foundational capabilities to ensure consistent, basic levels of protection across the country — and public health departments at all levels must receive adequate funding to achieve these capabilities, including:

- **Infectious disease policy — including for pandemic and emerging threats — should be driven by the best available science and be consistent across the country, especially in the midst of a dynamic outbreak:** Public health should be based on the best available evidence to weigh the potential benefits and harms of policies such as social distancing and quarantine.
- **Conducting a timely and comprehensive After-Action Review and Improvement Plan for the initial phase of the Ebola response:** It is essential to capture the experiences and lessons learned from the Ebola outbreak and parlay them into ways to improve and upgrade the nation's ability to respond to infectious disease threats.

- **Appointing a permanent Special Assistant to the President for Health Security:** There should be a White House public health leadership position to manage infectious and other public health threats — and be responsible for coordinating a government-wide approach to preparedness, response and recovery efforts. While the appointment of an emergency Ebola response coordinator has been important, it has demonstrated that there is a gap in the permanent structure of the White House to respond effectively to emerging and ongoing public health threats.

- **Increasing support for global infectious disease prevention and control programs:** Infectious disease control strategies rely on the ability to detect and contain diseases as quickly as possible — which means working with other countries and across borders to contain threats globally. Additional support and priority must be placed on strengthening global public health infrastructure and the Global Health Security Agenda — including the need to improve surveillance, communications and other basic capabilities; and global disease programs at CDC, the DoS, DoD, NIH and other U.S. based programs; and partnering with WHO and other countries.

- **Defining, prioritizing and fully funding a set of foundational capabilities for public health departments at all levels of government:** Public health departments need the tools and skills that are necessary to provide basic public protections

while adapting to and effectively addressing changing health threats. The IOM and RWJF's Transforming Public Health project have identified key foundational capabilities.<sup>204, 205</sup> Two states, Washington and Ohio, have begun their own assessment of foundational capabilities.<sup>206</sup>

- **Increasing funding for public health at the federal, state and local levels:** Federal, state and local health departments must receive a sufficient level of funding, and some existing funding lines may need to be realigned to be able to ensure all states are able to meet and maintain a core set of foundational capabilities so they can adequately respond to emerging and ongoing threats. The use of all federal public health funds and the outcomes achieved from the use of funds must be transparent and clearly communicated with the public.
- **Increasing funding for public health at the federal, state and local levels:** Federal, state and local health departments must receive a sufficient level of funding, and some existing funding lines may need to be realigned to be able to ensure all states are able to meet and maintain a core set of foundational capabilities so they can adequately respond to emerging and ongoing threats. The use of all federal public health funds and the outcomes achieved from the use of funds must be transparent and clearly communicated with the public.

## RECOMMENDATIONS: Public Health — Leadership, Foundational Capabilities and Funding

- **Ensuring the country maintains sufficient personal protective equipment to be able to provide adequate protection for healthcare workers, patients and others during an outbreak:** Limits in the availability and training on the appropriate use of PPE have been a cause for concern for healthcare workers and others during the Ebola outbreak. Issues of sufficiently available PPE become exponentially amplified during a widespread outbreak, such as a pandemic flu. A 2012 review by ASTHO found that most acute care hospitals in the United States do not have robust supplies of respiratory PPE to use in the event of an influenza pandemic, and slightly more than half (56 percent) of the hospitals did not own an emergency cache of these supplies.<sup>207</sup>

- **Improving and coordinating risk communications:** The Ebola outbreak has also raised concerns about risk communications and media relations capabilities — there was a significantly disproportionate sense of concern in relation to the very low risk that Americans have faced. Conflicting messages from different sources and unnecessary actions taken based on perception rather than science compounded the confusion and contributed to rising levels of fear. Improved communications strategies could help better educate and inform the public and communities about their relative risk and what measures, if any, are being taken or are needed to help protect themselves and their families.

- **Establishing systems where public health departments should only pay for direct services when they cannot be paid for by insurance:** The ACA expanded the number of services covered by insurance, including eliminating co-payments for recommended vaccinations under new group and individual plans for in-network providers and for the Medicaid expansion population. Public health departments that provide direct services should make sure they have systems in place to be able to bill an individual's insurance provider, so they do not use their public health budgets to pay for services that should be billed to insurers. Some states already have these systems in place for some services, including billing for vaccinations. However, sensitive services, such as those for STIs, should be monitored to ensure that people do not avoid seeking these crucial prevention services due to confidentiality concerns.

- **Exploring new funding and business models to assure sufficient levels of funding to support foundational capabilities:** The federal government and states should develop a new financing system for public health that gives priority to foundational capabilities and assures that every American is served by a health department that has these capabilities. This can be achieved through new funding mechanisms or by giving states more flexibility with existing funding streams. Modernizing

business practices and finding efficiencies may require innovative approaches such as regionalization, public-private partnerships and resource sharing.

- **Increasing integration between public health departments and healthcare providers to help achieve maximum results for improving health and containing costs:** As health systems are reforming, they should be encouraged to incorporate public health and community-based prevention efforts into their systems. Integrating prevention and public health with the larger healthcare system can be implemented in a variety of ways, including through coordination between healthcare providers and existing public health programs and departments. And public health departments must adapt to work with new entities and financing mechanisms in the reformed health system, such as by working with ACOs or within new capitalized care structures and global health budgets, to help improve health beyond the doctor's office. These relationships need to be carefully negotiated, particularly in the areas of infectious disease control (see, for example, discussion of preparedness and TB in the following sections) because of the unique responsibility health departments have to stop the spread of communicable diseases, while the health system can and should be treating them.

## INNOVATION PRIORITY: Biosurveillance — for Detecting, Diagnosing and Tracking Disease Threats

One of the most fundamental components of infectious disease prevention and control is the ability to identify new outbreaks and track ongoing outbreaks.

Currently, the United States lacks an integrated, national approach to biosurveillance — which limits the rapid detection and tracking of diseases. As of 2011, there were more than 300 different health surveillance systems or networks supported by the federal government.<sup>208</sup> Most of the systems are not integrated or interoperable and serve an array of different purposes.

The existing systems do not capitalize on the potential advances that have been made in information technology to be able to track disease threats and trends, which compromises the ability to quickly detect, diagnose and contain outbreaks.

- At a federal level, CDC runs the majority of national human health surveillance networks. Some of these include the Arboviral Surveillance System (ArboNet), BioSense, Early Warning Infectious Disease Surveillance (EWIDS), Electronic Food-Borne Disease Outbreak Reporting System (eFORS), Emerging Infection Program (EIP), Environmental Public Health Tracking Network, Epidemic Information Exchange (Epi-X), GeoSentinel, Global Disease Detection and the National Outbreak Reporting System (NORS).
- Within each state there are also often more than a dozen health surveillance systems that work independently and voluntarily feed data to the corresponding national network at CDC.
- In addition, other federal agencies and departments have their own biosurveil-

lance systems, including the EPA, DHS, USDA, FDA, VA, DoD and the Office of the Director of National Intelligence (ODNI).

Recognizing this fragmented and inefficient approach to biosurveillance, CDC released a Surveillance Strategy in early 2014 to facilitate work to consolidate systems, eliminate unnecessary redundancies in reporting, and reduce reporting burden. The strategy included four cross-cutting initiatives aimed at large surveillance systems: the Notifiable Diseases Surveillance System (NNDSS), BioSense, electronic lab reporting and the National Vital Statistics System (NVSS). Performance objectives include the following:

- By 2016, 90 percent of data reported through NNDSS will be by standardized forms of messages, thereby enhancing timeliness, availability and usability by CDC programs and state, territorial, local and tribal (STLT) agencies.
- By mid-2015, BioSense will provide enhanced public health situational awareness utilizing electronic health records (EHR) data and active CDC and STLT analyses to better support public health decisions and programs at the local, state and national level.
- By 2016, 80 percent of laboratory reports to public health agencies (CDC and states) will be received as electronic lab reports.
- By 2016, 80 percent of death reports (i.e., cause of death) occurring in at least 25 states will be transmitted electronically to public health agencies within one day of registration and to CDC/National Center for Health Statistics within 10 days of the event.<sup>209</sup>



## RECOMMENDATIONS: Modernizing Biosurveillance

Biosurveillance needs to be dramatically improved to become a true real-time, interoperable system, able to quickly identify outbreaks and threats and implement containment and treatment strategies. Advances in health information technology (HIT) and EHRs provide new opportunities to integrate and improve systems. TFAH recommends expeditiously moving forward on the recommendations of the 2014 CDC Surveillance Strategy,<sup>210</sup> the 2012 National Biosurveillance Strategy and the 2013 National Biosurveillance Science and Technology Roadmap<sup>211</sup> and addressing key concerns, including:

- **Modernizing and integrating systems:**

The federal government should work to upgrade systems to the latest technologies to allow for real-time and interoperable tracking of diseases — to more efficiently collect and analyze data, to better identify threats and to understand how threats can be interrelated.

- At a state and local level, many health departments still lack the basic hardware, software, and staff training to be able to receive and interpret data from EHRs or other sources and to be able to integrate or upgrade systems. Support for building and maintaining baseline capabilities should be a high priority.

- CDC grants that support disease surveillance should bolster the agency's surveillance strategy by prioritizing interoperability of data systems, upgrading state and local surveillance workforce and technical capacity, reducing redundancy, and incorporating new technologies and data sources.

- **Supporting new technological advances:** Even the most developed systems at CDC must continually be upgraded to take advantage of new technological advances. For instance, technologies to make point-of-care (POC) diagnostics increasingly available would greatly improve care and screen patients who truly need attention during mass emergencies and continued support for Advanced Molecular Detection (AMD) technologies to build molecular sequencing and bioinformatics capacities, allowing public health to rapidly look for a pathogen's match to more efficiently identify an outbreak.<sup>212</sup>

- **Leveraging Health Information Technology:** The increased widespread and consistent use of EHRs and electronic laboratory reporting have the potential to provide public health officials with data in real time and offer two-way communication between healthcare providers and health departments. This can allow health departments with better,

faster data to track outbreaks and let providers know about risks to their patients in a more timely way. The Office of the National Coordinator (ONC) must work with software developers, public health professionals and providers to ensure information exchange is feasible and accessible while maintaining patient privacy. Government agencies should set standards for data, identify what health information is most relevant for public health purposes, and ensure that public health agencies have ready access to these data and the capacity to analyze information. Safety net providers, including health departments, should be eligible for the CMS EHR incentive program.

- **Connecting disease tracking and community resilience:** Traditionally, tracing infectious and chronic diseases has been siloed. There is an increasing recognition of the importance of understanding of how underlying health conditions make some individuals and groups more vulnerable to disease outbreaks and health disasters. Better tracking of the health of communities and social determinants of health through health information exchanges, ACOs and other systems can help identify less healthy areas to target resources and direct special response efforts during outbreaks.

## INNOVATION PRIORITY: Medical Countermeasures Research and Development

The government is often the only real customer for most medical countermeasure products, such as anthrax and smallpox vaccines. As a result, the U.S. government has invested in the research, development and stockpiling of emergency MCMs for a pandemic, bioterror attack, emerging infectious disease outbreak, or chemical, radiological, or nuclear event.

Development of medical products for the nation's biodefense is a key piece of any public health emergency response. By preparing for a bioterror attack with adequate supplies of countermeasures that can be rapidly deployed and administered, the nation can effectively neutralize that threat. A successful domestic MCM enterprise will prepare the nation for new threats, expected or unexpected, by building the science, policy and production capacity in advance of an outbreak.

Congress enacted Project BioShield in 2004 to spur development and procurement of MCMs. The Pandemic and All-Hazards Preparedness Act (PAHPA) of 2006 established and authorized BARDA to speed up the development of MCMs by supporting advanced research, development and testing; working with manufacturers and regulators; and helping companies devise large-scale manufacturing strategies. BARDA bridges the funding gap between early research and commercial production. The Special Reserve Fund (SRF) of \$5.6 billion was established to help guarantee a market for newly developed vaccines and medicines needed for biodefense that would not otherwise have a commercial market.<sup>213, 214</sup>

In August 2010, FDA launched a new Medical Countermeasures Initiative (MCMi) to improve the agency's efforts to minimize red tape, maximize innovation and maintain safety in its review and standards for the development of MCMs. At first, the initiative was limited to preparing for responding to a flu pandemic, but in 2011, the project



was expanded to address all vaccines and medications related to CBRN threats.<sup>215, 216</sup> Through the initiative, FDA is developing new scientific and analytic tools to speed the approval of lifesaving drugs and devices.

The Public Health Emergency Medical Countermeasures Enterprise, created in 2006 by HHS, is made up of federal partners, including the Office of the Assistant Secretary for Preparedness and Response, CDC, FDA, NIH, DoD, VA, DHS and USDA, responsible for protecting the nation from the health effects associated with chemical, biological, radiological and nuclear (CBRN) threats, through the use of MCMs. In 2012, ASPR released a PHEMCE Strategy and PHEMCE Implementation Plan, which together provide the blueprint the PHEMCE will follow in the near, mid- and long-term to achieve its strategic goals, which include developing new MCMs, establishing clear regulatory pathways, developing operational plans for use, and addressing gaps and plans for making sure new MCMs are available, distributed and used when needed in an incident — all while prioritizing investments in the most efficient ways possible.<sup>217</sup> An updated PHEMCE Strategy and Implementation plan is due by the end of 2014.

BARDA, along with partners at NIH, FDA, DoD, international health agencies and

private companies have been instrumental in making advances toward developing vaccines and treatments being piloted for Ebola.

As of the end of fiscal year 2013, BARDA investments resulted in 80 to 90 new candidate products in the pipeline under advanced research and development, and 12 products in the SNS.<sup>218</sup>

Under advanced research and development, BARDA has initiated new programs to support MCM development for candidate products for biodosimetry, biodiagnostics, antimicrobial resistance and biothreat pathogens, chemical, burns, blood products, sub-syndromes of acute radiation exposure (hematopoietic, gastrointestinal, lung and skin) and additional programs for anthrax and smallpox. BARDA has strategically invested the dollars available under the Special Reserve Fund and, in addition to procuring critical MCMs, has established a robust portfolio of candidate products under advanced research and development with the potential to transition to procurement in the future, addressing remaining preparedness gaps. In addition, the September 2014 Executive Order on Combating Antibiotic Resistant Bacteria expanded BARDA's authority to develop new and next generation countermeasures that target antibiotic-resistant bacteria that present a serious threat to public health.

## RECOMMENDATIONS: Improving Research and Development of Medical Countermeasures

TFAH recommends that the United States place a higher priority on research and development of MCMs, including vaccines, medicines and technology. Policymakers must ensure that the public health system is involved in this process, from initial investment through distribution and dispensing. The nation's MCM enterprise could be advanced through the following activities:

- **Supporting the entire medical countermeasure enterprise, from initial research through dispensing:** The PHEMCE must receive robust federal funding to ensure continuation of the pipeline, provide assurances to industry that the government will be a reliable partner in development and procurement of new products, and ensure products reach the intended recipients. These funding priorities should include no-year funding in the SRF for procurement; annual funding for advanced development at BARDA; the Strategic National Stockpile at CDC to enable replenishment, maintenance, storage and distribution of appropriate MCMs; and regulatory science in FDA's MCMi to promote safe pathways to approval for new products.
- **Developing an ongoing plan for maintaining and restocking the SNS and for the development of clinical guidance for the best use of MCMs:** A mandatory funding stream should be created to keep the SNS stocked

and to replace used or expiring products, based on which products are deemed absolutely essential. Given limited budgets, the PHEMCE must assess how it will prioritize purchases based on risk.

- **Investing in multiuse products and technologies and targeted biodefense products.**
- **Ensuring the development and availability of safe vaccines and medications for children in the SNS:** Progress continues to be made to make sure there are safe options available for children. The federal government should set a goal to increase the development and procurement of pediatric MCMs so that the right countermeasure in the right dose and formulation at the right time can be safely delivered to all children during an emergency.
- **Fostering public-private partnerships for distributing and administering vaccines and medications:** Federal, state and local health departments should partner with nongovernmental entities to develop the most efficient distribution and dispensing mechanisms for MCMs in an emergency. In some communities, private sector, healthcare, community-based or faith-based organizations may have better systems in place to reach target populations.

## INNOVATION PRIORITY: Climate Change and Disease Outbreaks

Health departments have an important role to play in helping communities prepare for the adverse effects of climate change, given their role in building healthy communities. Public health workers are trained to develop communication campaigns that both inform and educate the public about health threats and can use these skills to educate the public about climate change-related disease prevention and preparedness. Public health departments are also on the frontlines when there is an emergency, whether it's a natural disaster or an infectious disease outbreak. These types of emergency preparedness and response skills will be invaluable as extreme weather events become more common.



Source: King County, [www.kingcounty.gov/exec/climatechange](http://www.kingcounty.gov/exec/climatechange)

## RECOMMENDATIONS: Preventing and Preparing for the Adverse Impact of Climate Change on Infectious Disease Outbreaks

To help prevent and prepare for the new and increased infectious disease threats that climate change poses, TFAH recommends:

- **Ensuring every state has a comprehensive climate change adaptation plan that includes a public health assessment and response:** State and local health agencies should engage in public education campaigns and establish relationships with vulnerable populations as part of any plan. States should update state hazard mitigation plans to include climate change adaptation, as proposed by FEMA.
- **Improving prioritization and coordination across public health and environmental agencies:** Public health agencies at all levels must work in coordination with environmental and other agencies to undertake initiatives to reduce known health threats from food, water and air, and educate the public about ways to avoid potential risks.
- **Developing sustainable state and local mosquito control programs:** A review by ASTHO found that many states and local communities are challenged to develop and maintain vector control programs, especially in tight budgetary times and when emergency situations have quieted, but that these programs are a vital public health strategy to help control vector-borne diseases.<sup>219</sup>
- **Expanding the National Environmental Health Tracking Network:** The CDC's environmental public health tracking program should be expanded and fully funded to cover every state. Currently, the program only supports efforts in 23 states and New York City. CDC should be provided with the mandate and resources to expand the network so it can become a centralized, nationwide health tracking center, and each state should receive the necessary funding to fully conduct health-tracking activities. A fully funded tracking network should demonstrate interoperability with the larger HIT system to facilitate two-way communication with clinicians and state and local public health officials.
- **Building resilience to climate-related health effects at the federal, state and local level:** Climate change preparedness should be a required element of PHEP and HPP plans and grants. Funding should be significantly increased to support CDC's Climate Ready States and Cities Initiative to build capacity at the federal, state and local level to understand the impact of climate change and apply this to long-range health planning.

## INNOVATION PRIORITY: Building Community Resilience

Ensuring communities can cope with and recover from emergencies is a significant challenge to public health preparedness.

The most vulnerable members of a community, such as children, the elderly, people with underlying health conditions and limited-English proficiency, face special challenges that must be considered before disaster strikes.

The resilience of a community — including its ability to recover from disasters — is inextricably linked to the underlying health of that community and the basic, ongoing capabilities of that community's public health department or region. Without strong core capabilities, a public health department cannot be expected to meet additional demands that arise during emergencies. Dedicating and maintaining ongoing resources for these foundational public health capabilities, as measured in indicator one of this report, are tied to the ability of states and communities to be resilient in the face of unexpected and major threats. RAND identifies the levers of community resilience as wellness, access to services, education, engagement, self-sufficiency, partnership, quality and efficiency.<sup>220</sup>

Building community resilience is one of the two overarching goals identified by HHS in the release of the draft Biennial Implementation Plan for the National Health Security Strategy. It calls for

fostering informed, empowered individuals and communities.

Resilience is strongly tied to ongoing strong relationships between public health officials and the communities they serve and efforts to improve the overall health status of the community.<sup>221, 222</sup> For instance, individuals who are obese or have poor kidney function can need additional help and medications during an emergency. Currently, two-thirds of Americans are overweight or obese.

