



United States Department of

**Health & Human Services**

Office of the Assistant Secretary for Preparedness and Response



# **BARDA Analytic Decision Support**

2014 BARDA Industry Day

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**Director, Analytic Decision Support (ADS)**

October 15, 2014

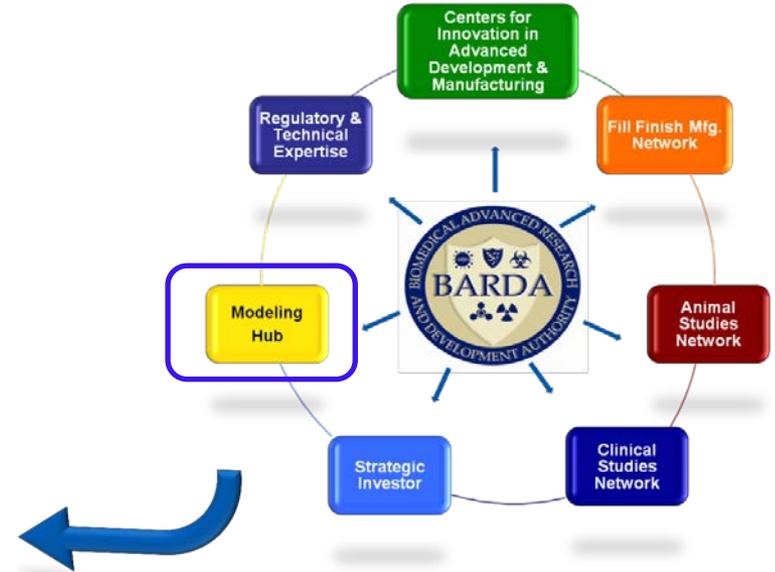
*ASPR: Resilient People. Healthy Communities. A Nation Prepared.*



# Background



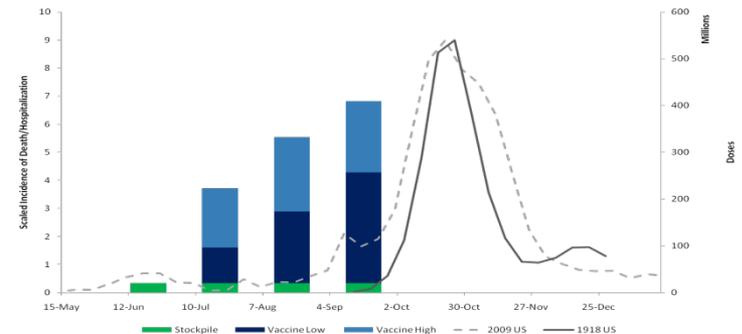
- ADS provides computational and mathematical analysis to BARDA to support the development and purchase of necessary vaccines, drugs, therapies, and diagnostic tools for public health medical emergencies.
- The Pandemic and All Hazards Preparedness Act (PAHPA) and Re-authorization (PAHPRA) designates HHS as lead agency for National Response Framework for Emergency Support Function 8. ASPR has delegated leadership role for medical support functions in a public health emergency. ADS coordinates the “Modeling Hub” for the federal interagency during a response.
- ADS coordinates modeling and analysis for ASPR and BARDA decision support, including the Public Health Emergency Medical Countermeasure Enterprise (PHEMCE) and frequently collaborates with other PHEMCE modeling units.
- There is a shared interest in the coordination of inter-agency modeling efforts to promote transparency to modeling products, leverage investments in modeling technologies, and meet the mission specific needs of partners.
- BARDA has established individual MOUs with PHEMCE modeling groups.

