

PACER

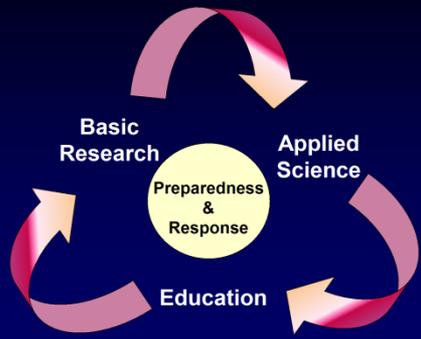


Detection and *Surveillance* of Biothreats and Emerging Infectious Diseases:

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**Team: JHU SOM, USF CBD, CUBRC, JHU APL
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Kalish, Farrell, Rothman**

March 18, 2009



CENTER FOR THE STUDY OF HIGH CONSEQUENCE EVENT PREPAREDNESS AND RESPONSE (PACER)

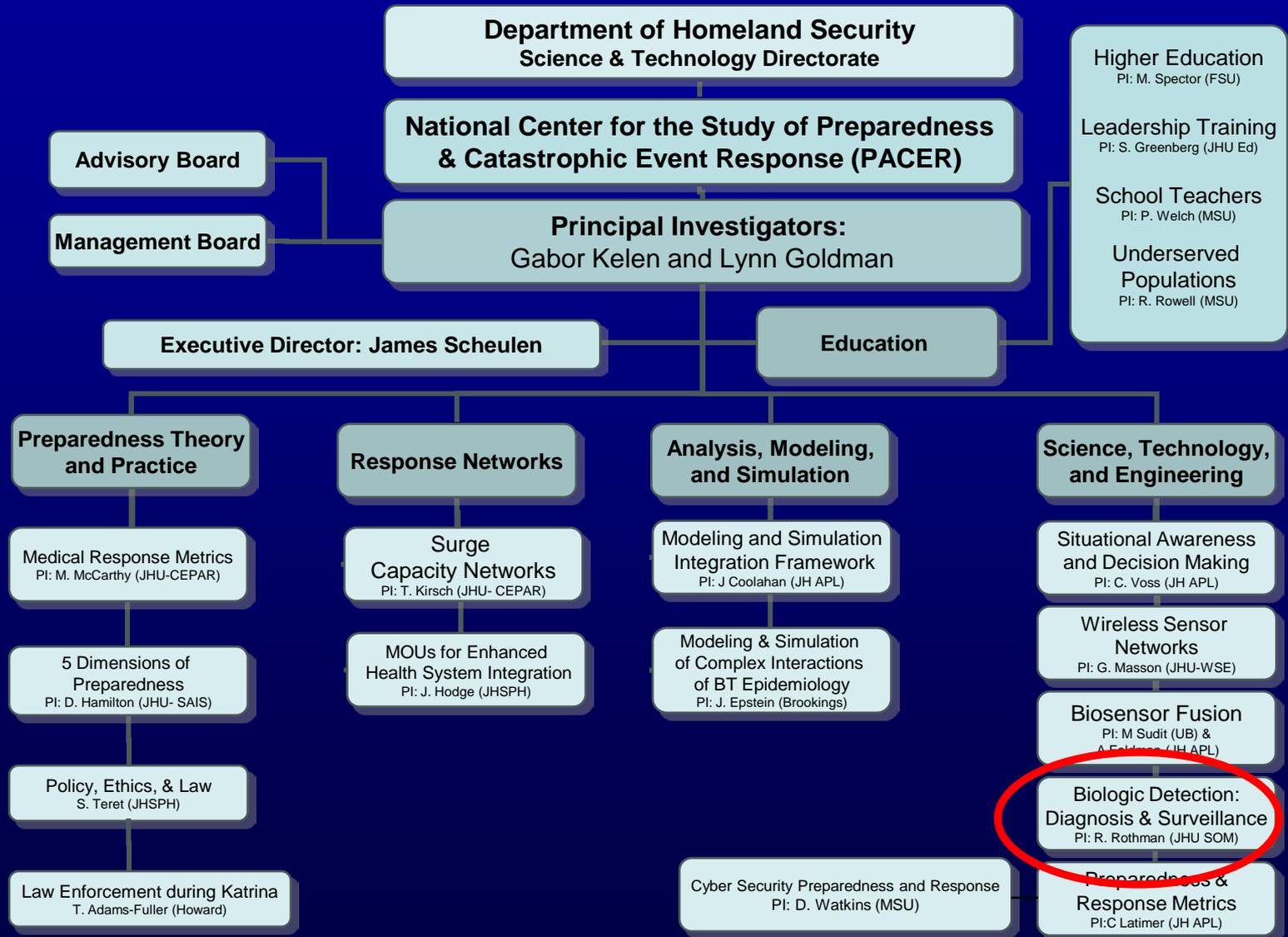
Funding: DHS

CoPI's: Gabor Kelen and Lynn Goldman

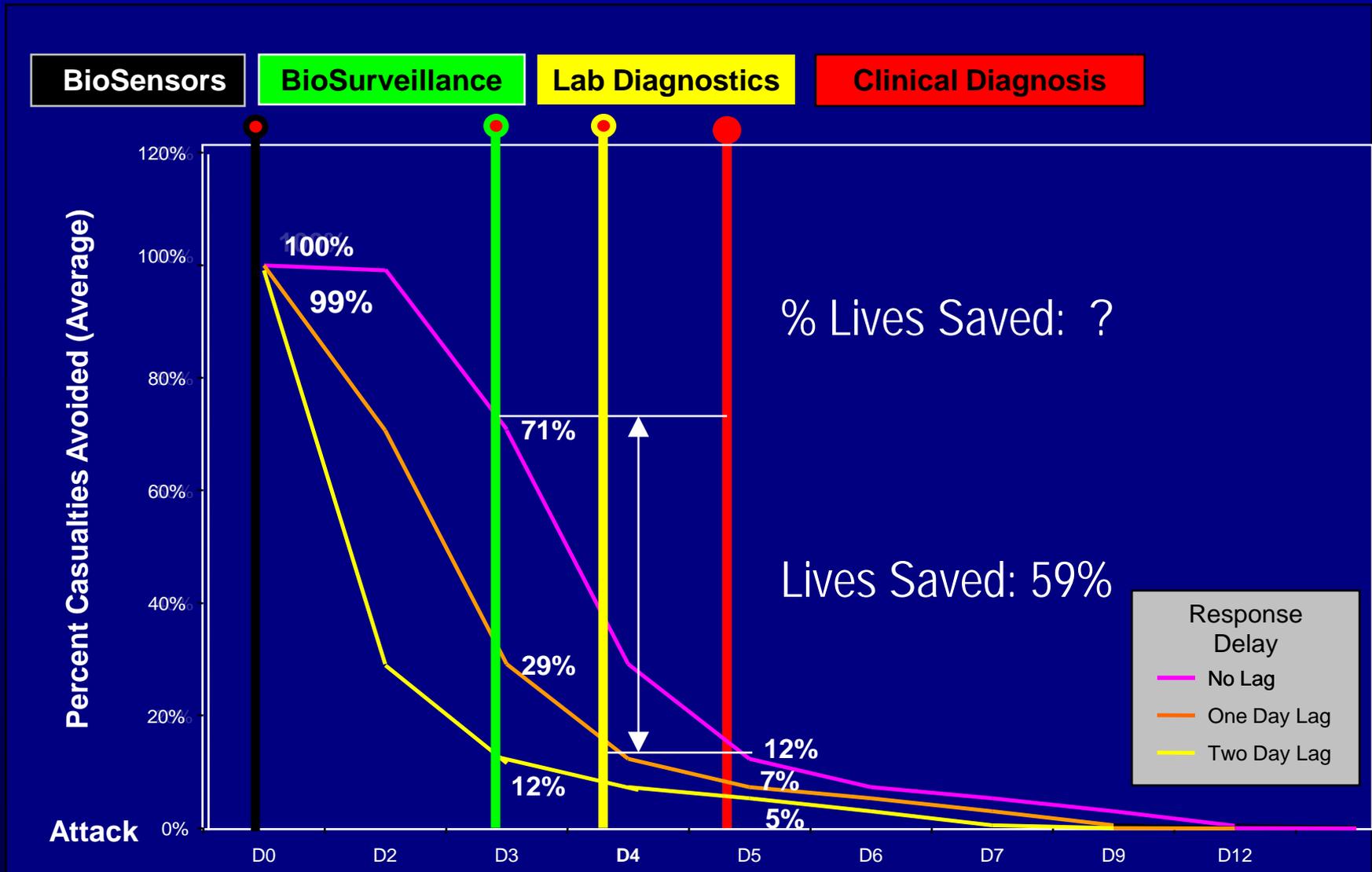
Multi-institutional and Cross Cutting Expertise



Science Framework Expert Domains



Infectious Disease Outbreak



Adapted from Kaufman, et al, 1997 Emerging Infectious Diseases

Program Objectives

I. Surveillance:

Describe infrastructure and gaps in *communication and response* to alert signals from syndromic surveillance systems across the US

II. Diagnostics:

Describe infrastructure and gaps in communication and response within The Laboratory Response Network

III. Diagnostics:

Describe currently available, and most promising developmental technologies for *rapid (point of care or near bedside)* detection of emerging and biothreat agents.