Experts recommend that improving resilience, particularly among vulnerable populations, requires:

- Improving the overall health status of communities so they are in better condition to weather and respond to emergencies. Initiatives and programs supported by the Prevention and Public Health Fund (PPHF) can assist in these efforts;
- Providing clear, accurate, straightforward guidance to the public in multiple languages;
- Developing ongoing relationships between health officials and members of the community, so they are trusted and understood when emergencies arise; and
- Engaging members of the community directly in emergency planning efforts.

To reach diverse communities, experts also recommend providing information through channels beyond the Internet,

such as radio, racial and ethnic publications and television, and in languages other than English. In addition, idiomatic translations are important to reach specific cultural perspectives effectively, and messages should be delivered by trusted sources, such as religious and community leaders.

In 2013, HHS and DHS launched a Community Health Resilience Initiative (CHRI). The CHRI is a public-private collaboration intended to provide stakeholders with resources and guidance to promote resilience in their communities.<sup>223</sup> CDC has also funded the development of a Community Resilience Index: Composite of Post-Event Wellbeing (CoPE-WELL), to develop a predictor of the ability of a community to prepare for, survive and rebuild from a disaster scenario.<sup>224</sup>

In 2014, the HHS Climate Adaptation Plan outlined different health risks and responsibilities and initiatives within the department for helping to protect Americans from these threats.

One key element of the plan includes the Sustainable and Climate Resilient Health Care Facilities Initiative, which includes an information tool kit for use by a wide range of healthcare facilities to assess their specific vulnerabilities and identify potential measures to address those vulnerabilities.



## RECOMMENDATIONS: Improving Community Resilience

Helping build healthier and stronger communities ensures they can cope with and recover from major outbreaks, health emergencies and other disasters more easily. TFAH recommends that improving community resilience should be a top priority for federal, state and local governments, and they should:

- **Support prevention and public health programs:** Prevention programs that help improve the health of communities, such as diabetes and obesity prevention efforts and infection control programs, can decrease the vulnerability for infectious diseases by improving American's underlying health and can contribute to strategies to contain the spread of infections. The PPHF, the National Prevention Strategy (NPS) and other programs focused on improving the health of communities — particularly targeting health inequities in lower-income communities and empowering those communities to actively engage their residents in improving the health of their neighborhoods — help prepare all communities for disease outbreaks and other health emergencies.
- **Include community resilience in emergency preparedness plans:** It is important for health officials to know and understand special needs and concerns in different areas of the community, particularly where there

are many vulnerable populations. Health officials and emergency management officials must have plans and mechanisms in place to provide assistance to these neighborhoods in times of crisis, and members of these communities should be part of any emergency planning effort to ensure the needs and concerns of the public are heard and addressed. Federal partners must provide strong technical assistance to allow for the creation of models that can be adapted to meet the needs of specific communities.

- **Integrate preparedness activities into the ongoing work of public health departments and other social services and community organizations:** Building partnerships and preparedness engagement between health departments and other services, agencies and community groups, such as housing and faith-based organizations, creates important channels for reaching and providing assistance to at-risk individuals and neighborhoods in times of crisis.
- **Incorporate community resilience into hospital activities:** Hospitals should incorporate community-wide disaster preparedness planning and community resilience into their community benefit work. For example, hospitals can integrate disaster plans for individuals dependent on electricity or medication into

patients' discharge information. Hospitals can also add questions and data on community resilience into community health needs assessments. Under proposed changes to hospitals' Form 990 reporting, the Internal Revenue Service (IRS) will allow a hospital's efforts on community resilience to count as a community benefit activity.<sup>225</sup>

- **Prioritize plans for protecting children:** Special efforts must be made to work with childcare centers and schools to coordinate and plan for emergencies. All childcare facilities should have appropriate disaster plans in place, and public health officials should work with parents, educators, schools and school systems to ensure every school has a plan in place and that the plans are tested. Children should be taught how to be prepared, for example by creating plans to reunify with teachers or parents.
- **Ensure rebuilding efforts incorporate best practices for making the community even stronger:** As communities recover from a disaster, they should be rebuilt to maximize community resilience, health outcomes and social services. The IOM is beginning a relevant study, Post-Disaster Recovery of a Community's Public Health, Medical and Social Services, that should inform such an approach.<sup>226</sup>

## EXAMPLES OF KEY EMERGING AND EMERGENCY THREATS

### Ebola

Ebola is one of several rare, but deadly viral hemorrhagic fevers, first discovered in 1976 in what is now the Democratic Republic of the Congo. Symptoms include fever, severe headache, muscle pain, vomiting, diarrhea and unexplained bleeding or bruising. The virus can be transmitted through contact with bodily fluids of a symptomatic patient. There is no cure or vaccine for Ebola and survival depends on supportive care and the patient's immune response. As of early

December 2014, there have been more than 17,000 cases and over 6,000 deaths from Ebola in several West African nations, and there have been two fatalities on U.S. soil.<sup>227</sup> In the last few months, the U.S. has significantly increased its capacity to handle potential Ebola infections nationwide — increasing the number of treatment facilities from three to 35 and the number of testing labs from 13 to 42, in addition to completing phase 1 clinical trials of the first Ebola vaccine.<sup>228</sup>

**HEALTH ADVISORY: EBOLA**  
Recently in West Africa?

If you get sick, call a doctor.  
Tell the doctor where you traveled.

Watch for fever, headaches, and body aches in the next 3 weeks.

3 WEEKS						
Sun	Mon	Tue	Wed	Thu	Fri	Sat
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

For more information: visit [www.cdc.gov/travel](http://www.cdc.gov/travel) or call 800-CDC-INFO.

### Enterovirus D68

Enterovirus D68 is one of over 100 non-polio enteroviruses that causes flu-like symptoms and severe respiratory illness in some patients. Infants, children and teenagers are most likely to contract the disease because of their limited immunity and those with asthma are at greatest risk of severe illness. There is no cure or vaccine for EV-D68.<sup>229</sup>

While cases of EV-D68 occur yearly in the summer and fall, 2014 has seen a significant spike in the number of infections—starting in the Midwest. From mid-August to December 4, 2014, 1,121 people in 47 states and D.C. have confirmed respiratory illness caused by EV-D68.<sup>230</sup> EV-D68 has been detected in specimens from 12 patients who died and had samples submitted for testing.

## Middle East Respiratory Syndrome Coronavirus

MERS-CoV was first reported in humans in September 2012. In July 2013, the WHO International Health Regulations Emergency Committee determined that MERS-CoV should be considered a serious concern, but not yet a “public health emergency of international concern.”<sup>231</sup>

As of June 11, 2014, 699 laboratory-confirmed cases (including 209 deaths) of MERS-CoV have been reported to WHO.<sup>232</sup> Individuals with chronic conditions appear to be more susceptible to MERS-CoV. The largest study to date of those infected included 47 patients and found that all but two had one or more chronic medical conditions, including diabetes, hypertension, heart disease or kidney disease, and 72 percent had more than one chronic condition.<sup>233</sup>

**HEALTH ADVISORY:**  
Middle East Respiratory Syndrome (MERS)

**Going to the Arabian Peninsula?**  
A new disease called MERS has been identified in some countries.

The risk to most travelers is low, but you should take these steps to prevent the spread of germs:

- Wash your hands often.
- Avoid touching your face.
- Avoid close contact with sick people.

Symptoms include fever, cough, and shortness of breath.

If you get sick within 14 days of being in the Arabian Peninsula, call a doctor and tell the doctor where you traveled.

For more information: visit [www.cdc.gov/travel](http://www.cdc.gov/travel) or call 800-CDC-INFO.

## Pandemic Flu

In addition to the seasonal flu, historically there have been three-to-four pandemic flu outbreaks each century. Pandemics occur when a new influenza virus emerges against which people have little-to-no immunity and the virus spreads internationally with sustained human-to-human transmission. While experts predict influenza pandemics will occur in the future, they cannot predict when the next pandemic will occur, what strain of the virus will be involved, or how severe the outbreak will be.<sup>234</sup> Once a novel influenza strain mutates and becomes easily transmissible among humans, it can cause a worldwide pandemic in a relatively short time. While the pandemic may last several years as it circles the globe, outbreaks in any single location often come in a series of “waves” that last 6 to 8 weeks each.

The United States experienced three flu pandemics in the 20th century and one in the 21st century:

- A severe pandemic in 1918 resulted in 30 percent of the population becoming ill and 2.5 percent (625,000 Americans) of those who became ill died.<sup>235</sup> In modern times, this would translate into approximately 90 million Americans becoming ill and roughly

2.25 million deaths. Based on a series of modeling study estimates, during a severe pandemic, the U.S. economy could lose an estimated \$683 billion — a 5.5 percent decline in annual Gross Domestic Product (GDP).<sup>236</sup>

- Milder pandemic outbreaks in 1957 and 1968 killed over 34,000 in the U.S. and over 700,000 across the globe.<sup>237</sup>
- The 2009 H1N1 Influenza (A) virus, while considered relatively mild, infected around 20 percent of Americans (approximately 60 million individuals), and resulted in approximately 274,000 hospitalizations and 12,000 deaths.<sup>238</sup> Proportionally, more people were hospitalized from 2009 H1N1 than are typically hospitalized from the seasonal flu. And about 90 percent of the Americans who died from 2009 H1N1 were under the age of 65 and at least 340 children died.<sup>239</sup> However, according to CDC, the actual number of deaths in children could be as high as between 910 and 1,880.<sup>240</sup> A study published in 2013 estimates that worldwide mortality from the 2009 H1N1 pandemic could be 10 times higher than the original WHO estimates, with most deaths occurring in people under 65.<sup>241</sup>

## 2013 NOVEL AVIAN INFLUENZA A OUTBREAK — H7N9

The first outbreak of a new avian influenza A (H7N9) virus in humans was reported in China by the WHO on April 1, 2013.<sup>242</sup> The first case outside of China was in Malaysia and was reported on February 12, 2014.<sup>243</sup>

Although H7N9 is not currently spreading from person-to-person, the pandemic potential of this virus is of concern to scientists. Influenza viruses are constantly evolving and experts are watch-

ing for the possibility that this virus could eventually spread through sustained person-to-person contact, triggering a global pandemic of H7N9. CDC and WHO are closely monitoring the situation.<sup>244, 245</sup> HHS invested in development of different H7N9 seed strains for vaccine production and has provided grants to WHO to support production of H7N9 pre-pandemic vaccine candidates and subsequent clinical trials.<sup>246, 247</sup>

## PANDEMIC FLU PREPAREDNESS: LESSONS FROM THE FRONTLINES

In 2009, TFAH issued a report *Pandemic Flu Preparedness: Lessons from the Frontlines* identifying key lessons from the response to the 2009 H1N1 response, which concluded that:<sup>248</sup>

- Emergency funds are essential — but not sufficient — to backfill the long-standing public health infrastructure issues;
- Pandemic and emergency response plans must be adaptable and science-driven;
- Establishing trust with the public through clear and honest communication is imperative — and the highest-risk groups often have the lowest levels of trust;
- Recommendations for sick leave, school closings and limiting community gatherings have major ramifications that must be taken into account;
- Coordination across communities, states and countries is extremely complicated, but must be a high priority; and
- Competing emergency declarations and laws must be better coordinated to avoid confusion and provide liability and health protection to medical personnel who volunteer to help during emergencies.

The 2009 H1N1 pandemic flu outbreak also demonstrated the importance of maintaining the research and development



of up-to-date countermeasures, including vaccines and antiviral medications, and to keep enough pharmaceuticals and medical equipment stockpiled for emergencies. Quick response capacity is essential during an outbreak or emergency, but it requires an ongoing investment in pharmaceutical research and development and stockpiling of medicines and equipment.

As soon as the H1N1 virus was identified, scientists raced to develop a vaccine to protect against the H1N1 flu strain, yet they were operating with outdated vaccine research capacity and technology. Despite these challenges, vaccine manufacturers were able to produce

limited quantities of vaccine by mid-fall, which public health officials directed to the highest-risk populations. However, it took until later in the year before enough vaccine was available for the entire U.S. population. This delay in the supply discouraged people from getting vaccinated.

In addition to vaccine development, within one week of the outbreak, the SNS delivered more than 11 million courses of antiviral drugs, 12.5 million facemasks, and 25 million N-95 respirators to 62 predetermined areas in states and localities around the country.<sup>249</sup> These materials included 25 percent of the states' fixed pandemic influenza allocations and was the first large-scale distribution of its kind. In the fall, an additional 535,000 courses of antiviral drugs and 59.7 million N-95 respirators were also deployed from the SNS in response to the pandemic emergency.

The relatively rapid development of a vaccine despite limited production capabilities and the quick distribution of antivirals and other equipment were only possible due to prior investments in research and development and effective planning, stockpiling and practice in drills and tabletop exercises by state and local health departments and their key community partners.

## Chikungunya: A Concern for U.S. Travelers

Chikungunya is a mosquito-borne virus that, while rarely fatal, causes fever and joint pain that can be excruciating.<sup>250</sup> There are no vaccines or treatments for chikungunya, but symptoms usually subside in about a week. In some people, joint pain can persist for months.<sup>251</sup> The best way to protect oneself from contracting the virus is by avoiding mosquito bites.<sup>252</sup>

While other parts of the world have experienced chikungunya outbreaks in the past, it wasn't until late 2013 that chikungunya first appeared in the Americas in the Caribbean islands.<sup>253</sup> As of October 31, 2014, nearly 780,000 suspected and over 15,000 laboratory-confirmed chikungunya cases had been reported in the western hemisphere.<sup>254</sup> A total of 1,627 chikungunya cases have been reported to ArboNET from U.S. states — most of which were in travelers returning from elsewhere in the Americas. However, 11 cases were contracted in Florida this year — the first transmission of the disease on U.S. soil.<sup>255</sup> Chikungunya can jump to new geographic locations if an infected person returns home and is bitten by a local mosquito while the virus is present in his or

her blood, generally during the first week of infection when viremia is high. That mosquito then carries the disease with it to its next host.<sup>256</sup> Because chikungunya is not a notifiable disease and symptoms in most people subside quickly, the actual number of infections is likely much higher than reported.<sup>257</sup> Fortunately, once infected, patients are likely immune to further infections.<sup>258</sup> Prevention strategies include eliminating standing water, using insect repellent and appropriate clothing and behavior changes to reduce mosquito bites.

**RECENTLY IN THE AMERICAN TROPICS?**

**MOSQUITOES** spread diseases such as **CHIKUNGUNYA** and **DENGUE**

Watch for fever with joint pains or rash in the next 2 weeks.

2 WEEKS						
Sun	Mon	Tue	Wed	Thu	Fr	Sat
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31	1	2	3	4

If you get sick, see a doctor. Tell the doctor where you traveled.

For more information: call 800-CDC-INFO (232-4636) or visit [www.cdc.gov/travel](http://www.cdc.gov/travel).

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

## Dengue Fever

Dengue fever is a mosquito-borne illness that causes flu-like symptoms and severe joint, muscle and bone pain. Dengue has emerged as a worldwide problem only since the 1950s. WHO estimates that 50 to 100 million infections occur yearly, including 500,000 cases of dengue hemorrhagic fever and 22,000 deaths, mostly among children. There are no vaccines

to prevent dengue and no drugs for treatment. Although dengue rarely occurs in the continental United States, it is endemic in Puerto Rico and in many popular tourist destinations in Latin America, Southeast Asia and the Pacific islands. Small dengue outbreaks occurred in Hawaii in 2001, Texas in 2005 and most recently in Florida in 2013.<sup>259, 260</sup>

## Chagas Disease

Chagas disease is caused by the parasite *Trypanosoma cruzi* and can lead to severe cardiac and gastrointestinal disease. It is transmitted to animals and people by insect vectors found exclusively in the Americas. As many as 8 million people in Mexico, Central America and South America—and over 300,000 in the United States—have Chagas disease, the majority of whom do not know

they are infected. If untreated, infection is lifelong and can be either symptom free or life threatening. In the United States, there have been limited cases of infection through insects but people have also become infected through mother-to-baby transmission, organ transplantation, and accidental laboratory exposure. Despite the large number of infected persons in the United States,

most healthcare providers and public health professionals are not familiar with Chagas disease, which leads to under-diagnosis and under-reporting. Chagasic cardiomyopathy affects approximately 30,000 to 45,000 people in the United States but can be prevented through early treatment, so expanded awareness and knowledge about Chagas disease is essential.<sup>261</sup>

## West Nile Virus

In 2012, the United States experienced its second-largest and deadliest outbreak of West Nile virus. Every state but Alaska and Hawaii reported infections in people, birds or mosquitoes. There were a total of 5,674 human cases of the disease, with 286 deaths. Half of the cases were classified as neuroinvasive (e.g., meningitis or encephalitis).<sup>262</sup> The majority of cases — 80 percent — were reported from 13 states: Texas, California, Louisiana, Illinois, Mississippi, Michigan, South Dakota,

Oklahoma, Nebraska, Colorado, Arizona, Ohio and New York. Texas reported almost a third of all cases.<sup>263</sup>

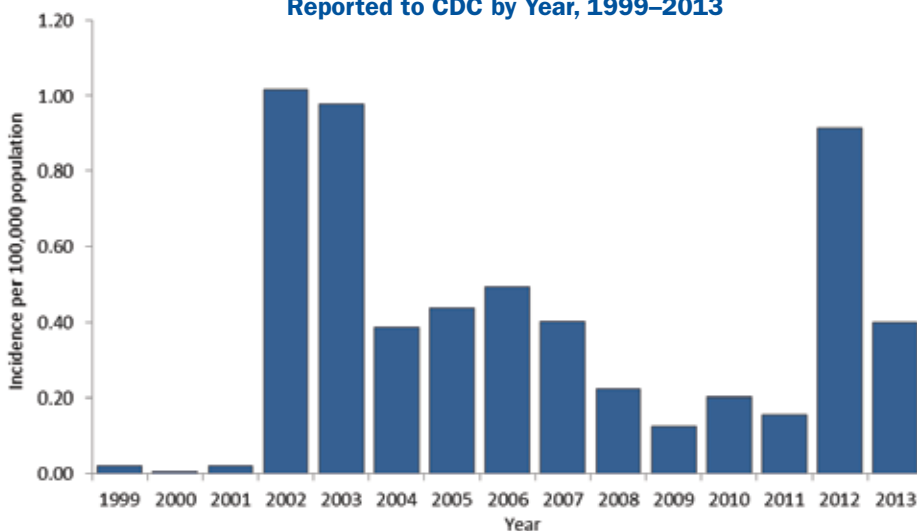
As of December 2, 2014, 47 states and Washington, D.C. have reported WNV infections in humans, birds or mosquitoes. Overall, 2,002 cases of West Nile virus disease have been reported to CDC. Of these, 1,196 (60 percent) were classified as neuroinvasive disease (such as meningitis or encephalitis) and 806 (40 percent)

were classified as non-neuroinvasive disease.<sup>264</sup> Older adults are at higher risk for developing WNV neuroinvasive disease.

WNV is a potentially serious illness that is spread by infected mosquitoes that contract the virus from feeding on infected birds. WNV prevention strategies focus on preventing mosquito bites by eliminating standing water, using quality insect repellent and appropriate clothing and other behavior changes.

The majority of individuals (80 percent) who contract WNV develop no symptoms. Up to 20 percent of infected individuals develop minor symptoms that last from a few days to several weeks. Possible symptoms include fever, headache, body aches, nausea, vomiting, swollen lymph glands and rashes on the trunk of the body. A small portion of infected people (one in 150) will develop serious symptoms that can last several weeks and may result in permanent neurological effects. Possible symptoms include high fever, headache, neck stiffness, disorientation, coma, tremors, convulsions, muscle weakness, vision loss, numbness and paralysis. There is no specific treatment or human vaccine for WNV, although those with severe symptoms can receive supportive care in a hospital setting.