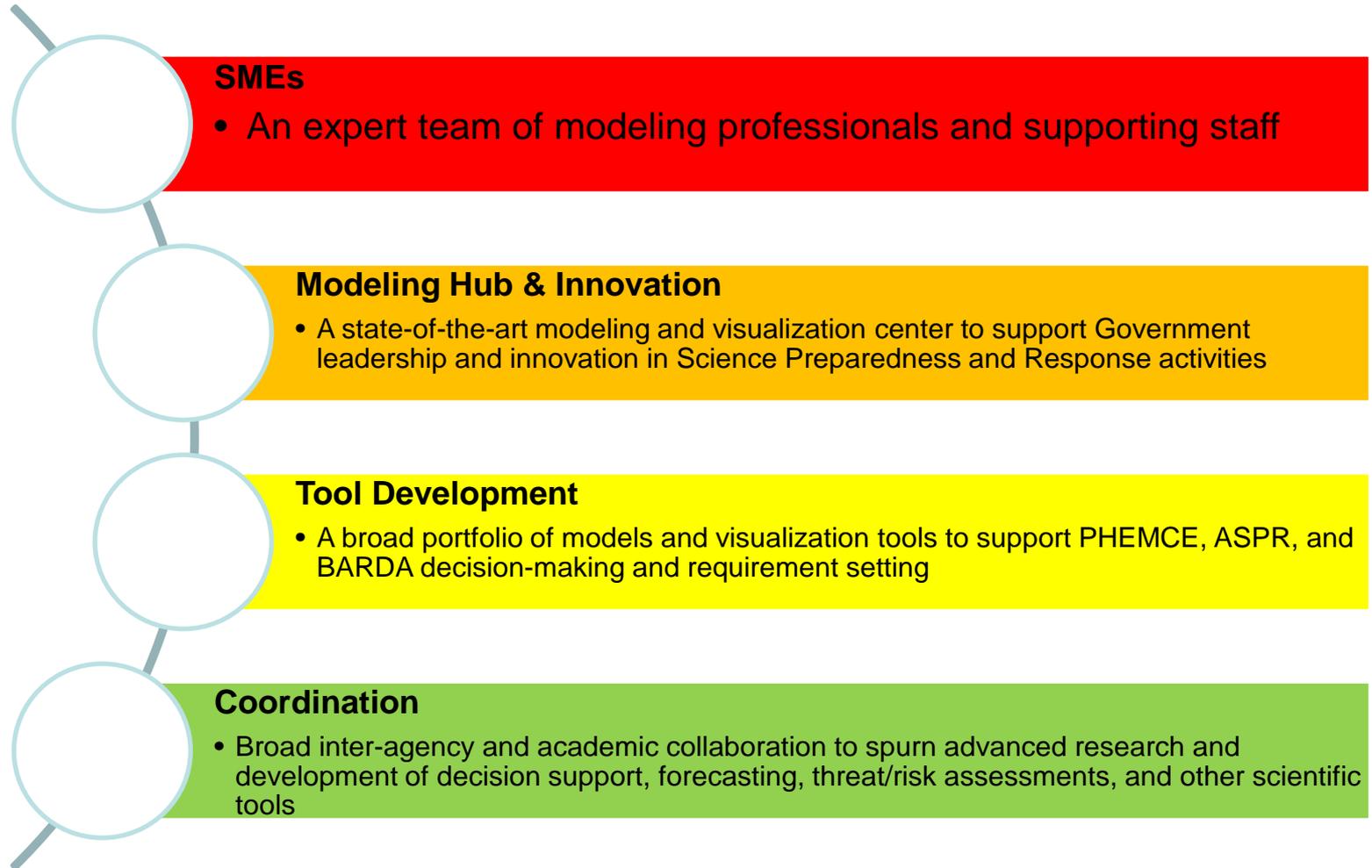


**ADS supports the BARDA mission by ensuring consistent, coordinated analysis for requirement setting, analytic decision support across the PHEMCE, and real-time modeling during public health emergencies.**

# BARDA ADS snap-shot

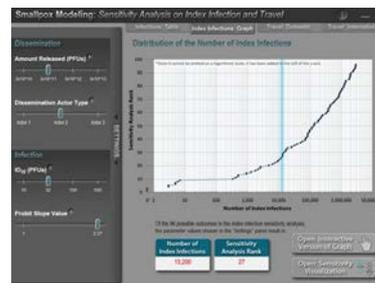
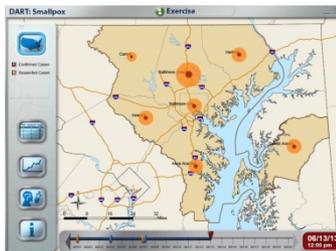
- Core federal staff
- On-site staff support operations of the Modeling Hub
- Additional reach-back support through CDC, DOD/DTRA, NIH/MIDAS, National Labs, and contract support
- Inter-agency agreements:
  - DOD, DHS, CDC, NIH





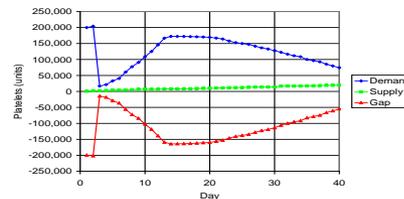
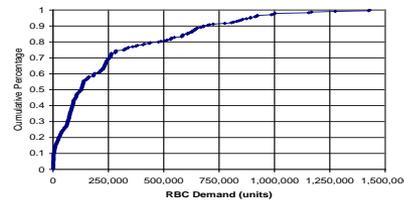
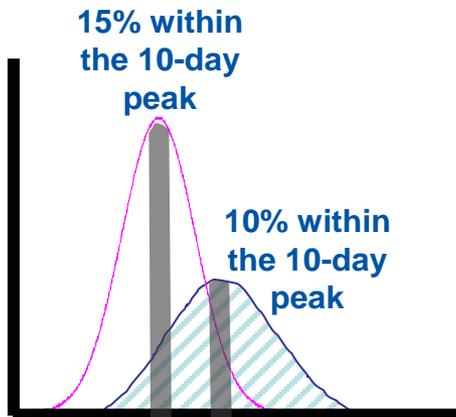
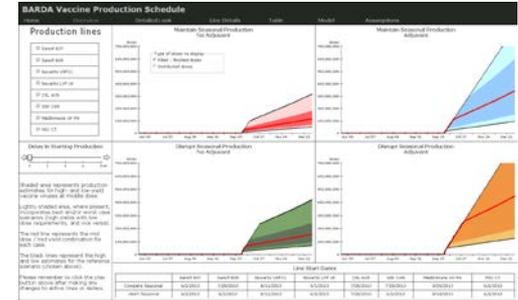
## CBRN tools/analyses:

- Smallpox consequence visualization tool
- MVA Formulary Acquisition Decision Support
- Smallpox Exercise Visualization Tool
- Anthrax Exercise Visualization Tool (A-EVT)
- IND Medical Consequence Visualization Tool
- IND Blood & Tissue Gap Analysis Model (BT-GAM)
- Chemical Prioritization
- Decisional Anthrax Readiness Tool (DART)
- SNS Prioritization tools

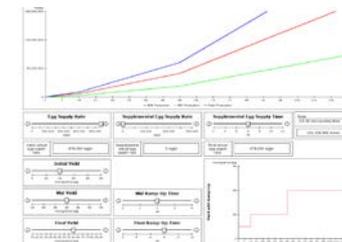
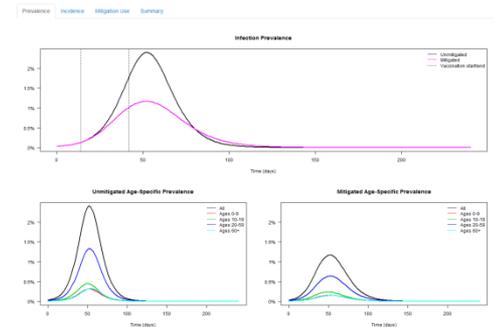
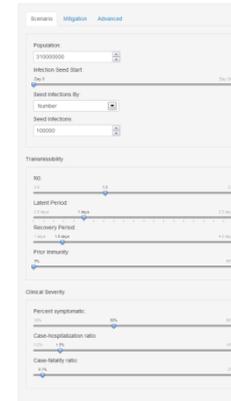