**West Nile Virus Neuroinvasive Disease Incidence Reported to CDC by Year, 1999–2013**



Source: ArboNET, Arboviral Diseases Branch, Centers for Disease Control and Prevention

## Malaria: A Concern for U.S. Travelers

Malaria — which is preventable and curable — is rampant in developing countries, particularly in sub-Saharan Africa and South Asia, but malaria transmission has been considered eliminated in the United States for decades. However, imported cases and sporadic episodes of local transmission continue to occur and the malaria vector mosquitoes capable of transmitting the disease are present in the United States (*Anopheles quadrimaculatus* and *An. Freeborni*). In 2011, 1,925 imported malaria cases were reported in the United States, which is the highest since 1971, and represents a 14 percent increase since 2010.<sup>265</sup> In 2011, five people in the U.S. died from malaria or associated complications.<sup>266</sup> All but five of the malaria cases reported in the United States were acquired overseas with more than two-thirds of the cases imported from Africa.<sup>267</sup> The growing number of imported malaria cases in the U.S. reflects changing patterns of travel and migration to and from malaria-endemic countries.

In 2010, there were 219 million malaria cases worldwide and 660,000 deaths.<sup>268</sup> Although malaria has been virtually eliminated in developed nations with temperate climates, it is still prevalent in tropical and subtropical countries in Africa, Asia, the Middle East, South America and Central America. Recent efforts to expand malaria control in endemic countries have

substantially reduced the burden of malaria worldwide since 2000.<sup>146</sup> Evolving strains of drug-resistant parasites and insecticide-resistant mosquitoes continue to make this emerging infectious disease a global health threat.

Malaria is typically transmitted to humans by mosquitoes, but it can also be transmitted through blood transfusions, organ transplants, contaminated needles or syringes or from mother to baby before or during childbirth.<sup>269</sup> A malaria infection is generally characterized by fever and chills, along with headache, malaise, fatigue, muscular pains, occasional nausea, vomiting and diarrhea.<sup>270</sup> Doctors can treat malaria effectively with antimalarial drugs.

Due to increased malaria prevention efforts, malaria mortality rates have fallen by more than 25 percent globally since 2000, and by 33 percent in the WHO African Region.<sup>271</sup> The Lantos-Hyde United States Global Malaria Strategy (USG) has contributed to the drop in malaria rates. U. S. investments in 20 countries through the President's Malaria Initiative (PMI) have resulted in significant improvements in population coverage of proven effective interventions. It has helped reduce mortality rates in children under the age of 5 by 16 to 50 percent in these countries over the past 5 to 7 years.<sup>272</sup>



**1,925 Malaria Cases**  
the most since 1971

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## Valley Fever

Valley fever (coccidioidomycosis) is an infection caused by the fungus *Coccidioides*, which is endemic to the soils of the U.S. southwest, mainly Arizona and California. People can breathe in dust containing spores that are able to dive deep into the lungs with one breath. For most people, the spores settle in the lungs, but never cause symptoms.<sup>273</sup> In others, the spores grow roots in the lungs and cause more severe problems — requiring treatment with anti-fungal drugs. Some patients develop flu-like symptoms that last from weeks to months and 5 percent to 10 percent will develop long-term lung problems. Around 1 percent of patients develop disseminated valley fever, where the disease wreaks havoc elsewhere in the body — causing meningitis, infections of the skin, bones and joints or even death.<sup>274</sup>

Anyone can catch valley fever, but those at highest risk for contracting the disease are those who work outside in soil-disrupting activities (e.g., construction or agriculture) and people over age 60. Those at greatest risk of developing a

severe infection include Blacks, Filipinos, pregnant women and people with diabetes or weakened immune systems.<sup>275</sup>

Despite its over 100-year existence, much is unknown about valley fever and many medical personnel are unfamiliar with it. Its symptoms — fever, cough, headache, rash and muscle and joint pain — mirror those of other common diseases, so it is most often misdiagnosed.<sup>276</sup> A 2013 MMWR article states that more than 20,000 cases of valley fever are reported each year, but the true number of infections could be significantly higher due to mild symptoms and misdiagnosis — upwards of 150,000.<sup>277</sup> Approximately 100 people a year die of valley fever — more than from pertussis, hantavirus and salmonella poisoning combined.<sup>278</sup> Though it sickens more people per month than West Nile virus does in a year, it has historically garnered little attention from the media or government officials.<sup>279</sup>

The economic impact of valley fever is significant. A recent study on valley fever-associated hospitalizations between

2000 and 2011 reported that the average hospital stay was 6 days, cost per day was \$6,800, and cost per patient was over \$55,000. Adjusting for inflation, the average total charges for valley fever in the United States from 2000 to 2011 was over \$2.2 billion. Sixty-two percent of those charges were paid by government payers — over \$1.38 billion.<sup>280</sup>

Awareness of valley fever is increasing. In September 2013, prompted by the “Just One Breath” series developed by the Reporting on Health Collaborative, valley fever experts — including leaders from CDC and NIH — convened in Bakersfield, California for Valley Fever Research Day. The two-day symposium focused on the disease and its impact on the community and the critical need for national attention and scientific research.<sup>281</sup> In October 2014, the FDA announced the fast-tracking of a new anti-fungal drug called Nikkomycin Z (NikZ) created specifically to treat valley fever. Clinical trials will begin next year since the FDA has designated the drug a “qualifying infectious disease product.”<sup>282</sup>

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## Carbapenem-resistant Enterobacteriaceae (CRE)

Enterobacteriaceae are a family of bacteria that include *Klebsiella* species and *E. coli*, which are found in normal human intestines. These bacteria can cause major infections when spread outside the gut, including pneumonia, bloodstream infections, urinary tract infections,

wound infections and meningitis.

Enterobacteriaceae are one of the most common causes of bacterial infections in both healthcare and community settings. Carbapenem are a type of antibiotic frequently used to treat severe infections. Carbapenem-resistant Enterobacteriaceae

are difficult to treat because they are resistant to commonly used antibiotics. Infections with these germs can be deadly — one report cites they can contribute to death in up to 50 percent of patients who become infected.<sup>283</sup>



## BIOTERROR THREATS

CDC classifies biological agents that could be used for an intentional bioattack into three categories:

- **Category A**, or “High-Priority Agents,” is considered the most dangerous and includes: Anthrax, botulism, plague, smallpox, tularemia and viral hemorrhagic fevers (e.g., Ebola, Marburg).
- **Category B**, or “Second-highest Priority Agents,” includes food safety threats (e.g., Salmonella and E. coli), ricin toxin, Typhus fever and viral encephalitis, among others.
- **Category C**, or “Third-highest Priority Agents” include emerging pathogens that could be engineered for mass dissemination in the future because of availability; ease of production and dissemination; and potential for high morbidity and mortality rates and major health impact. Hantavirus is an example of a Category C agent.<sup>284</sup>

Two threats that have been of high focus in U.S. bioterrorism preparedness strategies include:

- **Anthrax:** In September and October 2001, at least five envelopes containing *Bacillus anthracis* (anthrax) were mailed to Senators Patrick Leahy and Thomas Daschle and to members of the media in New York City and Boca Raton, Florida. After the bioterrorist attacks were identified, the FBI and the United States Postal Inspection Service (USPIS) formed a task force to investigate the crime. The investigation lasted seven years

and was undertaken by FBI field offices in Miami, New York, Newark, New Haven, Baltimore and Washington, D.C. At the beginning of the investigation, the limitations on scientific analysis prevented the task force from finding the culprit because it was impossible to determine precisely which spores the anthrax came from.

At least 22 victims contracted anthrax, and five people died from inhalation anthrax. An additional 31 people tested positive for exposure to anthrax spores. In all, 35 post offices and mailrooms were contaminated along with seven buildings on Capitol Hill in Washington, D.C.

Anthrax is a potentially lethal infection, particularly when it manifests as inhalation anthrax. Outside of a host, this bacterium normally resides as a spore — a hardy, dormant cell that may become active (germinate) in the right conditions. Anthrax generally affects large grazing animals, but it can also infect humans who handle products of infected animals. However, deliberate exposure to aerosolized anthrax spores also is a highly effective means of transmission.<sup>285</sup> Historically, numerous nations have experimented with anthrax as a biological weapon, including the U.S. offensive biological weapons program that was disbanded in 1969.<sup>286</sup> The worst documented outbreak of inhalation anthrax in humans occurred in Russia in 1979, when anthrax spores were accidentally released from a military biological weapons facility near the town of Sverdlovsk, killing at least 66 people. Much of the planning for the

Cities Readiness Initiative has centered on planning for the ability to respond to a major anthrax attack in urban areas.

- **Smallpox:** Although WHO declared that smallpox was eradicated in 1980, this contagious and deadly infectious disease caused by the Variola major virus, remains high on the list of possible bioterror threats.

The last naturally occurring case of smallpox was reported in 1977. Currently, there is no evidence of naturally occurring smallpox transmission anywhere in the world. Although a worldwide immunization program eradicated smallpox disease decades ago, small quantities of smallpox virus officially still exist in research laboratories in Atlanta, Georgia, and in Novosibirsk, Russia. There is a fear there may be other unknown sources of smallpox virus that could fall into the hands of terrorists. In January 2003, the Bush Administration declared smallpox the “number one bio-threat facing the country” and made planning for an attack a top priority.<sup>287</sup> The Administration launched a national smallpox vaccination initiative with the goal of immunizing 500,000 healthcare workers in 30 days and 10 million emergency response personnel within a year. Immunization rates fell well below that target level with approximately 40,000 people actually vaccinated. The plan faced obstacles, including unexpected side effects, worker compensation issues and liability concerns that precluded its full implementation.<sup>288, 289</sup>

## B. Health System Preparedness and Enhancing Surge Capacity and Infection Control

In public health emergencies, such as a new or major disease outbreak, a bioterror attack or catastrophic natural disaster, U.S. hospitals and healthcare facilities are on the front lines providing triage and medical treatment to individuals. The ability of our healthcare system to quickly provide safe care for an influx of patients during an emergency is critical, but it is often identified as one of the most difficult components of a preparedness response.

Not only must healthcare facilities be able to quickly ramp up staffing to meet increasing demand, but — as highlighted by the Ebola outbreak — they must be able to do so with clear and effective safety protocols in place, including adequate personal protective equipment, and staff that are highly trained to protect not only patients, but themselves. Two nurses who treated an Ebola patient in Dallas contracted the virus. While both survived, their experience highlights gaps in local implementation of guidance and communication from CDC and in basic infection control safety procedures and training.

- **Basic Infection Control and Safety:** It is critical that all medical care be provided under conditions that minimize or eliminate risks of healthcare-associated infections and adverse events. Outbreaks and large-scale patient notifications continue to be associated with breakdowns in standard precautions and lack of adherence to recommended prevention practices. A strong foundation in infection control and prevention is needed across the healthcare continuum. This will require clear standards, training and dedicated resources.

- **Emerging Threats:** When faced with a deadly contagion like Ebola, healthcare

facilities must have standard procedures in place to not only safely diagnose and treat patients, but also ensure that other patients and the healthcare workers themselves are protected from exposure. This requires a solid foundation built on basic infection control principles and not only sufficient personal protective equipment, but also thorough training in the proper use, removal and disposal of protective gear.

- **Surge Capacity:** During a severe health emergency — such as a pandemic flu outbreak or mass bioterror attack — the healthcare system would be stretched beyond normal limits. Patients would quickly fill emergency rooms and doctors' offices, exceed the existing number of available hospital beds, and cause a surge in demand for critical medicines and equipment. The challenge of how to equip hospitals and train healthcare staff to handle the large influx of critically injured or ill patients who show up for treatment after or during a public health emergency remains the single most challenging issue for public health and medical preparedness.<sup>290</sup> Emergency rooms and intensive care units (ICUs) have limited numbers of beds, staff and equipment to be able to respond to a major influx of patients.



The HPP, administered by ASPR, provides leadership and funding through grants and cooperative agreements to states, territories and eligible municipalities to improve surge capacity and enhance community and hospital preparedness for public health emergencies.<sup>291</sup> HPP was created to build capabilities in the areas of health system preparedness, health system recovery, medical surge, emergency operations coordination, fatality management, information sharing, responder safety and health and volunteer management. Through the planning process and cooperation within healthcare coalitions, facilities are learning to leverage resources, such as developing interoperable communications systems, tracking available hospital beds, and sharing assets such as mobile medical units. HPP was reauthorized in the Pandemic and All-Hazards Preparedness Reauthorization Act (PAHPRA, P.L. 113-5), but funding for the program has been cut from a high point of \$515 million in 2004 and is now funded at about \$255 million annually to support the entire healthcare system.

HPP has been working toward a model that recognizes that healthcare system preparedness must extend beyond focusing on individual hospitals, toward a coalition-based model to better leverage resources, disseminate information, enhance credibility and broaden reach.<sup>292, 293, 294</sup> A healthcare coalition is a collective network of healthcare organizations and public and private sector partners that work together to prepare for, respond to and recover from a disaster. Since 2007, HPP has piloted a coalition-based model, and in 2012, launched new measures to move the full program toward a coalition approach. The new measures focus on continuity of operations, medical surge and healthcare coalition development assessment. To help understand and address gaps during the initial domestic phases of the Ebola response, a 2014 IOM and National Research Council ad hoc committee of experts convened to identify a set of potential research priorities to inform public health and medical practice, including gaining an understanding of the environmental characteristics of the Ebola virus and standards for use for personal protective equipment and behavior.<sup>295</sup>

As Ebola has grown as a domestic concern, a government-wide response has been developed in partnership with the health system to create a tiered system for being able to diagnose and treat Ebola patients quickly, effectively and safely.<sup>296</sup> Initially in August 2014, only three U.S. healthcare facilities had the capacity to treat Ebola patients. As of December 2014, a tiered system has been developed for diagnosing and treating patients by 1) increasing the availability of Ebola training and PPE available for healthcare providers nationwide; 2) working with state and local public health officials to increase the number of “Ebola Assessment Hospitals” — as healthcare facilities that can serve as points of immediate referral for individuals who have a travel history and symptoms compatible with Ebola to be safely screened, isolated and then transported to facilities with additional capabilities; 3) expanding the number of Ebola Treatment Centers from three to 35 hospitals around the country; and 4) maintaining the three national bio-containment facilities — at Emory University Hospital, Nebraska Medical Center and the National Institutes of Health — for patients who are medically evacuated from overseas.

## RECOMMENDATIONS: Enhancing Health System Preparedness for Infectious Diseases and Surge Capacity

Health system preparedness capabilities have been one of the most persistent problems in public health preparedness and require increased agreement and implementation on crisis standards of care and improved integration of preparedness concerns into overarching healthcare systems and coordination across public health and healthcare providers. To help improve health system preparedness concerns, while ensuring safety protocols are in place, TFAH recommends:

- **Continuing to rebuild and modernize the Hospital Preparedness Program, including focusing on:**

- Rebuilding the program by restoring funding to enable adequate development of healthcare coalitions and training and exercising of hospital staff;
- Continuing to prioritize coordination between the inpatient and outpatient health systems, including long-term care facilities and clinical laboratories, and ensure that healthcare coalitions are reaching out to these partners;
- Defining a minimum set of standards and population size that a healthcare coalition must meet to be considered effective. While HPP has avoided being overly-prescriptive with grantees, limited budgets demand that healthcare coalitions should meet a federally-defined standard for their ability to respond to a disaster;
- Aligning HPP measures with other health system quality initiatives, such

as CMS measures, Joint Commission standards and National Quality Forum (NQF) measures; and

- Publicly report data from the recently revamped HPP measures so policy-makers can track progress and gaps in the program.
- **Improving hospital preparedness — as a partnership across hospitals, HPP and public health — for emerging and ongoing infectious disease threats:**
- Every hospital should have baseline capabilities for screening and basic isolation capabilities to ensure healthcare workers and patients are safe from a potential threat — including training in infection control and use of protective gear and safe removal and disposal of protective gear and waste. To maximize efficient and effective use of expertise and resources, hospitals should be part of a “tiered” system — where patients are safely transported to a set of hospitals with increased capabilities and facilities to treat different potential scenarios for a range of types of emerging threats — such as the network of Ebola-ready hospitals or a tiered system for being able to screen, triage and treat a mass influx of patients during a severe pandemic flu outbreak;
- Hospitals and public health agencies should invest in training, drills and preparing frontline healthcare workers for unfamiliar infections and disasters;
- Every hospital and outpatient health-

care system should be able to screen for emerging threats, isolate patients when necessary, protect healthcare workers and prepare patients for transport if unable to treat;

- Health systems and HIT vendors should incorporate health alerts from CDC into electronic medical records so that the triage process includes relevant screening questions and decision support; and
- Clinical laboratories should have ongoing staff training to ensure familiarity and adherence with protocols for handling, packaging and preparing dangerous pathogens and waste for transport.
- **Incorporating preparedness into the healthcare delivery system:**
- State and local emergency medical services (EMS), 9-1-1 public safety answering points (PSAP) and other medical first responders should be included as partners and participants in the U.S. healthcare delivery system to ensure a coordinated response with well-trained and equipped personnel during a medical surge.
- CMS should finalize and expedite the release of emergency preparedness requirements for Medicare and Medicaid participating providers.<sup>297</sup> CMS and ASPR should work together to align those requirements, provide technical assistance to eligible entities, ensure coordination with healthcare coalitions and track progress.



- Newly established federal and state healthcare marketplaces should begin planning for disasters. Exchange marketplace systems, using information provided by providers and insurers, should have the ability to operate and maintain key enrollment and coverage information in case of emergency. In addition, systems must be interoperable in a way that would permit sharing data across states if people are evacuated in large numbers.

- Expand telemedicine and telephone triage to increase surge capacity and concentrate resources where needed.

- **Establishing and implementing effective crisis standards of care and resource allocation planning:**

- Public health must take a leadership and quality assurance role to ensure health facilities and systems are engaging in meaningful crisis and contingency standards of planning and using resources

created by the IOM and ASPR's Communities of Interest website. If necessary, the federal government should require crisis standards planning of PHEP and HPP grantees. Meanwhile, given recent shortages of saline solution and other everyday medical products, the roles and potential actions of federal agencies, including ASPR, CMS and FDA, should be clarified before the next outbreak, disaster drug or medical supply shortage.

## RECOMMENDATIONS: Reducing Healthcare-Associated Infections Across the Healthcare Spectrum

HAIs continue to be an ongoing, serious preventable problem, where millions of Americans are infected each year while receiving routine medical care. HAIs are still a problem in hospitals, and at the same time there is an increasing amount of medical care being delivered through outpatient venues and long-term care facilities. HAI prevention, surveillance and outbreak reporting requirements are lacking in many of these additional settings. Compared to acute care facilities, these facilities often operate with limited oversight from state licensing boards, accrediting organizations or federal authorities. Ongoing outbreaks stemming from breakdowns in basic infection control such as reuse of syringes and the spread of infections with drug-resistant bacteria point to unmet prevention needs.

Recent efforts to improve infection control practices have started showing promising results in reducing HAIs. TFAH recommends that public health and healthcare officials should make limiting HAIs a top priority in hospitals and across the U.S. healthcare system, which includes:

- **Aligning incentives to promote prevention:** Initiatives like the Medicare “no pay” rules and prevention-oriented healthcare payment strategies outlined

in a call to action in the American Journal of Infection Control can provide incentives for healthcare providers to improve practices to reduce infections and infection-related costs.”<sup>298</sup>

- **Supporting State HAI and Infection Control Programs:** Key areas where

states can play a critical role in supporting infection control and HAI prevention:

- Coordinate and assess infection control capacity at healthcare facilities in each jurisdiction;
- Ongoing tracking of local facilities performance through National Healthcare Safety Network to identify facilities in need of assistance and to monitor national progress in infection control;
- Support the identification of single infections and clusters of infections, and rapidly implement control measures;
- Implement and facilitate new infection control licensure requirements for healthcare workers and collaborate with state hospital associations and medical societies to survey infection control training needs and provide CDC supported trainings.