## Influenza tools/analyses:

- Influenza vaccine manufacturing projection tool
- Vaccine-egg production model and visualization
- Influenza mitigation epidemiological modeling tool
- In collaboration with NIH/MIDAS:
  - Influenza forecasting study
  - Two-dose vaccine “optimization”



### Interactive SEIR Model for Influenza





# Recent Accomplishments to Support Preparedness



ADS works closely with DHS to produce the threat assessments for chemical, biological, radiological, and nuclear agents

FOR OFFICIAL USE ONLY

Strategic Implementation Plan  
to Conduct Material Threat  
Assessments

U.S. DEPARTMENT OF  
HOMELAND SECURITY  
**Homeland  
Security**  
Science and Technology

DEPARTMENT OF HEALTH & HUMAN SERVICES - USA  
ASSISTANT SECRETARY FOR PREPAREDNESS AND RESPONSE

ADS develops tools that allow planners and first-responders in the medical and public health community to prepare for a nuclear event.

Division of Analytic Decision Support

IND Visualization Tool

**Challenge**

The Public Health Emergency Medical Countermeasures Enterprise (PHEMCE) Radiological/Nuclear Incident Preparedness (IND) modeling scenarios with weapons of various yields, heights of burst, and with impacts in different cities. The supporting analysis examines a wide variety of medical countermeasures and produces a large volume of data on injury and treatment needs, which becomes a daunting interpretation task.

**Solution**

The Division of Analytic Decision Support developed a dynamic visualization tool that allows users to easily explore the complex scenario space and examine the impact of different assumptions on consequences and countermeasure needs. The tool also displays prompt and fallout results in a GIS environment to aid in intuitive understanding of nuclear weapon effects.

**Impact**

PHEMCE IND response planners now have a visualization tool that allows them to gain insight into the challenging problem of preparing for an IND incident. Also, analysts can now more rapidly respond to questions about the underlying modeling and easily produce informative charts.



# Biological Agent Preparedness Tools: **ASPR**

## Anthrax

ASSISTANT SECRETARY FOR  
PREPAREDNESS AND RESPONSE

**Our tools are used to estimate medical consequences resulting from scenarios. Most federal HHS plans are based on these scenarios.**

**Division of Analytic Decision Support** **Anthrax Planning Tool**

**Challenge**  
The Department of Health and Human Services needed a way to identify potential gaps in the Aerosolized Anthrax Response Playbook to coordinate HHS activities and resources.

**Solution**  
The Division of Analytic Decision Support developed an interactive visualization tool that allows the user to define the timing of decisions and actions that are required during a public health response.

**Impact**  
The visualization tool is available to help improve public health response plans and further develop plans with federal, state, and local partners.

Implementation of modeling tools are useful in an exercise environment with decision makers to examine the “What ifs?”

Division of Analytic Decision Support

## Smallpox Vaccine Response Exercise Tool

**Challenge**

The Public Health Emergency Medical Countermeasures Enterprise wanted to test the new smallpox vaccine response strategy with national, state, and local stakeholders in a simulated exercise environment to assess how it would be implemented.

**Solution**

The Division of Analytic Decision Support developed a reusable exercise support tool that allows participants to rapidly develop new evidence-based scenarios, make decisions about smallpox countermeasure utilization, and measure medical outcomes.





**Impact**

The Vaccine Response Exercise Tool was used to introduce the smallpox vaccine response strategy in support of a large interagency tabletop exercise in Washington, D.C. with representatives from the Office of the Assistant Secretary for Preparedness and Response, the Centers for Disease Control and Prevention, the Department of Homeland Security, state and local public health officials, and other public health preparedness partners.





# Budget Analysis for the Strategic National Stockpile



ADS has developed decision support tools that are used during the Strategic National Stockpile Annual Review.

Division of Analytic Decision Support

## SNS Annual Review Budget Analysis Tool

**Challenge**

As part of the SNS Annual Review, the Public Health Emergency Medical Countermeasures Enterprise (PHEMCE) must make recommendations on SNS holdings in order to match projected budget constraints with procurement and maintenance costs. Exploring the potential options is very labor intensive and in the past it was not possible to quickly construct recommendations.