- **Fully and Swiftly Implementing the National Action Plan to Prevent**

**Healthcare-Associated Infections:** A Roadmap to Elimination:<sup>299</sup> Some key strategies in the Action Plan include:

- Reducing inappropriate and unnecessary use of devices, like catheters and ventilators;
- Expanding HAI prevention efforts beyond the hospital setting, to include ambulatory surgery centers, dialysis clinics, and nursing homes;
- Adhering to the best hygiene practices;
- Prescribing antibiotics only when absolutely necessary;
- Improving education, communication and best-practice protocols as the regular standard-of-care throughout entire healthcare facilities; and
- Improving reporting and regulatory oversight of HAIs and financial incentives for reducing the number of infections.

- **All healthcare facilities should make following infection control best practices a top priority.**

- Efforts to define and enforce basic standards of infection control in inpatient and outpatient settings (e.g., [www.cdc.gov/hai/settings/outpatient/outpatient-care-guidelines.html](http://www.cdc.gov/hai/settings/outpatient/outpatient-care-guidelines.html)) and effective oversight activities (e.g., audits and inspections), though increasing, require strengthening at both the state and federal levels.

- **All hospitals should have an infection prevention specialist on staff.**

By Eric Toner, MD, Senior Associate,  
UPMC Center for Health Security

# The Basics of Hospital Infection Control and How It Applies to Diseases Like Ebola

It is clear that the unlucky Dallas hospital that treated that first U.S.-diagnosed Ebola patient was not well prepared for such a disease. It is also reasonable to assume that most U.S. hospitals were also not optimally prepared then to take care of a patient with Ebola or another highly contagious and lethal disease. Why is that?

Quite simply, it is not enough to have plans, guidance and equipment, the hospital personnel at the bedside have to implement the plans flawlessly. This takes extraordinary training and lots of practice — both of which are quite expensive and disruptive to normal operations. So, who is in charge of ensuring that hospitals are prepared for any potential infectious disease outbreak? The answer to that question, as described below, is complicated.

Most U.S. hospitals are licensed by the states, not by the federal government and are therefore mostly subject to state laws and regulations. In reality, there is no single set of infection prevention and control requirements for healthcare facilities and no single agency with regulatory authority. Rather, infection control in hospitals is governed by a mélange of local, state and federal laws and regulations and standards set by funding and accrediting organizations. There are numerous sets of useful guidelines promulgated by government agencies and professional societies such as the Association of Professional in Infection control and Epidemiology (APIC) and Society for Healthcare Epidemiology of America (SHEA).

## Centers for Disease Control and Prevention

CDC is not a regulatory agency. It does not inspect healthcare facilities nor does it enforce any laws or regulations related to infection control within hospitals. It does, however, provide the comprehensive National Healthcare Safety Network surveillance system to monitor healthcare-related infections and process of care measures, and issues relevant guidelines that are generally quite influential but which hospitals are not required to follow. CDC also generates education and training materials, alerts and best practices. Each hospital, and to some extent each clinician within each hospital, makes his or her own decision about which aspects of the guidelines and other materials he or she will follow and how they will be implemented.

## State and Federal Public Health Departments and Agencies

Typically, states have laws that require healthcare facilities to maintain hygienic conditions and address general infection control. The state health departments have the authority to inspect hospitals and enforce state laws and regulations. Local and state health departments

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Accrediting organizations, such as The Joint Commission's Infection Prevention and Control Standards, require that a participating hospital have at least one individual who is responsible for an infection control program although there is no training or expertise requirement for that individual.

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all have lists of infectious diseases that must be reported to them by healthcare practitioners and facilities. These reportable diseases typically include infections such as sexually transmitted infections, salmonella and measles. In addition, CSTE annually publishes a list of infectious diseases of particular concern that should be reported within each state and to CDC. Included in this list are diseases that have caused outbreaks of global concern such as anthrax, SARS, MERS and Ebola.<sup>300</sup>

### **Occupational Safety and Health Administration**

Healthcare facilities are required by federal law (29 CFR 1910.1030) to adhere to minimal standards of precautions against bloodborne pathogens as determined by the federal Occupational Safety and Health Administration (OSHA).<sup>301</sup> This includes use of universal precautions (wearing gloves and washing hands), handling of needles and other sharp objects, training employees, and having a written bloodborne exposure plan. Beyond this, hospitals are required to have an infection control program if they participate in Medicare or Medicaid or if they are accredited by The Joint Commission, a non-governmental organization that accredits most U.S. hospitals.

### **Centers for Medicare and Medicaid Services**

CMS funds the healthcare of more than 100 million people in the United States. In order to participate and

therefore be paid by CMS, hospitals must agree to abide by Conditions of Participation (COP),<sup>302</sup> which include provisions related to infection control (§482.24) and requirements to report healthcare-associated infections to the CDC National Healthcare Safety Network.<sup>303</sup> CMS, typically acting through state health departments, conducts unannounced surveys (inspections) of hospitals that are not surveyed by the Joint Commission (see below). CMS, again through the state health departments, will also conduct unannounced surveys as part of an investigation of a complaint. In a nutshell, CMS requires that hospitals have “an active program for the prevention, control, and investigation of infections and communicable diseases” along with a quality assurance process to address infection related issues.

### **Accrediting Organizations**

Accrediting organizations, such as The Joint Commission's Infection Prevention and Control Standards, require that a participating hospital have at least one individual who is responsible for an infection control program although there is no training or expertise requirement for that individual. The individual must also have access to an infection control expert. Further, the hospital must provide the program with some amount of funding, equipment and laboratory resources. The Joint Commission's standards require

hospitals to undertake infectious disease surveillance, investigate outbreaks, and report certain diseases to local, state and federal public health authorities as required by law. The Joint Commission conducts onsite surveys (inspections) of participating hospitals on a periodic basis (every few years) and looks for evidence of compliance with its standards.<sup>304</sup> The Joint Commission has been granted “deeming authority” by CMS, meaning that these surveys also serve to document compliance with CMS's COP.

### **Conclusion**

Unfortunately, the hospital-acquired Ebola infections in Dallas demonstrate that normal day-to-day infection control practices are far from perfect. Although Ebola makes infection control deficiencies very obvious, the same sorts of lapses are the root cause of HAIs that occur every day. CDC, CMS and the Joint Commission have made reducing HAIs a top priority in recent years and there is evidence that these efforts have had some success. But a perpetual high-level commitment to rigorous infection control in every hospital is needed. Hospital executives and boards must become more proactive when alerted about a contagious and lethal threat and not wait until there is misadventure that becomes “breaking news.” CDC and federal leaders, for their part, must realize that extraordinary measures are needed to truly prepare the U.S. healthcare system for an Ebola-like disease.



## C. Changing Healthcare and Public Health Norms to Increase Vaccinations and Combat Antibiotic Resistance

Two of the most revolutionary advances in fighting infectious diseases have been biomedical — vaccines to prevent diseases and antibiotics to treat them.

The current system, however, perpetuates the underuse of vaccines and overuse of antibiotics — diminishing their potential and effectiveness as tools against disease.

Increasing the use of vaccines and discouraging the misuse of antibiotics requires rethinking how they are provided as part of routine healthcare and how their use is supported as part of the larger public health system.

Both require major public and healthcare education efforts — to help educate about the effectiveness and safety of available vaccinations and to discourage overuse of antibiotics. And both require changes in healthcare delivery practices — to make vaccines more easily accessible as part of routine healthcare and beyond the traditional healthcare system, and to disincentivize unnecessary prescribing.

### 1. Improving Vaccination Rates — for Children and Adults

Vaccines are the safest and most effective way to manage many infectious diseases in the United States. Some of the greatest public health successes of the past century — including the worldwide eradication of smallpox and the elimination of polio, measles and rubella in the United States — are the result of successful vaccination programs.<sup>305</sup>

However, despite the recommendations of medical experts that vaccines are effective and that research has shown vaccines to be safe, on average, an estimated 45,000 adults and 1,000 children die annually from vaccine-preventable diseases in the United States.<sup>306</sup>

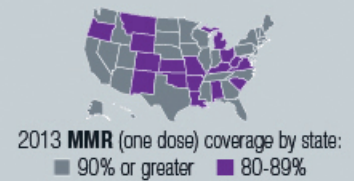
Millions of Americans are not receiving the recommended vaccinations. For instance, more than 2 million preschoolers do not receive

#### Opportunities for improvement

##### Increase MMR (Measles, Mumps and Rubella) vaccination rates

In 2013, 17 states had MMR coverage below 90.0%, and these states are at higher risk for measles outbreaks.

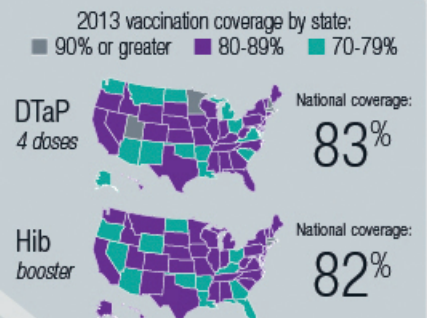
Even in states with high MMR coverage, there can be communities with groups of people who are unvaccinated, and the people in these communities are vulnerable to measles as well.



##### Finish the toddler vaccine series

Many clinicians and parents are challenged in making sure children get all the recommended vaccine doses during the second year of life.

Make sure that children continue after their first birthday to get all recommended doses.



##### Provide vaccines for all children

In 2013, children living below the poverty line had lower coverage for several vaccines. Fortunately, the Vaccines For Children (VFC) program provides vaccines for children who are uninsured.

2013-2014 data are not complete. Source: National Notifiable Disease Surveillance System (NNDS) and direct report to the CDC

recommended vaccinations; there have been outbreaks of measles, mumps and whooping cough around the country; vaccination gaps put teens and young adults at risk for HPV and bacterial meningitis; and more than 35 percent of seniors have not received the recommended pneumococcal vaccination.<sup>307, 308, 309</sup>

Gaps are even larger for the number of adults not receiving recommended vaccinations. While many efforts focus on vaccines for children, it is also important to address the fact that currently, there is no real system or structure in place to ensure adults have access to or receive the vaccines they need unless they are part of institutions that have vaccine requirements, such as being enrolled in colleges or

universities, serving in the military or working in a healthcare setting. Significant numbers of adults do not have regular well care exams, switch doctors or health plans often or only seek care from specialists who do not traditionally screen for immunization histories or offer vaccines, which makes it extremely difficult to establish ways for people to know what vaccinations they need and for doctors to track and recommend vaccines to patients.

The Community Preventive Services Task Force, which evaluates the available evidence base for public health programs and strategies, has found that when education and registry systems are in place and used, combined with other intervention components, they are effective in improving vaccination rates.<sup>310</sup>

## VACCINE COVERAGE

Historically, limits on health insurance coverage and high costs have been an obstacle. The ACA now requires no co-pay or cost sharing for routinely recommended adult vaccines that are administered by in-network providers for adults enrolled in group and individual plans or are part of Medicaid expansion. This eliminates an added cost burden for individuals and by increasing the numbers of people vaccinated overall, helps protect the wider population by limiting the spread of disease.

States, however, are not required to eliminate co-pays for vaccinations for their existing or base Medicaid beneficiaries. Any given state can set policies

for its coverage of different vaccinations. To help incentivize states to expand coverage of recommended vaccinations without co-pays to their base Medicaid population, the ACA allows CMS to offer states a 1 percent Federal Medical Assistance Percentage (FMAP) increase for these services. The Medicaid program typically provides certain levels of matching payments to states for different types of medical care.

As of December 2013, only five states have expanded coverage to allow all of the Medicaid beneficiaries to get all the medically recommended vaccinations without co-pays. Medicaid-eligible children can receive vaccinations

through the Vaccines for Children (VFC) program at no cost.

In addition, Medicare does not consistently provide first dollar coverage for vaccines and the different policies for what is covered under Part B and Part D leaves many seniors with gaps in coverage. Beneficiaries can get their flu, pneumonia and HBV (for at-risk individuals) vaccine covered under Medicare Part B, but an out-of-pocket payment may be required, depending on the shot and provider. The rest of the recommended vaccines are covered under Medicare Part D, the prescription drug benefit, so the patient must find a provider who accepts Part D and carries the needed vaccine.

## RECOMMENDATIONS: Increasing Vaccination Rates

Improving the nation's vaccination rates would help prevent disease, mitigate suffering, and reduce healthcare costs. TFAH recommends a number of actions that can be taken to increase vaccination rates for children, teens and adults around the country, including:

- **Minimize vaccine exemptions:**

States should enact and enable universal childhood vaccinations except where immunization is medically contraindicated. Non-medical vaccine exemptions, including personal belief exemptions, enable higher rates of exemptions in those states that allow them.

- **Increasing public education**

**campaigns about the safety and effectiveness of vaccines:** Federal, state and local health officials, in partnership with medical providers and community organizations, should conduct assertive campaigns about the importance of vaccines, particularly stressing and demonstrating the safety and efficacy of immunizations. Targeted outreach should be made to high-risk groups and to racial and ethnic minority populations where the misperceptions about vaccines are particularly high.<sup>311</sup>

- **Routinizing adult vaccination recommendations and referrals:**

Private providers and health systems should have standing orders for vaccinations so every provider of care for adults can assess the need, recommend, and either provide directly or refer to another provider for vaccination. Vaccine locator systems should be expanded to build an effective vaccine referral system so providers can ensure the vaccine is administered, just as for mammograms or other preventive services. EHRs

should provide reminder recalls to patients and providers through text messages or other communications. A routine adult vaccination schedule should be established, where healthcare providers are expected to purchase, educate, advise about and administer immunizations to patients.

- **Expand alternate delivery sites:** The National Vaccine Advisory Committee (NVAC) has recommended including expansion of vaccination services offered by pharmacists and other community immunization providers, vaccination at the workplace, and increased vaccination by providers who care for pregnant women.<sup>312</sup>

- **Increasing provider education:** Professional medical societies and medical and nursing schools should support ongoing education and expanded curricula on vaccines and vaccine-preventable diseases, and expand standard practice for providers to discuss and track vaccination histories for all patients — including adults — and offer vaccinations to adults during other doctor and hospital visits.

- **Bolstering immunization registries and tracking:** States should take steps to integrate immunization registries and EHRs to help track when patients receive vaccines, improve information sharing across providers, remind providers to routinely provide recommended vaccinations, remind patients of vaccinations and address gaps. State health information

exchanges can make this process simpler by integrating registries into EHRs and enabling Immunization Information Systems (IIS) data exchange between states. Measures must be taken to encourage greater participation by healthcare providers, particularly private providers, in registries. Lifespan registries would also help better track patients' medical history to ensure they have received all needed vaccinations throughout their lives — to help improve and track vaccination rates for both children and adults.

- **Supporting expanded research and use of alternatives to syringe administration of vaccination.**

Experiences with alternative delivery methods, such as using the nasal mist intranasal administration of live-attenuated influenza vaccine (LAIV), have been well-received by the public and have contributed to increased uptake in pediatric and adult vaccinations.<sup>313, 314</sup>

- **Ensuring first dollar coverage of all recommended vaccines under Medicare and Medicaid:**

Vaccines recommended by ACIP should be covered under both Medicare Part B and Part D without cost sharing, to ensure complete, equitable access to vaccines for all Medicare beneficiaries. States that have not already done so should expand their Medicaid programs to ensure more low-income Americans have access to life-saving vaccines.

## the **benefits** of **flu vaccination**

The estimated number of influenza-associated illnesses prevented by flu vaccination during the 2012-2013 season:

**6.6 million**



or the population of the state of **Arizona**

The estimated number of flu-associated medical visits prevented by vaccination during the 2012-2013 season:

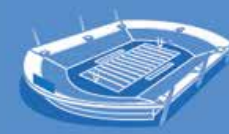
**3.2 million**



or the passengers of **1,067** mega cruise ships

The estimated number of flu hospitalizations prevented during the 2012-2013 season:

**79,000**



or all the fans in a **FULL** NFL stadium

Source: U.S. Centers for Disease Control and Prevention

### **RECOMMENDATIONS: Increasing Vaccination Rates**

#### ● **Continuing support for vaccine funding programs:**

While the ACA extends no-cost coverage of recommended vaccines to most Americans, the VFC and Section 317 programs will continue to provide a safety net for individuals who are uninsured, have “grandfathered” plans that do not cover these vaccinations or remain outside of the traditional healthcare system, such as children who are eligible but not enrolled in Medicaid/State Children’s Health Insurance Program (CHIP). Section 317 grants have also been key to building the immunization infrastructure, including registries, surveillance, outreach and service delivery.

#### ● **Requiring universal immunization of healthcare personnel for all ACIP recommended vaccinations:**

The Infectious Diseases Society of American (IDSA), the Society for Healthcare Epidemiology of American and the Pediatric Infectious Diseases Society (PIDS) support universal

immunization of healthcare personnel (HCP) by healthcare employers (HCE) as recommended by ACIP. According to a joint policy statement by the three Societies, mandatory immunization programs are the most effective way to increase HCP vaccination rates. As such, the Societies support HCE policies that require HCP documentation of immunity or receipt of ACIP-recommended vaccinations as a condition of employment, unpaid service, or receipt of professional privileges. For HCP who cannot be vaccinated due to medical contraindications or because of vaccine supply shortages, HCEs should consider, on a case-by-case basis, the need for administrative and/or infection control measures to minimize risk of disease transmission. The Societies also support requiring comprehensive educational efforts to inform HCP about the benefits of immunization and risks of not maintaining immunization.

## Vaccine Preventable Diseases

- **Diphtheria:** Diphtheria is a serious bacterial disease that frequently causes heart and nerve problems. Without treatment, 40 to 50 percent of infected persons die, with the highest death rates occurring in the very young and the elderly. Diphtheria has largely been eradicated in the United States and other industrialized nations through widespread vaccination. There were only seven reported cases of diphtheria between 1998 and 2009 in the United States.<sup>315</sup> However, children and adults who travel to endemic areas are still at risk for diphtheria.
- **Haemophilus influenzae type b (Hib):** Prior to the vaccine, Hib meningitis killed 600 children each year, and caused seizures among many survivors as well as permanent deafness and mental retardation. Since the vaccine's introduction in 1987, the incidence of serious Hib bacteria infection has declined by 98 percent in the United States.
- **Hepatitis A:** In 2011, there were 2,000 hepatitis A infections reported in the United States.<sup>316</sup> From 2007 to 2010, it resulted in between 70 to 100 deaths. Hepatitis A disease tends to occur in outbreaks sometimes attributed to many people having eaten the same contaminated food, or transmission from person to person after exposure to Hepatitis A in an endemic country. CDC confirmed an outbreak of 162 people ill with Hepatitis A in the United States in 2013.<sup>317</sup>
- **Hepatitis B:** In the United States, an estimated 800,000 to 1.4 million people have chronic Hepatitis B virus infection. More than 90 percent of infected infants and up to 10 percent

of infected adults develop chronic infection, increasing chances for chronic liver disease, cirrhosis and liver cancer. Hepatitis B-related liver disease kills about 5,000 people and costs \$700 million annually in healthcare and productivity-related costs.<sup>318</sup>

- **Human Papillomavirus (HPV):** HPV is the most common sexually transmitted infection and is a major cause of cervical and oropharyngeal (middle of the throat) cancer. Approximately 79 million Americans currently are infected with HPV, and another 14 million people become newly infected each year.<sup>319</sup> The HPV vaccine includes protection against the two HPV strains that cause 70 percent of all cervical cancers.
- **Influenza:** Many illnesses are erroneously called “flu.” These include respiratory as well as gastrointestinal disorders and can be caused by a variety of infectious agents. Influenza, however, is a specific respiratory infection caused by influenza viruses. Influenza vaccine

protects against influenza, not the other disorders. In an average year, influenza causes approximately 3,000 to a high of about 49,000 deaths and may contribute to approximately 200,000 hospitalizations in the United States.<sup>320</sup>

- **Measles:** As a result of widespread vaccination, measles is no longer endemic in the United States. However, because measles is still widespread in many countries, the United States is at risk of importation of the disease from international travelers and from U.S. residents who travel abroad, and if high immunity is not maintained in adults and children, there is a risk of re-establishment of endemic transmission. Measles is highly contagious. Each year, on average, 60 people in the United States are reported to have measles. Yet in just the first half of 2014, the United States saw the highest number of cases since 1994. From January through October 2014, more than 600 measles cases were reported in 22 states.<sup>321</sup>

The infographic features a red header with the text "HEALTH ADVISORY: MEASLES" in white and yellow. Below the header is a map of the United States. Three blue-bordered boxes are arranged horizontally across the map. The first box on the left contains the text "Measles spreads easily and can cause serious illness." and an illustration of a red female figure and a white male figure with a red arrow labeled "MEASLES" pointing from the female to the male. The middle box contains the text "Get vaccinated to prevent measles." and an illustration of a white figure sitting and receiving a yellow injection. The third box on the right contains the text "Protect yourself from measles." and an illustration of a red female figure and a white male figure with a large yellow "X" over them and the word "MEASLES" written across the "X". Below the boxes, there is contact information: "For more information: Call 800-CDC-INFO (232-4636) Visit www.cdc.gov/travel". To the right of the contact information are the CDC logo and the text "U.S. Department of Health and Human Services Centers for Disease Control and Prevention".

Source: U.S. Centers for Disease Control and Prevention

- **Meningococcal disease:** Meningococcal disease is a serious bacterial illness, and is a leading cause of bacterial meningitis in children 2 through 18 years old in the United States. About 1,000 people get meningococcal disease each year in the United States and 10 percent to 15 percent of these people die. Infants, the elderly, college students living in dormitories and military recruits living in barracks are especially vulnerable.
- **Mumps:** Prior to the mumps vaccine, on average 200,000 mumps cases were reported in the United States per year with 20 to 30 deaths. Since a second dose of mumps vaccine was added to the standard childhood immunization series, annual cases are now in the hundreds rather than the thousands, but outbreaks still occasionally occur.
- **Pertussis:** Also known as whooping cough, pertussis is highly contagious and can result in prolonged coughing spells that may last for many weeks or even months. Approximately 50 out of every 10,000 people who develop pertussis die from the disease. Since the 1980s, the number of reported pertussis cases has steadily increased, especially among adolescents and adults.<sup>322</sup> In 2012, a total of 41,880 cases of pertussis were reported to the CDC, the highest number since 1955. In 2014, from January 1 to August 16, 17,325 cases of pertussis were reported to CDC — a 30 percent increase compared with the same time period in 2013.<sup>323</sup> Young infants who die from pertussis often may have caught the infection from an adult or adolescent.
- **Pneumococcal disease:** The pneumococcal bacterium is spread by coughing and sneezing. It is the most common cause of bacterial pneumonia, inflammation of the coverings of the brain and spinal cord (meningitis), bloodstream infection (sepsis), ear infections, and sinus infections (sinusitis) in children under two years of age. The elderly are especially susceptible to this infection. There are more than 50,000 cases per year in the United States and rates are higher among elderly and very young infants. The fatality rate ranges from about 20 percent to 60 percent among the elderly.<sup>324</sup>
- **Rotavirus:** Rotavirus is a disease of the digestive tract. Infection causes acute gastroenteritis (vomiting and diarrhea) and humans of all ages are susceptible to rotavirus infection. According to CDC, before use of a rotavirus vaccine, each year rotavirus was responsible for more than 400,000 doctor visits; more than 200,000 emergency room visits; 55,000 to 70,000 hospitalizations; and between 20 and 60 deaths in the United States. Rotavirus vaccine now prevents an average of 40,000 to 50,000 hospitalizations a year among children under the age of 5 years old.
- **Rubella:** Before the rubella vaccine was introduced, widespread outbreaks mostly affected children in the 5 to 9 year age group. Between 1962 and 1965, rubella infections during pregnancy were estimated to have caused 30,000 still births and 20,000 children to be born impaired or disabled. Due to a successful vaccination program, rubella is no longer transmitted year round in the United States and fewer than 20 cases are reported every year. Rare cases of congenital rubella syndrome continue to be reported — almost all are acquired outside of the United States.
- **Tetanus:** Commonly known as lockjaw, tetanus is a severe disease that causes involuntary contractions of the muscles. Tetanus bacteria grow in soil and infection is usually caused by a dirty puncture wounds. In the United States, mortality due to tetanus has declined at a constant rate due to the widespread use of tetanus toxoid-containing vaccines since the late 1940s. According to CDC, during the period 2001 to 2008, a total of 233 cases and 26 deaths from tetanus were reported in the United States.<sup>325</sup>
- **Varicella (Chickenpox):** Although usually a self-limiting illness, varicella is a highly contagious virus that can lead to severe illness with complications such as secondary bacterial infections, severe dehydration, pneumonia, central nervous system deficits/disease and shingles. Each year, more than 3.5 million cases of varicella, 9,000 hospitalizations and 100 deaths are prevented by varicella vaccination in the United States.<sup>326</sup>
- **Zoster (Shingles):** Zoster is a very painful nerve infection caused by the same virus as chickenpox and is often accompanied by a localized skin rash with blisters and pain may persist for weeks or months after the rash resolves.<sup>327</sup> Anyone who has ever had chickenpox can develop shingles because the virus remains in the nerve cells of the body after the chickenpox infection clears and can emerge years later. The disease most commonly occurs in people 50 years and older, and those with compromised immune systems. There are approximately one million zoster cases annually; one in three Americans will get shingles in their lifetime.

## 2. Curbing Antibiotic-resistant Superbugs

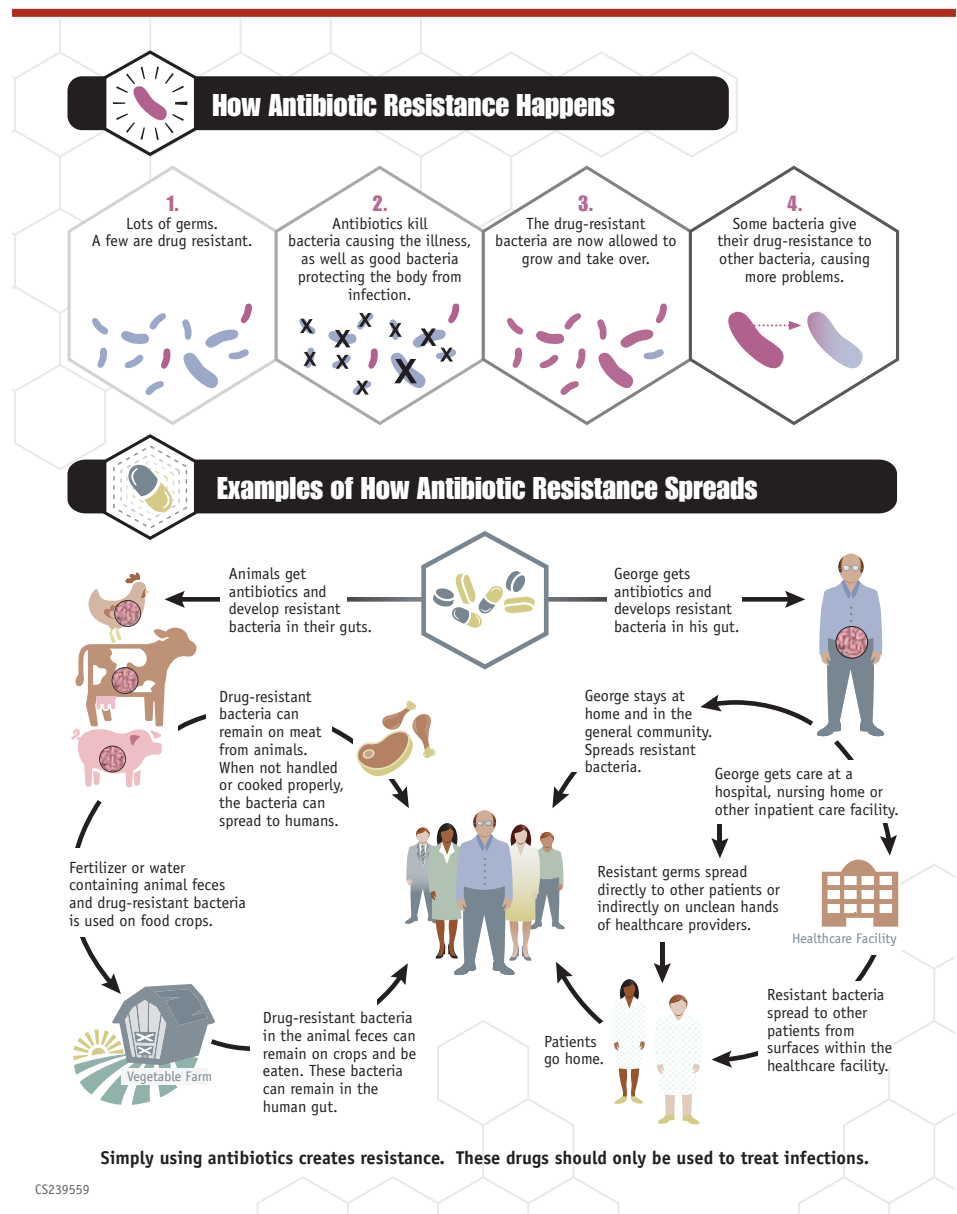
Antimicrobial resistance presents one of the greatest threats to human health around the world. While antibiotics have been used to treat countless bacterial infections since the 1940s, over time, some bacteria have adapted so that antibiotics can no longer effectively treat them. In these cases, once easily cured infections like strep and staph can in some cases turn lethal.

While antibiotic treatment is often appropriate and can even be lifesaving for many types of infections, antibiotics are commonly being used unnecessarily — often being prescribed for viruses or other ailments. Studies have demonstrated that treatment indication, choice of agent, or duration of therapy can be incorrect in up to 50 percent of the instances in which antibiotics are prescribed.

- One study reported that 30 percent of antibiotics received by hospitalized adult patients, outside of critical care, were unnecessary; antibiotics often were used for longer than recommended durations or for treatment of colonizing or contaminating microorganisms.
- Overuse increases the likelihood that drugs will be less effective when needed against bacterial infections. A 2014 study in *Infection Control and Hospital Epidemiology* suggests that there may be pervasive use of redundant antimicrobial therapy within U.S. hospitals.<sup>328</sup> CDC estimates up to half of antibiotic use in humans and much of antibiotic use in animals is unnecessary.<sup>329</sup> According to a study in the *New England Journal of Medicine*, the rates of antibiotics prescribed per year translate to treating four out of every five Americans.<sup>330</sup>

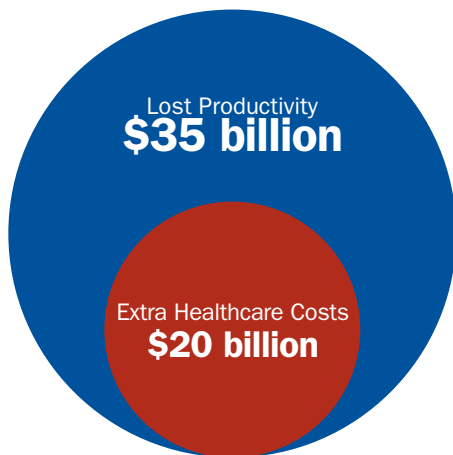
CDC issued an *Antibiotic Resistance Threats in the U.S. 2013* report in which it prioritized a list of 18 organisms that are an urgent, serious or concerning threat to

patient safety in the United States as they are resistant or increasingly resistant to antibiotics or have become more common because of widespread use of antibiotics.<sup>331</sup>



Each year more than 2 million Americans develop antibiotic-resistant infections — and at least 23,000 of these people die as a result.<sup>332</sup>

**Economic Impact of Antibiotic Resistance in Lost Productivity and Extra Healthcare Costs**



These are considered to be very conservative estimates, since current surveillance and data collection capabilities cannot capture the full impact. Experts warn that antibiotic-resistance is expected to continue to grow and become increasingly difficult to manage.

Antibiotic resistance leads to more than eight million additional days Americans spend in the hospital a year, costs the country an estimated extra \$20 billion in direct healthcare costs and at least \$35 billion in lost productivity annually.<sup>333, 334</sup>

As resistance rates continue to increase and more and more people are sickened and die due to resistant infections, fewer and fewer antibiotics are in the pipeline for approval, particularly to treat the most serious and life-threatening infections.<sup>335</sup> Many pharmaceutical companies have abandoned antibiotic research and development because they are less profitable than drugs to treat chronic conditions.

In 2014, the White House released The National Strategy for Combating Antibiotic Resistant Bacteria and a related executive order. The Strategy included five goals: slowing the development of resistant bacteria; strengthening surveillance; advancing development of diagnostic tests; accelerating research of new antibiotics and vaccines; and improving international collaboration. The executive order established a Task Force for Combating Antibiotic-Resistant

Bacteria, co-chaired by the Secretaries of Defense, Agriculture, and HHS.<sup>336</sup>

The President's Council of Advisors on Science and Technology (PCAST) also released a report in 2014, outlining recommendations around new antibiotics and diagnostics, surveillance and stewardship.<sup>337</sup>

By 2020, federal and private partners will aim to meet numerous goals, among them to develop new antibiotics, to find alternatives to antibiotics for promoting growth in animals and to study the relationship between antibiotic use in animals and antibiotic resistance.<sup>338</sup>

In October 2014, the IDSA convened the inaugural meeting of the U.S. Stakeholder Forum on Antimicrobial Resistance (S-FAR), which is comprised of over 90 organizations, including TFAH. In years past, CDC, FDA, USDA and other public health agencies have identified a number of strategies to reduce antibiotic resistance. A federal Interagency Task Force on Antimicrobial Resistance was created in 1999 and in 2001, they released *A Public Health Action Plan to Combat Antimicrobial Resistance* and updated the plan in 2012.<sup>339</sup> CDC, FDA and USDA also have been tracking antibiotic resistance in foodborne bacteria since 1996 through the National Antimicrobial Resistance Monitoring System (NARMS) and CDC tracks infectious diseases, HAIs and foodborne illnesses through a range of surveillance systems.<sup>340</sup>



## RECOMMENDATIONS: Reducing Antibiotic Resistance

TFAH recommends policies that help curb antibiotic overuse and encourage new antibiotic development become high priorities, including:

### Fully and rapidly implementing the 2014 Executive Order and National Strategy for Combating Antibiotic-Resistant

**Bacteria:**<sup>341, 342</sup> The Administration should move forward with a detailed action plan to implement the White House strategies, including a multiyear budget plan. Next steps should include:

- Reducing Overprescribing: CMS should make an effective, facility-appropriate antibiotic stewardship program a Condition of Participation for all CMS-enrolled facilities. Facilities should also participate in CDC's National Healthcare Safety Network Antimicrobial Use and Resistance (AUR) Module, which allows them to report and analyze antimicrobial usage at their facility as part of antimicrobial stewardship efforts and submit data through NHSN. Antibiotics usage should be added as a National Quality Forum quality measure; data to populate such measures should be included as a Meaningful Use requirement for EHRs. CMS, CDC, accrediting organizations, healthcare facilities and medical organizations must work

together to reduce overprescribing and misuse of antibiotics by tracking and publicly reporting prescribing data, educating providers and patients about the harm of inappropriate prescribing, and providing clinical decision support through HIT.

- Reducing overuse in agriculture: The FDA should fully implement and strengthen guidance to industry regarding the nontherapeutic use of antibiotics in food animals, such as by eradicating inappropriate use for disease prevention, requiring real veterinary oversight on the farm and a system to monitor how antibiotics are being used on the farm, and tracking the impact of these policies on antibiotic usage and resistance.
- Incentivizing development of new antibacterial drugs through BARDA and other mechanisms.
- FDA should be able to approve drugs for a limited population of patients with serious or life-threatening infections and for drugs that fill an unmet need based upon more limited data (e.g. smaller clinical trials). This mechanism would speed access to new antibacterial drugs to the patients who most need them. In

addition, the limited indication would help protect those new antibacterial drugs from losing their effectiveness through overuse.

- Improving surveillance: The country needs better data to monitor resistance patterns to inform local action to interrupt transmission, determine which interventions are working and where they can be expanded. National programs to identify emerging patterns of both resistance and antibiotic use will quantify the magnitude of antibiotic use in the U.S. and inform new interventions.
- Reducing Transmission: Improvements are needed at all levels of the healthcare system from healthcare facilities to local and state health departments and national agencies to reduce the burden of antibiotic resistant infections, including improvements in infection control infrastructure as well as research into novel ways to prevent transmission (e.g., microbiome manipulation). Coordination of efforts through regional prevention programs will facilitate identification of resistance problems early and enable action across the spectrum of healthcare to eliminate transmission and reduce infections.