**Solution**

The Division of Analytic Decision Support created a graphical tool to allow analysts to rapidly explore possible SNS procurement decisions and compare options. The tool also demonstrated the impact on preparedness by showing how potential changes in procurement or maintenance affected available regimens of countermeasures.

**Impact**

The 2013 SNS Annual Review was completed on time, which was a significant accomplishment given the compressed timeframe caused by the government shutdown. Had the previous manual methods been used, there would not have been enough time to complete the task. The PHEMCE now has a visual tool that can be reused in future years, resulting in compounding labor savings, and improving the communication of the results to senior leaders.



# Influenza Preparedness and Response

**Web-based, interactive models are used to collaborate between modelers and for communications with senior leadership.**



Division of Analytic Decision Support

### Interactive Influenza Mitigation Model

**Challenge**

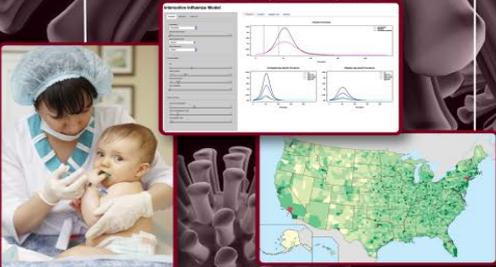
The Centers for Disease Control and Prevention (CDC) and BARDA independently conducted model-based analyses of influenza, and this resulted in difficulty comparing results from different models. Analyst-to-analyst communication of modeling results was constrained, and the presentation of results to senior leadership was unintuitive and labor-intensive. Furthermore, the regularly-used CDC models for short-term analyses were not able to consider the impact of countermeasures used in concert.

**Solution**

The Division of Analytic Decision Support, in consultation with CDC, designed a web-based interactive modeling interface and a back-end library of compartmental influenza models that allow for exploring the impact of various mitigations, independently and in combination.

**Impact**

The visual interface allows analysts and decision-makers to rapidly interact with influenza models to compare mitigation strategies and test the impact of key assumptions. The back-end modeling toolkit also provides a framework for continued collaborative influenza model development between CDC and Analytic Decision Support.



# Influenza Vaccine Production for Planning and Response

**Modeling tools are needed to understand the impact of medical countermeasure manufacturing performance on health outcomes**

Division of Analytic Decision Support

### Vaccine Production

**Challenge**  
BARDA regularly needs estimates of the amount of vaccine that could be manufactured in response to a novel pandemic influenza. Characterizing the level of certainty for many biological, manufacturing, and regulatory parameters remains a challenge and has potential significant impact on the levels of estimated vaccine production. During a potential pandemic, BARDA needs to examine whether or not particular subsidies could be reduced while maintaining pandemic preparedness.