**ANTIBIOTIC RESISTANT THREATS IN THE UNITED STATES, 2013 – CDC’S REPORT AND PRIORITIZATION OF THREATS<sup>343</sup>**

Superbug	Drug-Resistant Infections in U.S. Annually	How It Spreads (Most commonly: <b>healthcare associated; STI; food/water/agriculture; outside of healthcare setting</b> )	Types of Infections
<b>URGENT THREAT LIST</b>			
Carbapenem-resistant Enterobacteriaceae (CRE)	9,000; 600 deaths	Often healthcare-associated, via contaminated device or when patient is on a prolonged course of antibiotics as part of their care. CDC classifies as urgent because CREs can spread quickly and resistance to carbapenems is particularly worrisome, as one of the most powerful, “last resort” antibiotics.	Bloodstream infections from CREs can result in death rates as high as 50 percent. Can also cause urinary tract infections, pneumonia, inter-abdominal abscesses, and other forms of infection.
Drug-resistant Gonorrhea	246,000 resistant to any drug (one third of cases); 3,280 reduced susceptibility to ceftriaxone (the currently used form of treatment)	Second most commonly reported infectious disease in the U.S., sexually transmitted.	Can result in discharge and inflammation at the urethra, cervix, pharynx, or rectum, and can cause infertility. May facilitate transmission and acquisition of HIV.
<i>Clostridium difficile</i>	250,000 infections per year requiring or during hospitalization; 14,000 deaths	Infection often develops while individual is taking antibiotics for other care.	Can cause life-threatening diarrhea or colon inflammation.
<b>SERIOUS THREAT LIST</b>			
Multidrug-resistant <i>Acinetobacter</i>	7,300 multi-drug; 500 deaths	Healthcare-associated – often among critically ill patients.	Pneumonia or bloodstream infections.
Drug-resistant <i>Campylobacter</i>	310,000; 120 deaths	Contaminated food or water or exposure through antibiotic use in animals.	Diarrhea, fever, abdominal cramps, complications like temporary paralysis.
Fluconazole-resistant <i>Candida</i> (a fungus)	3,400; 200 deaths	Often healthcare-associated – related to prior use of fluconazole	Urinary tract infections, bloodstream infections; bloodstream infection related to this fungus is fourth leading form of HAI
Extended spectrum β-lactamase producing Enterobacteriaceae (ESBLs)	26,000; 1,700 deaths	Often healthcare-associated – either spread between patients on equipment or related to prior antibiotic use	Can lead to bloodstream and other forms of infection.
Vancomycin-resistant <i>Enterococcus</i> (VRE)	20,000; 1,300 deaths	Often healthcare-associated – resistant to vancomycin, one of the antibiotics of ‘last resort’.	Bloodstream, surgical site and urinary tract infections.
Multidrug-resistant <i>Pseudomonas aeruginosa</i>	6,700; 440 deaths	Healthcare-associated – either spread between patients on equipment or related to prior antibiotic use	Bloodstream, urinary and surgical site infections and pneumonia. Responsible for 8 percent of all HAIs.
Drug-resistant Non-typhoidal <i>Salmonella</i>	100,000	Mostly spreads through contaminated food and sometimes exposure through agriculture.	Diarrhea, fever, abdominal cramps, blood infections.
Drug-resistant <i>Salmonella Typhi</i>	38,000	Food and water contaminated by feces, Americans who develop typhoid fever often are exposed when traveling abroad.	Causes typhoid fever, which can lead to bowel perforation, shock and death. There is a vaccine that can prevent against this infection.
Drug-resistant <i>Shigella</i>	27,000; 40 deaths	Inadequate hand washing and hygiene habits, and can be sexually transmitted.	Diarrhea, fever, and abdominal pain, can lead to complications including reactive arthritis
Drug-resistant <i>Streptococcus pneumoniae</i>	1.2 million; 7,000 deaths	Pneumococcal infections often in young children or the elderly.	Leading cause of bacterial pneumonia and meningitis in the U.S. Can cause bloodstream, ear, and sinus infections. Rates in the U.S. have decreased with extensive use of PCV 13 vaccine.
Methicillin-resistant <i>Staphylococcus aureus</i> (MRSA)	80,461 severe infections; 11,285 deaths	Staph, including MRSA, are a leading cause of healthcare-associated infections. Often spread between patients in healthcare settings, although about one third acquired outside of healthcare settings	Can lead to a range of illnesses, from skin and wound infections to pneumonia and bloodstream infections to sepsis and death.
Drug-resistant tuberculosis	1,042	Most common serious infectious disease worldwide, spreads through the air via coughs, sneezes or respiratory fluids.	Often attacks the lungs but can attack other parts of the body.
<b>CONCERNING THREAT LIST</b>			
Vancomycin-resistant <i>Staphylococcus aureus</i> (VRSA)	13 since 2002	Healthcare-associated staph infection related to excessive prior use of antibiotics, often in patients with chronic wounds	Can lead to bloodstream infections, pneumonia, heart valve infections, and bone infections.
Erythromycin-resistant Group A <i>Streptococcus</i>	1,300; 160 deaths	Bacteria spread to a part of the body that is normally sterile, young children, the elderly and people with underlying conditions are most vulnerable.	Strep throat, toxic shock syndrome, “flesh-eating” disease, scarlet fever, rheumatic fever, and skin infections.
Clindamycin-resistant Group B <i>Streptococcus</i>	7,600; 440 deaths	Leading cause of bacterial infections in newborns, can cause infections in people of all ages.	Bloodstream infections, pneumonia, meningitis, and skin infections.

## D. Additional Persistent — Under Addressed — Infectious Threats

Attention to emerging threats often overshadows persistent infectious disease threats. Despite the fact that they endanger the health of Americans and cost billions in healthcare and economic losses, there is a sense of complacency around diseases like HIV/AIDS, viral hepatitis, a resurgence of TB and foodborne illnesses. Even though they are largely preventable, they remain persistent problems. A renewed sense of urgency and the updating of strategies could significantly reduce the threats these diseases pose.

### 1. Ongoing Crises in Sexually Transmitted Infections and TB

There are nearly 20 million new sexually transmitted infections in the United States each year. Half of these are among individuals ages 15 to 24. Overall, around 110 million Americans have some form of STI. They can have serious health consequences, including risk for reproductive health problems, such as infertility and some forms of cancer. STIs cost around \$16 billion in direct healthcare spending annually.<sup>344</sup> STIs can include HIV/AIDS, viral hepatitis, chlamydia, gonorrhea, syphilis, human papillomavirus, herpes simplex virus and trichomoniasis.

Misperceptions and effective treatments have contributed to diminished interest and resources devoted to prevent and control these diseases, but they remain serious health threats — and many also represent growing or renewed concerns. For instance:

- **HIV/AIDS and syphilis:** Rates have been rising sharply among young gay men in the past several years — reflecting problems of utilizing effective control measures, misinformation and complacency.<sup>345</sup>

- **Drug-Resistant Gonorrhea:** More than 330,000 Americans are infected with gonorrhea each year.<sup>346</sup> One-third of cases are drug-resistant and there is only one drug regime that is still recommended for treating the infection. Despite revised guidance and adherence to treatment helping to reduce the number of cases of the disease last year, CDC continues to warn that the potential for gonorrhea to become untreatable in the near future remains real.<sup>347, 348</sup>

CDC recommends that sexually active men and women under 25 years old and older individuals with risk factors, such as having multiple sex partners, be screened at least annually for chlamydia and gonorrhea, and that all pregnant women should be screened for syphilis, chlamydia, and, in women at risk, gonorrhea to ensure they do not spread infections to their babies. HPV vaccinations are also recommended for all teenage and young men and women. CDC also recommends annual screening of sexually active men who have sex with men for syphilis, urethral and rectal gonorrhea and

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Regular screening is important for both prevention — to help avoid the spread to others — and ensuring timely and effective treatment of these diseases.

chlamydia, and pharyngeal gonorrhea, as appropriate. More frequent STD screening at three and six month intervals is indicated for high risk MSM.

It is also important to consider public health strategies for HIV/AIDS, viral hepatitis, STIs and TB collectively, since they have some overlapping at-risk populations, including racial and ethnic minorities. Populations at risk for HIV, viral hepatitis and STIs include MSM and injection drug users — and most STIs have similar prevention strategies. Persons at high risk for TB include people born outside the United States, racial and ethnic minorities, persons experiencing homelessness, incarceration, substance and alcohol abuse and people who have weakened immune systems from HIV/AIDS, diabetes and other conditions.

These diseases can also co-exist, contribute to the susceptibility of other diseases and worsen symptoms of diseases. For instance, of Americans living with HIV, 25 percent are also co-infected with HCV and 10 percent are co-infected with HBV, and HIV is one of the biggest risk factors for progression of TB, while TB accelerates HIV progression.<sup>349, 350</sup>

Prevention through safe sex and condom use, syringe exchange programs and routine screening can help identify those in need of treatment and help prevent the additional spread of the diseases and ensure those who need treatment receive appropriate care and services.<sup>351, 352</sup> In addition, providing treatment to those who have HIV is one of the most effective ways to limit the continued spread of the disease to others.



**1 ONE NEEDLE,  
ONE SYRINGE,  
ONLY ONE TIME.**

Safe Injection Practices Coalition  
[www.ONEandONLYcampaign.org](http://www.ONEandONLYcampaign.org)

**The One & Only Campaign is a public health campaign aimed at raising awareness among the general public and healthcare providers about safe injection practices.**

Source: U.S. Centers for Disease Control and Prevention

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## HIV/AIDS

Successful treatment regimens have led to complacency and a belief that HIV/AIDS is under control. But, more than 1.2 million Americans are living with HIV/AIDS, and about one in six do not know they are infected.<sup>353</sup> And there is a sharp rise in new infections among gay men — accounting for the majority of the nearly 50,000 new HIV diagnoses in 2012.<sup>354</sup> The risk is even more acute for gay men of color, with Blacks representing nearly half of Americans living with AIDS, and Black men, particularly young gay Black men (ages 13 to 24), are at the highest risk for new HIV infections. Infections among young gay men increased by 22 percent from 2008 to 2018 and by 48 percent among young gay Black men.<sup>355</sup>

- Behavioral risks alone do not account for the disproportionately high new HIV infections among Black gay men. A review of 53 studies found that key risk factors were comparable or lower compared to White MSM. Other factors, such as the legacy of higher infection rates among Blacks in the earlier years of the epidemic, less frequent use of available treatment and higher rates of individuals who do not know they are infected (e.g., have not been screened for HIV), exacerbate the trends.<sup>356</sup>

Worldwide, an estimated 35 million people are living with HIV/AIDS, nearly half of whom are women.<sup>357</sup> And though the spread of the virus has slowed in some countries, it has escalated or remained steady in others. Since the epidemic began, more than 36 million people have died due to AIDS (the most advanced stage of HIV).<sup>358</sup> More than 2.1 million people were newly infected with HIV and 1.5 million died in 2013 alone.<sup>359</sup>

An individual can become infected with HIV in several ways, including unprotected sex; transfusion of infected blood; transmission through needle sharing or accidental needle sticks; re-use of syringes in a medical setting, especially where the medical infrastructure is lacking; or transmission from mother to child during pregnancy, delivery, or through breast feeding.<sup>360</sup> In rare cases, the virus may be transmitted through organ or tissue transplants or unsterilized dental or surgical equipment.

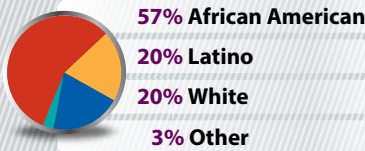
Some significant federal initiatives to combat HIV/AIDS include:

- NIH conducts ongoing research to advance treatments for HIV/AIDS and to try to develop a vaccine, microbicides, new treatments, behavioral and social science prevention interventions and strategies to limit the spread of the disease through better treatment.<sup>361</sup>
- The Division of HIV/AIDS Prevention (DHAP) at CDC supports a range of prevention, control and surveillance programs.<sup>362</sup>
- In 1990, the Ryan White AIDS Resources Emergency Care Act (now the Ryan White HIV/AIDS Treatment Extension Act of 2009) was enacted as the largest federally funded program for people in the United States living with HIV/AIDS. The program has provided at least some level of care for around 500,000 Americans each year as a “payer of last resort” to fund treatment and support services when no other resources are available, including for drug therapy.<sup>363</sup>

## HIV Rates Among Youth

**12,000**  
new HIV cases among youth  
aged 13-24 years in 2010

**1 in 4**  
of all new  
HIV infections



**83%**  
male

**17%**  
female

Among male youth,  
approximately  
**87%**  
of new HIV infections were from  
**male-to-male sexual contact**

Vital Signs: HIV Among Youth in the US, 2012

## Risky Health Behaviors

Of high school students in 2013:

**47%**  
have ever had sex

**15%**  
have had sex with 4+ people  
(during their lifetime)

**34%**  
are currently sexually active  
(have had sex during previous  
3 months)

and  
of these...

**41%**  
did not use a condom  
the last time they  
had sex

National Youth Risk Behavior Survey, 2013

Source: U.S. Centers for Disease Control and Prevention

- In 2003, the President's Emergency Plan for AIDS Relief was launched, committing \$15 billion over 5 years to combat global HIV/AIDS. In 2008, PEPFAR funding was increased to \$39 billion over 5 years, including \$4 billion in funding to fight TB and \$5 billion to fight malaria. In 2013, the one-millionth baby born HIV-free due to PEPFAR's efforts to curb mother-to-child transmissions was announced on the tenth anniversary of the program.<sup>364</sup> In 2012 alone, the program supported antiretroviral treatment for nearly 5.1 million people and HIV screening and counseling for more than 49 million people in 15 target countries in sub-Saharan Africa, Asia and the Caribbean.<sup>365, 366</sup>
- In 2010, a National HIV/AIDS Strategy was issued, focusing on domestic policies to reduce new infections, disparities and health inequities, increase access to care, improve health outcomes and achieve a more coordinated response to the HIV epidemic.<sup>367</sup>
- In 2012, HHS released an updated Guidelines for the Use of Antiretroviral Agents in HIV-1-Infected Adults and Adolescents, which included a new recommendation of treatment of all people with HIV as important not just for treatment but also for preventing secondary transmission of HIV.<sup>368</sup>
- In 2013, President Obama issued an executive order creating an HIV Care Continuum Initiative within the United States "to be overseen by the Director of the Office of National AIDS Policy. The Initiative will mobilize and coordinate Federal efforts in response to recent advances regarding how to prevent and treat HIV infection. The Initiative is supporting further integration of HIV prevention and care efforts; promoting expansion of successful HIV testing and service delivery models; encouraging innovative approaches to addressing barriers to accessing testing and treatment; and ensuring that Federal resources are appropriately focused on implementing evidence-based interventions that improve outcomes along the HIV care continuum."<sup>369</sup>
- In 2014, the U.S. Public Health Service released the first comprehensive guidance on the use of pre-exposure prophylaxis (PrEP) — to promote regular use of anti-retroviral drugs by those who are not infected with HIV can prevent transmission from an infected partner. PrEP is considered to be a powerful prevention tool and has been shown to reduce the risk of HIV infection in people who are high risk by more than 90 percent, when taken consistently.<sup>370</sup>

## RECOMMENDATIONS: HIV/AIDS Prevention and Control

For decades, the country has approached the HIV/AIDS epidemic focused on individual behavioral risk, but the research shows that is only one part of the equation.

More effective strategies include focusing on improving the overall wellbeing and health of members of the lesbian, gay, bisexual and transgender (LGBT) community — developing supportive and respectful policies that help reduce stigma, discrimination and bullying.<sup>371</sup>

Some key recommendations from TFAH to better prevent and control HIV/AIDS include:

- **Implementing traditional risk reduction efforts:** This includes 1) reducing HIV risk behaviors, particularly through condom use, and 2) learning HIV status since research shows that those who are aware of their infections engage in less risky behavior.<sup>372</sup> These interventions are essential, but are also “inherently limited.”
- **Focusing on the overall wellness of gay men:** Programs must focus on improving the health and wellbeing of gay men generally, and specific interventions must help HIV-positive gay men learn their status, connect to appropriate healthcare services, stay in care and maintain treatment adherence and prevent transmission to others. Young gay men must be a priority. Particular focus is needed on behavioral health issues faced by gay men that affect HIV risk taking and adherence to treatment if HIV infected. These have been described as syndemics — co-occurring challenges that gay men (and others face), including high rates of mental health problems, substance abuse, stigma and other negative experiences.

- **Supporting “treatment as prevention” strategies:** Recent studies have shown that HIV-positive individuals with full viral suppression are far less likely to transmit HIV infection, while modeling studies have demonstrated the potential for “treatment as prevention” or “test and treat” initiatives in combination with other approaches to dramatically slow the HIV epidemic.<sup>373</sup> These strategies can only be successful if individuals know their HIV status and receive full treatment.

- **Routine screening for all sexually transmitted infections, as recommended by the U.S. Preventive Services Task Force.**

- **All state Medicaid programs should cover routine screening of HIV, regardless of risk** (consistent with CDC and USPSTF guidelines).

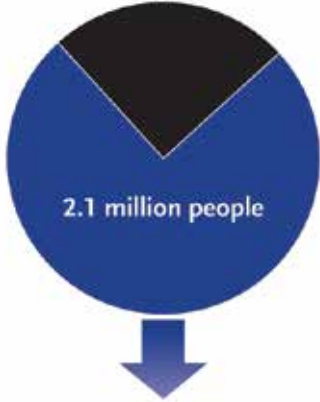
- **Promote the use of and insurance coverage of PrEP for high-risk individuals.**

- **Reassessing sexual risk reduction guidelines in light of treatment as prevention and pre-exposure prophylaxis:** CDC should release revised guidelines to assist individuals in assessing their risk in the context of these new treatment and chemoprophylaxis approaches to match the most recent evidence-based epidemiological data.<sup>374</sup>

- **Coordinating prevention strategies and treatment when appropriate for HIV/AIDS, hepatitis and TB:** Since the at-risk populations often overlap for the conditions, it is important to coordinate strategies, surveillance and treatment programs for the conditions, which also helps more efficiently use available resources.

- **Removing all restrictions on needle exchange programs – and support syringe public safety campaigns and syringe exchange programs to help prevent HIV and viral hepatitis:** In addition, there should also be increased state, local and private support for syringe exchange programs and campaigns to inform the public about the effectiveness of syringe exchange programs for limiting the spread of HIV/AIDS, HBV and HCV, including for protecting first-responders and healthcare workers. Needle exchange programs have been shown to be one of the most effective, scientifically based methods for reducing these diseases and have been endorsed by leading scientific organizations, including the IOM, WHO, AAP, the American Medical Association (AMA), the American Nurses Association (ANA), and the American Public Health Association (APHA).<sup>375, 376</sup> Alternative approaches to needle exchange, such as disinfection and decontamination and outlawing the sale of needles, have been shown to be much less effective.<sup>377</sup> Many needle exchange programs often also work to target the underlying problems of drug use by providing and/or referring individuals to substance abuse treatment or other health and social services. Hundreds of scientific studies have been conducted that have found needle exchange programs can help to reduce HIV transmission and do not promote illegal drug use. There is also evidence that needle exchange programs do not increase unsafe disposal of unused syringes among participants in those programs.<sup>378</sup>

Baby boomers represent more than 75% of American adults with hepatitis C



Up to 1.5 million baby boomers are unaware of their infection



Source: U.S. Centers for Disease Control and Prevention

## Hepatitis B and C

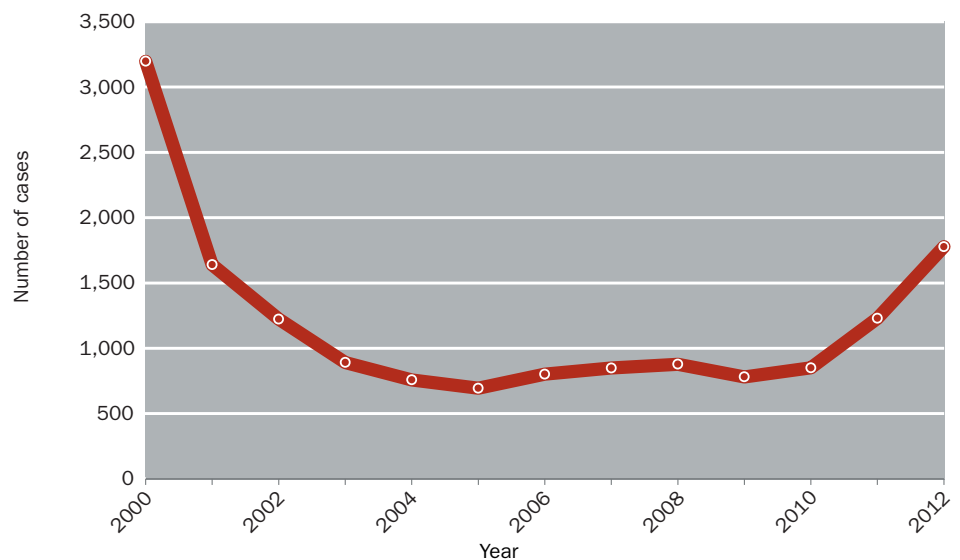
Around five million Americans have HBV or HCV, but between 65 percent and 75 percent do not know they have them.<sup>379</sup> As they age, they are at risk for developing serious liver diseases or cancer unless they receive treatment. Two-thirds of those with HCV are Baby Boomers and one in 12 Asian Americans has HBV. An independent Milliman report found total medical costs for HCV patients could more than double over the next 20 years — from \$30 billion to \$80 billion per year.<sup>380, 381</sup>

- In 2013, USPSTF recommended routine one-time HCV screening of individuals born between 1945 and 1965 for the first time, which means the test is now available to these individuals who are enrolled in new group or individual health insurance, Medicare or Medicaid Expansion programs with no cost-sharing.<sup>382</sup> A 2013 study of 1,578 patients born between 1945 and 1965 found that only

2 percent (31) of these Baby Boomers were screened for HCV.<sup>383</sup>

- Breakthroughs in treatments for HCV have dramatically increased cure rates — and is particularly more effective in treatment of Blacks with HCV, but it has a relatively high cost — \$1,000 a day.<sup>384</sup> In 2014, FDA approved a new drug called Harvoni®, which is expected to be more effective than previously available options but is also forecasted to have a high cost.<sup>385, 386</sup> A new drug called Sovaldi® had a 95 percent cure rate for HCV in clinical trials. These new treatment options offer the potential to end the epidemic.
- A recent national rise in heroin use — related to the increase in prescription drug abuse and individuals using heroin as an alternative — and exposure while receiving healthcare treatment have contributed to the growth of new HCV infections.<sup>387</sup>

## Reported Number of Acute Hepatitis C Cases United States, 2000–2012



Source: National Notifiable Diseases Surveillance System (NNDSS)



## RECOMMENDATIONS: Preventing and Controlling Viral Hepatitis

Health reform combined with new scientific advances provide the chance to dramatically improve hepatitis prevention, help identify people who do not know they are infected for earlier treatment and treat people in the most effective ways possible. TFAH recommends a comprehensive strategy be carried out to better prevent, control and treat hepatitis, including:

- **Ensuring everyone who is diagnosed**

**receives appropriate care:** Every person diagnosed with HBV or HCV should have access to and receive a standardized level of care and receive support services. CMS and Medicaid programs should take the lead in ensuring patients receive the most effective treatments available and removing discriminatory coverage rules for HCV treatment, such as denying treatment based on behaviors or inappropriately limited the types of providers who can prescribe HCV treatments. Payers, drug companies, and government agencies should address barriers to treatment. Mechanisms should be explored for covering the costs of new treatments, such as the expansion of the Ryan White AIDS Drug Assistance Program (ADAP) to cover HCV for individuals who are not also living with HIV/AIDS.

- **Promoting universal HBV vaccination:**

HBV vaccinations have helped reduce rates of infection by around 80 percent, but around 10 percent of infants still do not get vaccinated and adults who came of age before the vaccine was available in 1982 or were born abroad where the vaccine is not widely used should also be vaccinated. All newborns should receive their first HBV vaccination within 12 hours of birth

and should receive their full course of three vaccinations on schedule.

- **Promoting hepatitis A vaccination for at-risk populations:**

Americans traveling abroad to certain countries where hepatitis A is more prevalent, gay men, drug users and other at-risk populations should be routinely vaccinated against hepatitis A.

- **Making hepatitis B and C screening routine and active:**

HBV and HCV screenings should be regularly conducted for at-risk groups, including Baby Boomers, as recommended by the USPSTF. HBV vaccination should be the standard of care in the reformed health system. Doctors and other healthcare providers should be educated about the at-risk populations and appropriate health measures should be taken to prevent perinatal transmission from infected mothers to their newborns. Individuals with HBV and HCV need to be identified early to move them into care and healthier behaviors even before treatment begins, and Medicare should more fully embrace a wider range of providers.

- **Reducing disparities:**

The National Medical Association studied the disproportionate impact of HCV among Blacks and supported a number of

strategies to reduce the disparities including a Black-specific campaign to create awareness about the risks associated with HCV infections and providing adequate education and training to providers of all races and ethnicities about racial disparities in HCV epidemiology, clinical course and treatment outcomes and barriers to care and treatment.<sup>388</sup> Similarly, Asian American and Pacific Islanders (AAPIs) make up 50 percent of the U.S. population with chronic HBV, but most are unaware of their status, resulting in HBV-related death rates 7 times greater among AAPIs than among Whites.<sup>389</sup> HHS and its community partners should expand access to culturally appropriate education, screening, testing, and referral to treatment.

- **Investing in biomedical, behavioral and health services research and development:**

The investment in hepatitis-related biomedical and behavioral research must be significantly increased including support for understanding the differential impact of treatment among certain populations, improving screening and diagnostic tools, and for new and better vaccines. Research support should be more proportionate to the public health threat associated with hepatitis.

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Globally, an estimated 8.9 million people develop active tuberculosis each year, and 1.5 million die from TB.<sup>393</sup>

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**Over 5%**  
of the people who develop active TB each year will die from it.

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## Tuberculosis

During the 1970s, rates of TB cases had greatly declined (from more than 84,000 cases to just over 22,000). This led to a sense of complacency that allowed the deterioration of TB control programs.<sup>390</sup> However, the country experienced a resurgence of the disease in the mid-1980s and early-1990s with the emergence of drug-resistant TB, the emergence of HIV/AIDS and changing immigration patterns with more people arriving from countries with a high TB burden.<sup>391</sup> After significant and dedicated funding was provided at the federal, state and local levels to support improvements in treatment, case finding, laboratory capacity, and infrastructure, the United States was able to regain control from the resurgence, and cases again declined.

Increased resources and a concerted public health campaign helped lead to declines in TB from 1993 to 2013, but TB remains a threat. There were 9,582 TB cases reported in the United States in 2013 (3 cases per 100,000 people), with 65 percent of cases occurring in foreign-born patients.<sup>392</sup> Rates were highest among Asian Americans (18.7 cases per 100,000 people). Foreign-born persons and racial/ethnic minorities are disproportionately affected. The declining number of TB cases masks the increasing complexity of the cases being reported. There are high numbers of cases with co-morbid conditions (HIV/AIDS and other immune-compromising conditions), increases in multidrug-resistant or extremely drug-resistant cases requiring longer, more toxic and more expensive treatment regimens and cases with significant socio-economic challenges.

The infection is common — about one-third of the human population is infected with TB, with one new infection occurring each second, but most cases of this TB infection (often referred to as “latent”

infections) are not contagious. One in 10 people infected with TB bacteria develops active TB. These rates are higher, however, for individuals with compromised immune systems or that have other underlying health conditions, such as diabetes.

ACIP and the Health Resources and Services Administration (HRSA) recommend routine TB testing for children at high risk for TB, but there currently is not a recommendation for routine screening for at-risk adults by ACIP, HRSA or USPSTF.<sup>394</sup>

People who are at-risk for TB include those who do not receive regular or high-quality healthcare, including people who are homeless, foreign-born, incarcerated or co-infected with other conditions. People with weakened or compromised immune systems, individuals with HIV or other immune-compromised conditions (diabetes, arthritis), those receiving chemotherapy, pregnant women and young children, including infants (under 12 months old), are at a much greater risk for developing active TB disease. TB's most common co-infection is HIV. People with HIV are four times more likely to contract TB.<sup>395</sup> Policy makers and public health officials were slow to mobilize a response to the HIV-TB co-epidemic that began in sub-Saharan Africa in the 1990s.

Prior to the ACA, states had the option of adding diagnosed TB patients to Medicaid.<sup>396</sup> The covered TB-related services include prescribed drugs, physician's services, lab and x-ray services, clinic and Federally Qualified Health Center services, case management services and other services such as those designed to encourage completion of outpatient regimens, including directly observed therapy (DOT) — the recommended standard of care where healthcare professionals watch to make sure a patient is taking all of their treat-

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ment medication. Nine states have elected to provide this Medicaid waiver/expansion. There is receipt of matching federal dollars for treating these TB patients. However, even with the ACA in effect, many individuals are still uninsured or fall outside of the system of receiving routine medical care or attention, so there is a continued role for public health agencies to provide access to care and treatment, in addition to conducting surveillance, contact tracing, outreach and education. Since treating TB is complicated and long, most states rely on public health experts to provide care rather than within the mainstream healthcare system. However, even in states that elect to add TB patients to Medicaid, the majority of TB care is provided by health departments. The health departments then pay the costs of care, including drugs and intensive case management (often including staff- and time-intensive DOT). Many states are not able to recover these costs, since many states lack the capacity to set up billing systems or lack the legal authority to bill insurers. For TB patients who are covered

but are in plans with high deductibles, it can lead to delays or avoidance of care, inability to afford medications and delays in diagnostic testing. In addition, the ACA benefits are generally not available to undocumented immigrants, who represent a high-risk group for TB but may not seek or receive care because of this gap. Patients with active TB who do not receive appropriate care are at risk to spread the disease to others.

Most strains of TB can be treated with drug therapy, but it is imperative that people finish the medicine and take the drugs exactly as prescribed. It usually involves a regimen of drugs taken for six months to two years depending on the type of infection. The treatment is long and intense in duration and is often difficult for patients to tolerate, which can contribute to non-adherence. If patients stop taking the drugs too soon or do not take the drugs correctly, they can become ill again and the infection may become drug resistant.

In recent years, severe shortages of medications and antigen used in skin tests

for diagnosing TB — along with significant increases in costs of medications, budget cuts and hiring freezes — have impacted the capacity of state and local TB programs. Weakened programs have compromised the ability of many states to conduct investigations to track down contacts TB patients may have had, to test for and treat TB infections and to provide directly observed therapy treatment.

The non-adherence rates and medication shortages combine to exacerbate even more resistance development and future outbreaks.

There has been a growth in not only drug-resistant TB, but extremely drug resistant (XDR) TB. Patients with XDR TB are left with treatment options that are much less effective and considerably more expensive. Between 1993 and 2011, 63 cases of XDR TB have been reported in the United States.<sup>397</sup> Treatment for multidrug-resistant TB (MDR-TB) costs an average of \$131,000, compared with \$17,000 to treat drug-susceptible TB.<sup>398</sup>

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## TB and Diabetes

The rising co-epidemic of TB and diabetes — a unique partnering of an infectious disease and a chronic disease — is gaining attention worldwide. Research shows that diabetics are two to three times more likely to contract TB, due to a weakening of the immune system. Diabetics are also more likely to die of TB, are infectious longer and relapse is more common. In addition, the drugs that treat each disease interfere with one another, complicating disease control.<sup>399</sup>

Worldwide, there were 390 million diabetics in 2013 and cases are projected to approach 600 million by 2035.<sup>400</sup> In 2013, 1.5 million people died from TB. Further, it is estimated that one-third of the world's

population has latent TB. For most people, the disease remains dormant. However, as the number of cases of diabetes increase and immune systems weaken, these latent infections could progress into active TB in alarming numbers — potentially reversing much of the progress made in combatting TB.<sup>401</sup>

Experts say that bi-directional screening of people living with TB for diabetes and people living with diabetes for TB is essential, and India was the first country to create a national policy of addressing the diseases simultaneously after discovering high rates of diabetes among TB populations.<sup>402</sup>

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**Doctors and public health workers may have to shift their thinking, given that infectious diseases and non-communicable diseases are often siloed.**<sup>403</sup>

## RECOMMENDATIONS: Toward Eliminating TB in America

The resurgence of the disease is particularly troubling since TB is treatable, curable and preventable. TB, once largely controlled in the United States, disproportionately affects Americans living in poverty and those with HIV/AIDS who are at higher risk for the disease. Now there are antibiotic-resistant forms of the disease. TFAH consulted with a set of TB control experts to identify key recommendations for curbing a future resurgence of TB in the United States, which include:

- **Fully funding TB control programs:**

The resurgence of TB in the mid-1980s shows the need for continued vigilance. TB control efforts require strong surveillance for individuals and clusters of the disease, infection control programs in communities with outbreaks and ensuring infected patients receive full and complete treatment, which is important not only for their care but for helping to limit the transmission of the disease. States should ensure routine screenings in correctional facilities and also consider TB screening for international college students. At the federal level, consideration should be given to expanding the screening, and requirement for treatment, of internationals seeking work visas or other longer-term stays within the United States. Additionally, plans, procedures and sufficient fiscal resources should be in place to ensure the timely and coordinated management by the Immigration and Customs Enforcement (ICE), CDC and state and local health officials in order to ensure proper care when TB-infected individuals transition from being a federal responsibility when they seek and are granted asylum.

- **Ensuring quality control in TB treatment:**

Treating TB is an intensive and long process. It requires patients to take a full course of their medicine precisely as prescribed through DOT, and often requires providing wrap-around services for lower-income patients, particularly since they often need to be isolated for periods of time to stop the spread of the disease and are not able to sustain employment. Private health-care providers and insurers should enter into contracts and arrangements with TB public health programs to refer patients to experts in TB care, since improper care can exacerbate the development of additional drug-resistant cases or forms of the disease or lead to the patient becoming ill again. Public health departments should be able to bill a patient's insurance company for direct service treatment costs.

- **Addressing the TB drug costs and shortages and biologics shortages:**

The shortage of treatment medication and biologics used to diagnose TB infection and the growing cost of TB treatment drugs is harming not only the care for individuals but also control efforts in states. Ensuring sufficient quantities, adequate supplies of TB biologics (Tubersol and Aplisol) and payment for drugs are essential for effective TB control and monitoring of outbreaks and diagnosing new infections.

- **Supporting research and development of new treatments for TB:**

Drug treatments for TB have not advanced significantly in decades. Resources should be devoted to increased research for improved and alternate ways to treat the disease, and the federal govern-

ment should explore incentives for private companies to produce these drugs. This includes basic science research to understand the host-organism response as well as for research to shorten treatment, produce less toxic medications and combinations of drugs for new regimens.

- **Encouraging all states to participate in the TB Medicaid waiver/expansion:**

All states have the option of being able to add all TB patients to their Medicaid program and receive federal matching support. As of 2013, there were nine states reported to be participating.<sup>404</sup>

- **Supporting routine screening and diagnostics for target high-risk groups:**

CDC should work with the USPSTF to assess the value of routine screening of TB for target at-risk groups. If supported by the USPSTF, screening would be a mandated benefit offered to Americans with new group and individual plans and those covered by Medicaid expansion with no-copayments.<sup>405</sup>

- **Requiring no-cost-sharing treatment for TB patients by public and private payers:**

Given the public health threat of TB patients spreading the disease to others, it is essential that all diagnosed patients receive high-quality care.

- **Providing adequate federal, state and local support for TB prevention and control:**

Some states have reduced or eliminated state contributions to the TB control program, relying exclusively on the federal monies provided by CDC. TB control is largely local and federal funding alone is not sufficient to control — and prevent — TB.

## 2. Fixing Food Safety

Nearly all foodborne illnesses could be avoided with a stronger U.S. food safety system. There are around 48 million cases of illness each year, with 1 million resulting in long-term complications, 28,000 leading to hospital visits and 3,000 resulting in death.<sup>406, 407</sup>

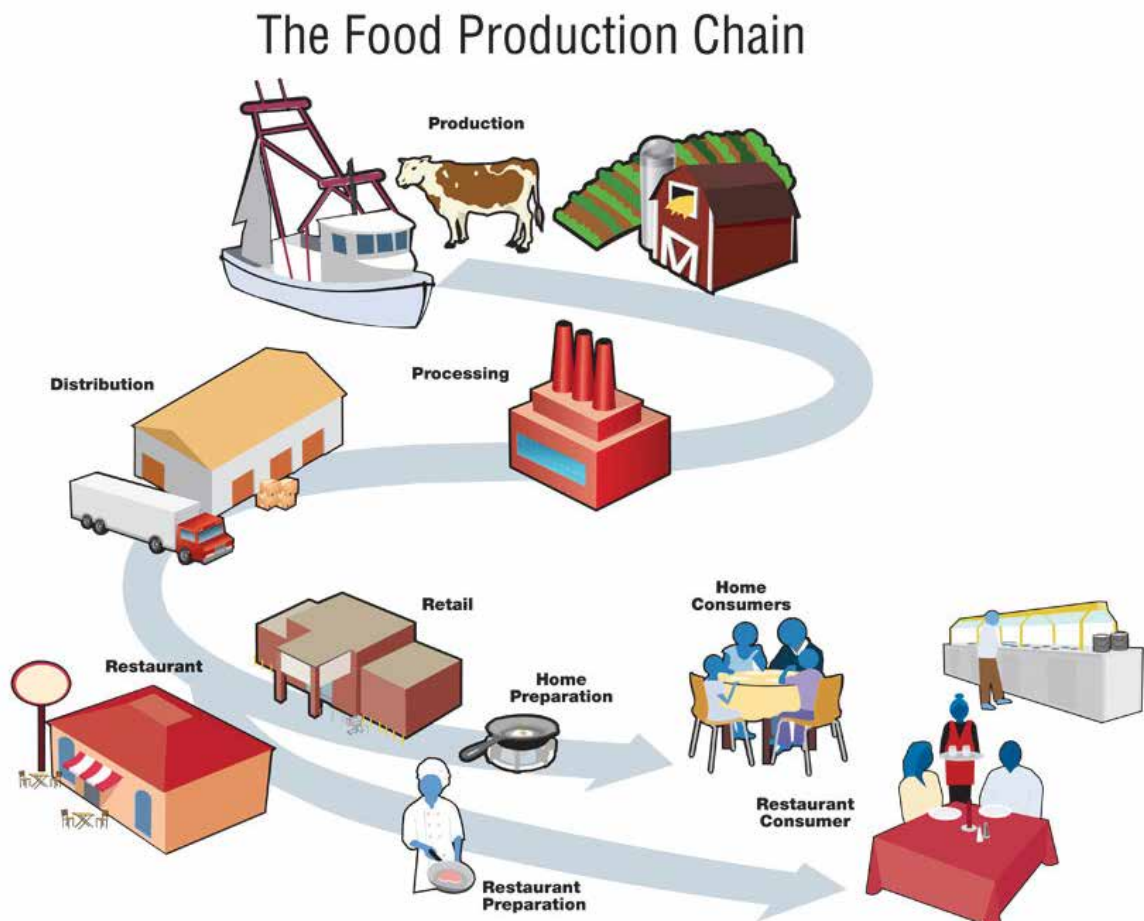
The estimates of the economic costs of foodborne illnesses range from \$15.6 to \$77 billion annually in medical costs and lost productivity.<sup>408, 409</sup> Major outbreaks can also contribute to significant economic losses in the agriculture and food retail industries, which account for approximately 13 percent of the U.S. GDP and are the largest industries and employers in the United States.<sup>410</sup> Salmonella infections alone are responsible for an estimated \$365 million in

direct medical costs annually and the number of infections has not decreased in the past 15 years.<sup>411</sup> From March 2013 through July 2014, there were 634 cases across 29 states of multidrug-resistant Salmonella Heidelberg infections linked to Foster Farms chicken. Thirty-eight percent of patients required hospitalization.<sup>412</sup>

According to CDC, produce causes the most illness (46 percent), but meat and poultry cause the most deaths (29 percent).<sup>413</sup> Norovirus is the leading cause of illness from contaminated food in the United States.<sup>414, 415</sup> Foodborne norovirus outbreaks result most commonly from handling of ready-to-eat foods by infected individuals, but can also occur due to use of fecally contaminated water during production.<sup>416</sup>

According to a study by the Center for Science in the Public Interest (CSPI), 10 foods regulated by the FDA account for almost 40 percent of all foodborne outbreaks since 1990. The list includes 1) leafy greens; 2) eggs; 3) tuna; 4) oysters; 5) potatoes; 6) cheese; 7) ice cream; 8) tomatoes; 9) sprouts; and 10) berries.<sup>417</sup>

In 2014, FDA re-released proposed rules implementing portions of the Food Safety Modernization Act (FSMA), including Produce Safety, Preventive Controls for Human and Animal Foods, and the Foreign Supplier Verification Program.<sup>418</sup> The changes added flexibility and broadened some exemptions for small producers.



Source: U.S. Centers for Disease Control and Prevention

## RECOMMENDATIONS: Fixing Food Safety

To improve food safety in the United States, TFAH recommends:

- **Fully funding and implementing the Food Safety Modernization Act:**

FDA should ensure public health is the top priority as it finalizes and implements FSMA prevention rules. FDA should also track implementation of these rules to ensure that proposed exemptions do not increase risk from foodborne illness. Sufficient funding should be devoted at the federal and state levels to be able to implement and enforce the law.