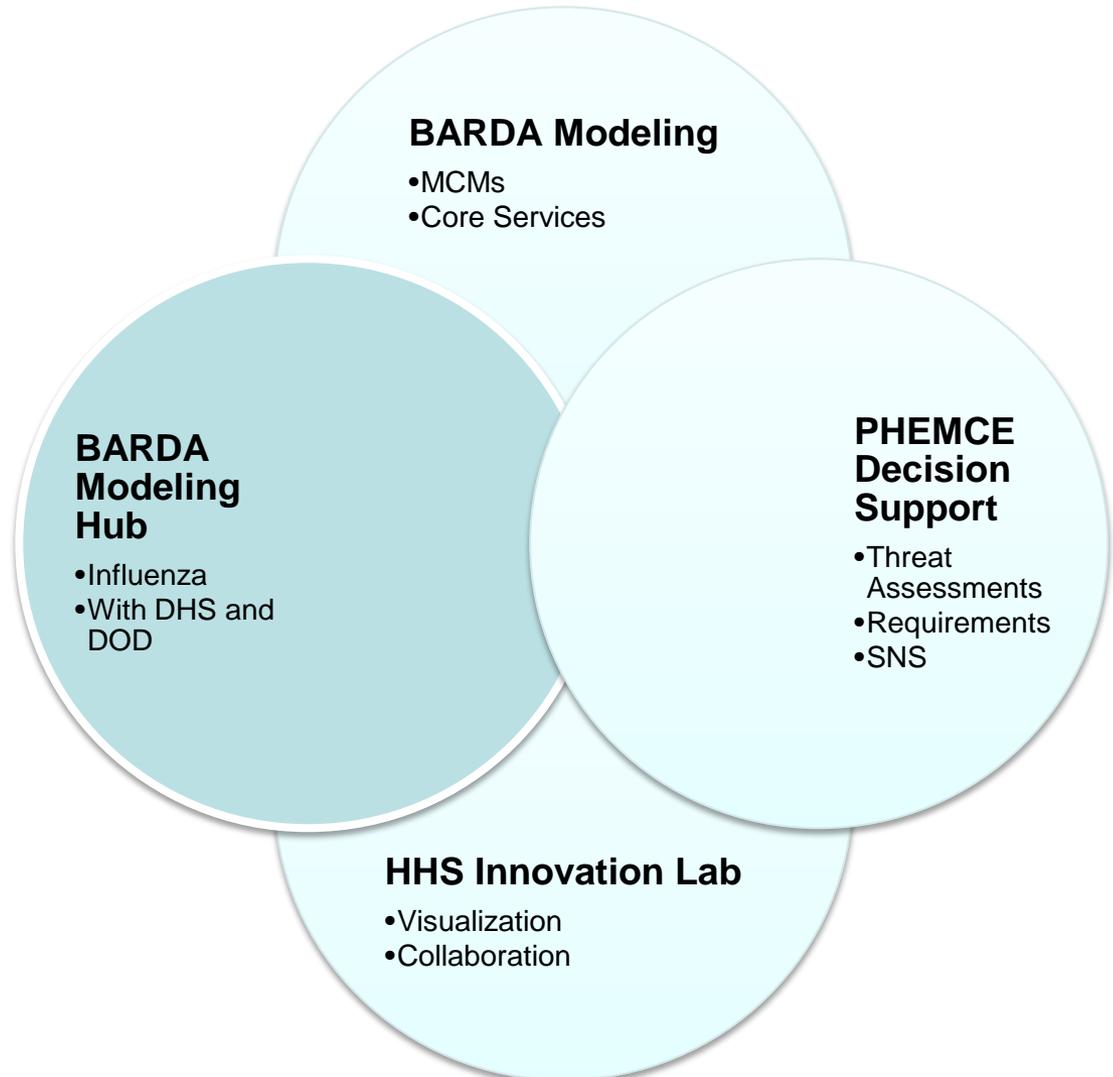
**Solution**  
The Division of Analytic Decision Support vetted many assumptions involved in estimating vaccine production and attempted to quantify uncertainty in each. Parameters were adjusted multiple times as new data were received. ADS also created graphical tools to allow decision-makers to quickly change assumptions involved in production and to see the outcome on vaccine doses delivered.

**Impact**  
BARDA now has a family of visual modeling tools that allow the interagency to gain and maintain insight into potential production capability. The underlying uncertainties involved in predicting manufacturing capacity are now more clearly understood and more readily communicated. Furthermore, production estimates can now be more readily refined in the face of new data.



# ADS coordinates modeling with many stakeholders.

- **Coordination Activities:**
  - convene and coordinate
  - engage in preparedness activities including requirement setting, planning, and exercises
  - engage with end-users through Federal preparedness programs





# Response Activities



# H7N9

# Ebola

- **The HHS Modeling Hub – coordinated by BARDA ADS – facilitates inter-agency coordination and collaboration during public health events and emergencies.**



# What does the BARDA Modeling Coordination Group Do?



- Coordinates Ebola modeling activities with academic, government, and NGO partners.
- H1N1 and other health emergencies demonstrated the need for modeling coordination as a preparedness activity.
- Partners across interagency have important health-related missions, and benefit from coordinated modeling capabilities:
  - 24/7 operational modeling support (DTRA Reachback)
  - Information sharing (NBIC, ASPR Fusion)
  - Bio-surveillance (CDC, NBIC)
  - OCONUS surveillance (DOD, CDC)
  - Early warning and prediction (DOD)
  - Situational Awareness (ASPR Fusion)
  - Basic Research (NIH)
- Stakeholders with limited access to models can be reached with coordinated efforts.



# Chartered Activities



1. Provide a **coordinating forum** within the federal interagency for **modeling, simulation, analytical and visualization efforts** regarding **CBRN, influenza, and EIDs** to facilitate a common understanding of respective mission spaces, requirements, capabilities, upcoming efforts, and overall potential gaps.
2. **Foster an interagency modeling enterprise** that will allow for increased interagency collaboration, defining modeling requirements and gaps, and maximizing opportunities.
3. **Coordinate and advise on requirements and efforts** to develop and maintain a suite of analytic decision support and visualization tools and models across the federal government in support of Homeland Security Presidential Directives and Federal response plans for Public Health and Medical Services.
4. **Facilitate leveraging existing acquisition mechanisms** to nimbly and effectively develop models for preparedness and response. This group will not, however, direct constituent budget decisions.

# 2012 H7N9 Response Efforts

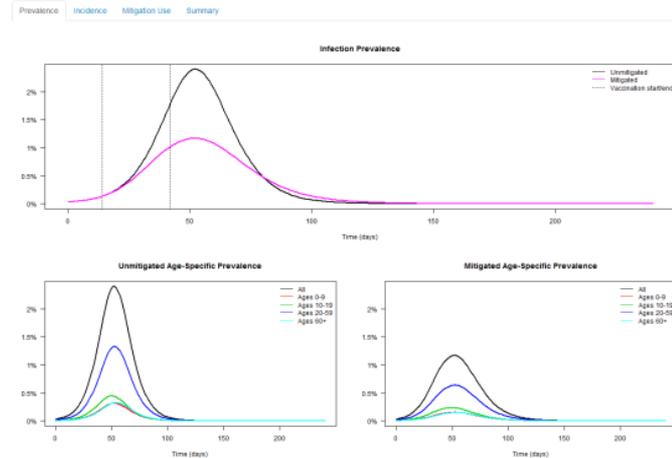
- Modeling coordination between BARDA and CDC

- Aim:

- facilitate communication among modeling units within the agencies
- Estimate the pandemic potential of H7N9 and the impact of pharmaceutical and non-pharmaceutical interventions on health outcomes.

- Joint analyses and results were well received by senior leaders from both organizations.

Interactive SEIR Model for Influenza

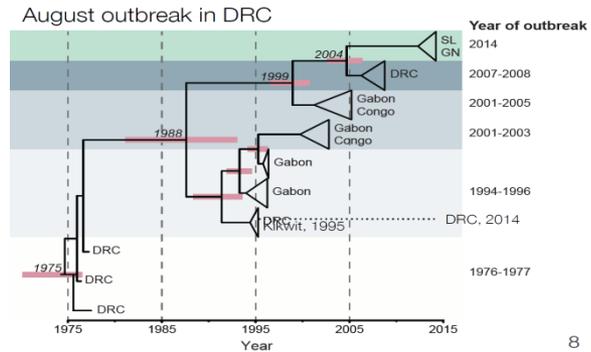




# MCG Response Efforts: 2014 Ebola Virus Disease



## Genomic surveillance elucidates Ebola virus origin and transmission during the 2014 outbreak



- Began meeting ~weekly since 11 August
- Aim:
  - facilitate communication among USG
  - provide awareness of analyses that could be useful for operations
- AD Analyses:
  - Number of beds needed in West Africa
  - Impact of non-pharmaceutical intervention strategies
  - Quantify amount of vaccine for long term purposes.