- **Improving enforcement and inspection capacity:**

FDA should work with states to ensure they are ready to enforce FSMA regulations, develop an operational strategy and ensure compliance across states.

- **Moving toward a unified government food safety agency:**

The government currently does not have a coordinated, cross-governmental approach to food safety. Right now, food safety activities are siloed across a range of agencies, and many priorities and practices are outdated. In 2014, FDA released a Food and Feed Program Action Plan as a framework to help realign operations. Each year the Office of Regulatory Affairs (ORA), the Center for Food Safety and Applied Nutrition (CFSAN), the Center for Veterinary Medicine (CVM) and the Office of International Programs (OIP) will identify deliverables to be accomplished that year. The FY 2015 objectives and deliverables align with and promote the FDA food Safety

Modernization Act implementation efforts and priorities.<sup>419</sup> In the longer term, the Administration should develop a plan with a set timeline for how to restructure food safety functions across the federal government into a single, unified food safety agency to carry out a prevention-focused, integrated strategy. This same type of coordinated, cross-governmental approach to food safety is also needed within each state.

- **Improving surveillance of foodborne illnesses:**

Currently, foodborne illnesses are radically underreported in the United States and the quality of reporting varies dramatically by state. New standards and requirements should be put in place to incentivize states to improve reporting and penalize states for underreporting. Surveillance for foodborne illness outbreaks should be fully integrated with other HIT systems, which will help improve tracking and identification of the scope of problems as well as sources of outbreaks. FDA and CDC should also have a plan for requiring clinics to send cultures from rapid response tests showing problems to public health labs to allow for subtype pathogen testing.<sup>420</sup>

- **Preventing the tainting of food by environmental contaminants:**

Measures should be implemented to prevent the tainting of food by environmental contaminants, such as arsenic, lead and untreated sewage or manure that enter waters and pollute crops downstream.

# State Public Health Budget Methodology

TFAH conducted an analysis of state spending on public health for the last budget cycle, fiscal year 2013-2014. For those states that only report their budgets in biennium cycles, the 2013-2015 period (or the 2014-2016 and 2013-2014 for Virginia and Wyoming respectively) was used, and the percent change was calculated from the last biennium, 2011-2013 (or 2012-2014 and 2012-2013 for Virginia and Wyoming respectively).

This analysis was conducted from September to October of 2014 using publicly available budget documents through state government web sites. Based on what was made publicly available, budget documents used included either executive budget document that listed actual expenditures, estimated expenditures, or final appropriations; appropriations bills enacted by the state's legislature; or documents from legislative analysis offices.

"Public health" is defined to broadly include all health spending with the exception of Medicaid, CHIP, or comparable health coverage programs for low-income residents. Federal funds, mental health funds, addiction or substance abuse-related funds, WIC funds, services related to developmental disabilities or severely disabled persons, and state-sponsored pharmaceutical programs also were not included in order to make the state-by-state comparison more accurate since many states receive federal money for these particular programs. In a few cases, state budget documents did not allow these programs, or other similar human services, to be disaggregated; these exceptions are noted. For most states, all state funding, regardless of general revenue or other state funds (e.g. dedicated revenue, fee revenue, etc.), was used. In some cases,

only general revenue funds were used in order to separate out federal funds; these exceptions are also noted.

Because each state allocates and reports its budget in a unique way, comparisons across states are difficult. This methodology may include programs that, in some cases, the state may consider a public health function, but the methodology used was selected to maximize the ability to be consistent across states. As a result, there may be programs or items states may wish to be considered "public health" that may not be included in order to maintain the comparative value of the data.

Finally, to improve the comparability of the budget data between FY 2012-2013 and FY 2013-2014 (or between biennium), TFAH adjusted the FY 2013-2014 numbers for inflation (using a 0.9778 conversion factor based on the U.S. Dept. of Labor Bureau of Labor Statistics; Consumer Price Index Inflation Calculator at <http://www.bls.gov/cpi/>).

After compiling the results from this online review of state budget documents, TFAH coordinated with the Association of State and Territorial Health Officials (ASTHO) to confirm the findings with each state health official. ASTHO sent out emails on November 4, 2014 and state health officials were asked to confirm or correct the data with TFAH staff by December 1, 2014. ASTHO followed up via email with those state health officials who did not respond by the December 1, 2014 deadline. Twenty states (AL, CA, CO, DC, FL, ID, IL, KS, LA, ME, MD, MA, MI, NM, NY, OK, PA, SD, UT and WV) did not respond by December 12, 2014 when the report went to print. These states were assumed to be in accordance with the findings.

## State Public Health Budget Methodology *Appendix A*

# State Facts and Figures Summary

## Appendix B

## STATE FACTS AND FIGURES SUMMARY

	Childhood Vaccination Rate 4:3:1:3:3:1:4 Series (2013)	Whooping Cough Vaccination Rate (4+DTaP) (2013)	HPV teen girls 3 doses (2013)	Flu Vaccination Rate 6 months + (2013-2014)
Alabama	78.5% (+/- 7.6)	84.0% (+/- 7.3)	39.6% (+/- 9.0)	48.3% (+/- 2.3)
Alaska	67.1% (+/- 6.6)	75.5% (+/- 6.1)	27.1% (+/- 8.2)	41.7% (+/- 2.2)
Arizona	66.6% (+/- 7.7)	76.6% (+/- 6.6)	37.4% (+/- 9.2)	38.5% (+/- 1.8)
Arkansas	60.6% (+/- 8.8)	74.3% (+/- 8.3)	24.4% (+/- 8.0)	49.7% (+/- 2.4)
California	72.6% (+/- 7.6)	83.1% (+/- 6.4)	45.8% (+/- 10.2)	N/A
Colorado	70.3% (+/- 6.9)	81.2% (+/- 6.0)	39.1% (+/- 8.7)	51.8% (+/- 1.4)
Connecticut	79.1% (+/- 6.8)	88.0% (+/- 5.9)	40.1% (+/- 9.1)	51.8% (+/- 2.4)
Delaware	74.8% (+/- 6.4)	87.9% (+/- 5.0)	51.7% (+/- 8.9)	50.0% (+/- 2.4)
D.C.	78.9% (+/- 7.1)	86.2% (+/- 5.8)	30.2% (+/- 12.3)	47.3% (+/- 2.9)
Florida	70.7% (+/- 8.7)	80.3% (+/- 7.7)	34.3% (+/- 9.8)	37.5% (+/- 1.5)
Georgia	72.9% (+/- 9.5)	83.5% (+/- 7.9)	33.2% (+/- 9.5)	39.3% (+/- 1.9)
Hawaii	69.1% (+/- 7.6)	83.7% (+/- 6.1)	34.4% (+/- 9.5)	54.4% (+/- 2.6)
Idaho	75.2% (+/- 6.5)	84.2% (+/- 5.3)	31.3% (+/- 9.6)	37.9% (+/- 2.0)
Illinois	69.3% (+/- 5.2)	82.7% (+/- 4.5)	33.8% (+/- 7.2)	43.4% (+/- 2.0)
Indiana	68.9% (+/- 6.7)	82.1% (+/- 5.3)	34.6% (+/- 7.7)	41.5% (+/- 1.6)
Iowa	81.9% (+/- 6.3)	89.6% (+/- 4.4)	41.9% (+/- 8.8)	48.6% (+/- 1.7)
Kansas	74.0% (+/- 6.8)	81.6% (+/- 6.1)	21.0% (+/- 8.2)	47.0% (+/- 1.5)
Kentucky	77.9% (+/- 7.1)	84.1% (+/- 6.4)	26.8% (+/- 8.5)	46.9% (+/- 1.8)
Louisiana	72.1% (+/- 7.3)	78.5% (+/- 6.4)	42.1% (+/- 9.8)	44.6% (+/- 2.0)
Maine	71.4% (+/- 7.3)	87.9% (+/- 5.7)	45.8% (+/- 8.8)	47.8% (+/- 1.6)
Maryland	77.1% (+/- 8.0)	87.4% (+/- 6.5)	33.4% (+/- 10.7)	48.9% (+/- 2.8)
Massachusetts	80.2% (+/- 6.5)	93.3% (+/- 4.0)	39.3% (+/- 8.4)	53.3% (+/- 1.9)
Michigan	71.1% (+/- 7.3)	79.6% (+/- 6.6)	34.5% (+/- 9.4)	42.9% (+/- 1.5)
Minnesota	77.3% (+/- 7.5)	90.5% (+/- 5.0)	37.6% (+/- 9.0)	51.7% (+/- 1.3)
Mississippi	76.0% (+/- 7.6)	87.4% (+/- 5.4)	25.2% (+/- 8.6)	N/A
Missouri	70.1% (+/- 7.7)	82.1% (+/- 6.6)	28.8% (+/- 9.0)	48.3% (+/- 2.1)
Montana	66.7% (+/- 8.1)	79.0% (+/- 6.4)	28.3% (+/- 8.1)	41.9% (+/- 1.8)
Nebraska	81.3% (+/- 5.5)	88.3% (+/- 4.7)	41.5% (+/- 9.1)	51.0% (+/- 1.5)
Nevada	65.6% (+/- 6.1)	81.1% (+/- 5.0)	27.4% (+/- 8.3)	36.4% (+/- 2.4)
New Hampshire	78.2% (+/- 6.5)	91.3% (+/- 3.9)	43.2% (+/- 8.6)	48.0% (+/- 1.9)
New Jersey	73.9% (+/- 6.7)	86.4% (+/- 5.3)	31.4% (+/- 9.2)	46.1% (+/- 1.7)
New Mexico	67.7% (+/- 7.2)	79.8% (+/- 6.4)	44.3% (+/- 9.2)	46.6% (+/- 1.9)
New York	74.3% (+/- 4.9)	86.6% (+/- 3.8)	45.4% (+/- 6.6)	48.4% (+/- 1.8)
North Carolina	75.6% (+/- 7.0)	87.5% (+/- 5.3)	32.8% (+/- 9.1)	51.0% (+/- 2.0)
North Dakota	73.4% (+/- 6.2)	78.6% (+/- 5.9)	41.1% (+/- 9.1)	48.9% (+/- 2.3)
Ohio	63.4% (+/- 7.6)	75.8% (+/- 7.0)	35.0% (+/- 8.8)	44.7% (+/- 1.6)
Oklahoma	63.9% (+/- 6.3)	79.2% (+/- 5.4)	35.4% (+/- 8.3)	46.7% (+/- 2.0)
Oregon	70.7% (+/- 6.3)	83.8% (+/- 5.2)	39.5% (+/- 8.8)	42.2% (+/- 2.5)
Pennsylvania	77.4% (+/- 5.1)	88.7% (+/- 3.9)	45.9% (+/- 8.1)	46.3% (+/- 1.6)
Rhode Island	84.5% (+/- 6.3)	91.6% (+/- 4.9)	56.5% (+/- 9.3)	56.9% (+/- 3.4)
South Carolina	67.1% (+/- 8.3)	77.3% (+/- 7.5)	40.7% (+/- 10.4)	44.3% (+/- 1.6)
South Dakota	75.9% (+/- 7.4)	86.5% (+/- 5.8)	42.3% (+/- 9.6)	57.4% (+/- 2.5)
Tennessee	71.4% (+/- 6.7)	81.1% (+/- 6.0)	35.9% (+/- 9.1)	52.7% (+/- 3.2)
Texas	74.1% (+/- 5.0)	81.5% (+/- 4.5)	38.9% (+/- 7.4)	45.2% (+/- 1.8)
Utah	78.6% (+/- 5.9)	90.3% (+/- 4.1)	20.5% (+/- 7.8)	41.5% (+/- 1.5)
Vermont	69.2% (+/- 6.5)	85.8% (+/- 5.1)	42.7% (+/- 9.1)	50.0% (+/- 2.1)
Virginia	71.2% (+/- 9.8)	78.8% (+/- 9.3)	27.6% (+/- 10.6)	50.4% (+/- 1.8)
Washington	71.0% (+/- 7.8)	79.8% (+/- 7.0)	45.3% (+/- 9.8)	48.4% (+/- 1.7)
West Virginia	69.4% (+/- 7.5)	83.4% (+/- 6.2)	38.4% (+/- 9.0)	52.6% (+/- 1.9)
Wisconsin	75.7% (+/- 6.8)	84.0% (+/- 6.1)	36.8% (+/- 9.0)	42.3% (+/- 2.0)
Wyoming	70.1% (+/- 7.7)	80.9% (+/- 6.6)	42.1% (+/- 9.3)	37.6% (+/- 2.0)



	Flu Vaccination Rate 18+ (2013-2014)	West Nile Virus Cases (2013)	Standardized Infection Ratio* for Central Line-associated Bloodstream Infections (2011)	Antibiotic Prescriptions per 1,000 (2010)	HIV Rate per 100,000 (2011)	Hepatitis A Rates per 100,000 (2012)	Hepatitis B Rates per 100,000 (2012)	Hepatitis C Rates per 100,000 (2012)	TB Rates per 100,000 (2013)
Alabama	44.6% (+/- 2.7)	9	0.694	1,079.6	17.6	0.4	1.6	0.5	2.2
Alaska	38.7% (+/- 2.5)	0	0.716	510.7	3.7	0.1	0.1	N/A	9.7
Arizona	35.4% (+/- 2.0)	62	0.575	732.5	10.9	1.4	0.2	N/A	2.8
Arkansas	43.9% (+/- 2.9)	18	0.481	1,020.8	8.3	0.3	2.5	0.2	2.4
California	N/A	379	0.565	554.6	15.8	0.5	0.4	0.2	5.7
Colorado	48.9% (+/- 1.6)	322	0.587	611.0	8.0	0.5	0.5	0.8	1.4
Connecticut	46.7% (+/- 2.9)	4	0.627	821.9	12.0	0.6	0.4	0.9	1.7
Delaware	45.5% (+/- 2.9)	3	0.534	921.1	14.0	1.0	1.2	N/A	2.1
D.C.	43.4% (+/- 3.3)	1	0.693	976.4	155.6	N/A	N/A	N/A	5.9
Florida	34.4% (+/- 1.6)	7	0.540	706.1	28.4	0.5	1.3	0.6	3.3
Georgia	35.5% (+/- 2.2)	10	0.816	853.0	25.7	0.5	1.1	0.8	3.4
Hawaii	50.2% (+/- 2.9)	0	0.258	543.7	5.7	0.4	0.4	N/A	8.2
Idaho	35.3% (+/- 2.2)	40	0.428	677.9	2.4	0.7	0.3	0.7	0.7
Illinois	40.3% (+/- 2.5)	117	0.593	836.1	16.6	0.5	0.7	0.2	2.5
Indiana	38.6% (+/- 1.8)	23	0.580	956.5	7.9	0.2	1.4	1.7	1.4
Iowa	46.9% (+/- 1.8)	44	0.555	851.9	4.3	0.2	0.4	0.1	1.5
Kansas	43.7% (+/- 1.6)	91	0.434	961.0	5.2	0.5	0.3	0.6	1.2
Kentucky	44.9% (+/- 2.0)	3	0.718	1,196.9	7.9	0.6	4.1	4.1	1.3
Louisiana	40.5% (+/- 2.4)	54	0.727	1,122.8	30.2	0.2	1.0	0.2	3.0
Maine	44.6% (+/- 1.8)	0	0.989	654.5	4.5	0.7	0.7	0.6	1.1
Maryland	44.1% (+/- 3.3)	16	0.670	758.1	30.6	0.5	0.9	0.7	3.0
Massachusetts	48.5% (+/- 2.2)	8	0.562	797.7	19.2	0.6	1.1	0.6	3.0
Michigan	39.5% (+/- 1.6)	36	0.362	907.0	8.1	1.0	0.8	0.8	1.4
Minnesota	48.5% (+/- 1.2)	79	0.403	679.6	6.0	0.5	0.3	0.6	2.8
Mississippi	N/A	45	0.606	1,137.0	20.7	0.4	2.6	N/A	2.2
Missouri	46.6% (+/- 2.5)	29	0.468	932.1	9.4	0.3	0.8	0.1	1.7
Montana	39.6% (+/- 2.0)	38	0.408	636.9	2.2	0.6	0.2	0.9	0.6
Nebraska	47.3% (+/- 1.6)	226	0.610	935.9	4.3	0.9	0.5	0.2	1.1
Nevada	32.3% (+/- 2.9)	11	0.577	637.4	14.6	0.4	1.0	0.4	3.3
New Hampshire	43.9% (+/- 2.2)	1	0.640	619.2	4.2	0.5	0.3	N/A	1.1
New Jersey	40.2% (+/- 2.0)	12	0.728	875.7	17.8	0.7	0.8	0.8	3.6
New Mexico	40.3% (+/- 2.2)	38	0.523	689.7	7.1	0.5	0.1	1.0	2.4
New York	44.1% (+/- 2.2)	32	0.837	840.9	25.5	0.6	0.6	0.5	4.4
North Carolina	48.0% (+/- 2.4)	3	0.571	818.7	17.3	0.3	0.7	0.6	2.2
North Dakota	45.3% (+/- 2.5)	125	0.373	950.5	2.2	0.3	0.0	0.0	1.7
Ohio	41.8% (+/- 1.8)	24	0.472	874.1	10.6	0.3	1.5	0.1	1.3
Oklahoma	44.1% (+/- 2.4)	89	0.514	854.3	8.8	0.3	2.1	2.1	1.8
Oregon	39.3% (+/- 2.9)	16	0.384	556.9	6.7	0.2	0.6	0.9	1.9
Pennsylvania	42.7% (+/- 1.8)	11	0.485	787.2	12.1	0.5	0.5	0.5	1.7
Rhode Island	52.5% (+/- 4.1)	1	0.710	879.7	12.1	0.3	N/A	N/A	2.6
South Carolina	40.7% (+/- 1.8)	7	0.706	880.5	18.4	0.1	0.8	0.0	2.3
South Dakota	54.0% (+/- 2.9)	149	0.443	834.5	3.2	0.0	0.2	N/A	1.1
Tennessee	50.6% (+/- 3.9)	24	0.699	1,159.4	14.5	0.4	3.7	2.0	2.2
Texas	39.3% (+/- 2.2)	183	0.559	867.4	19.7	0.5	0.7	0.2	4.6
Utah	38.0% (+/- 1.4)	7	0.673	791.0	3.3	0.1	0.5	0.6	1.1
Vermont	47.9% (+/- 2.4)	2	0.246	626.5	1.9	0.3	0.3	1.0	0.8
Virginia	47.2% (+/- 2.0)	6	0.700	768.6	13.6	0.6	1.0	0.9	2.2
Washington	45.9% (+/- 1.8)	1	0.477	571.2	8.0	0.4	0.5	0.8	3.0
West Virginia	52.3% (+/- 2.2)	1	0.460	1,177.7	5.7	0.4	7.6	3.0	0.7
Wisconsin	38.2% (+/- 2.4)	21	0.574	715.8	4.8	0.4	0.4	0.5	0.9
Wyoming	36.3% (+/- 2.2)	41	0.289	744.3	2.8	0.2	0.0	N/A	N/A

\*The standardized infection ratio (SIR) is a summary measure and adjusts for the fact that each healthcare facility treats different types of patients. The SIR compares the actual number of HAIs in a facility or state with the standard population, adjusting for several risk factors that have been found to be most associated with differences in infection rates. An SIR significantly greater than 1.0 indicates that more HAIs were observed than predicted; conversely, an SIR of significantly less than 1.0 indicates that fewer HAIs were observed than predicted.

## Endnotes

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1730 M Street, NW, Suite 900  
Washington, DC 20036  
(t) 202-223-9870  
(f) 202-223-9871



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