# Ebola: MCG Constituent modeling efforts / results



- Projecting cases of West Africa outbreak
- Assessing impact of potential US outbreak
- Estimates for quantities of therapeutics, vaccines, diagnostics, PPE
- Non-Pharmaceutical Interventions
- Population at Risk
- Evacuation Planning
- Comparing DoD & CDC models
- Risk of international spread - airline data
- Risk of regional spread - mobile phone data
- Under consideration – supply chain analysis



# New capabilities under development



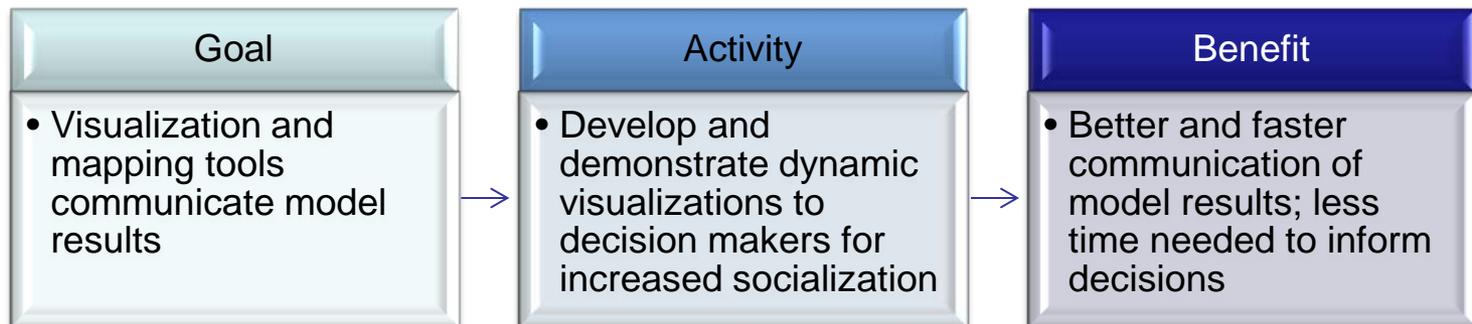
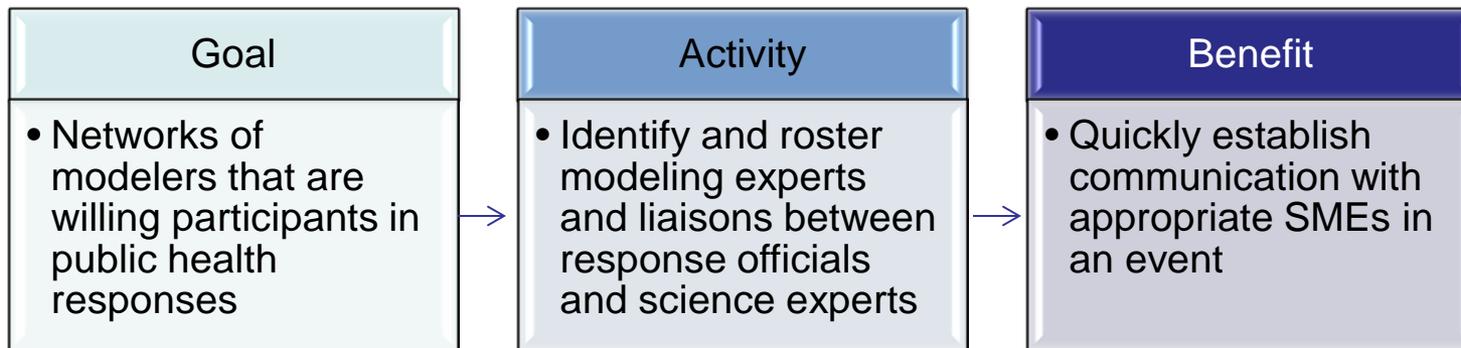
FY15: Develop model and data libraries with enhanced BARDA and PHEMCE decision support tools including significant legacy requirements and decisions.

Modeling Hub and Network: Model Coordination Group and Inter-agency agreements

Ongoing: BARDA ADS Modeling and Visualization Hub and Network as an interactive resource center for BARDA and stakeholders to conduct, document, and archive medical consequence and public health response models.



# Goals for a Center of Innovation



# Thank you