Response to Alert from Syndromic Surveillance Systems: 3 PHASES

Lori Uscher-Pines, PhD, MSc luscher@jhsph.edu

- I. Broadly describe** current SS systems in place across U.S. with focus on response protocols
 - Immense investment post 9/11
 - Anecdotal reports on what exists
 - Critical for informing phase II and III

- II. Conduct case studies** of response protocols in representative states to inform development of a 'guidance framework'

- III. Convene expert panel to develop guidance** for public health departments and **identify research priorities**
 - Limited guidance materials to inform protocol development
 - Limited research on response

Methods: Phase I

Survey ALL US State Epidemiologists

- **Generated contact lists of US state epidemiologists**
- **Selected survey elements for inclusion**
 - Number and types of SS system in use
 - Level of initiation of outbreak response
 - Plans for expansions
- **Conducted survey**
 - Email and telephone; 5 attempts made
- **Analyzed data**
 - Descriptive statistics
 - Correlated with existing preparedness scoring systems
 - Qualitative comments by theme



Results: Phase I

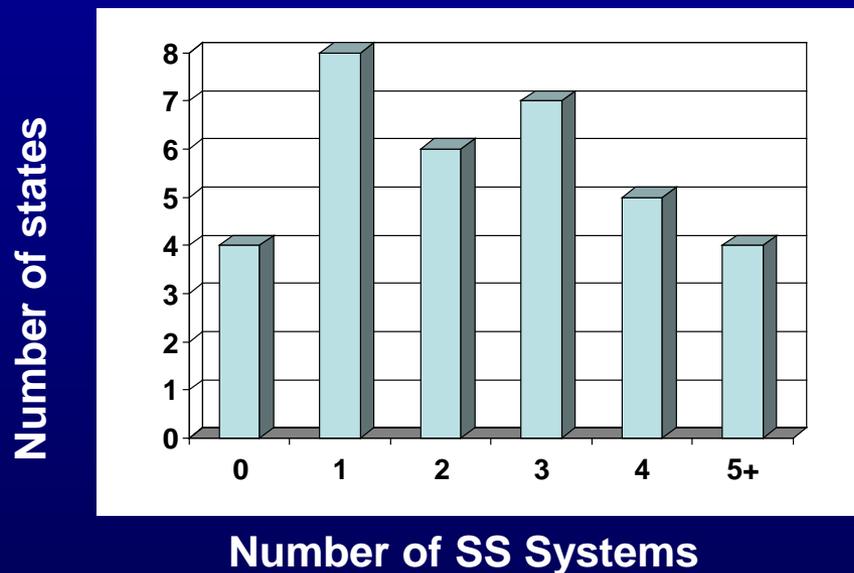
80% response rate (N = 41)

- 33 states (80%) with active SSS
- 54% reported all major metro areas covered
- 27 states (66%) planned to initiate SS activities or expand on existing systems within 12 months



Results: Phase I

- More than 25 types of systems described
RODS (13) and ESSENCE (9) most common*



- No correlation between presence of syndromic surveillance system and existing scoring metrics

* Most common systems other than BioSense

Results: Phase I

Level of Initiation of Investigation	Number of States (n=34) (%)
State-Level	25 (74%)
State-Level Only	9 (26%)
Regional-Level	11 (32%)
Regional-Level Only	1 (3%)
County/City-level	21 (62%)
County/City-level Only	6 (17%)
Both State and County/City Level	15 (44%)

Conclusions: Phase I

- **High penetration of BioSense**
 - *Variability in perceived utility*
- **Significant variability in site for response initiation**
 - **26% w/ state only**
 - may indicate gaps in preparedness (e.g. Hurricane Katrina)
 - **44% w/ state and local**
 - **Context dependent: suggest need for detailed response protocols**
- **Current metrics don't account for SS and/or SS not considered essential**
- **Lack of consensus on value of SS in early warning, yet majority planning expansions of current systems**

Phase II: Conduct Case Studies of Response Protocols to Inform Framework Development

Methods:

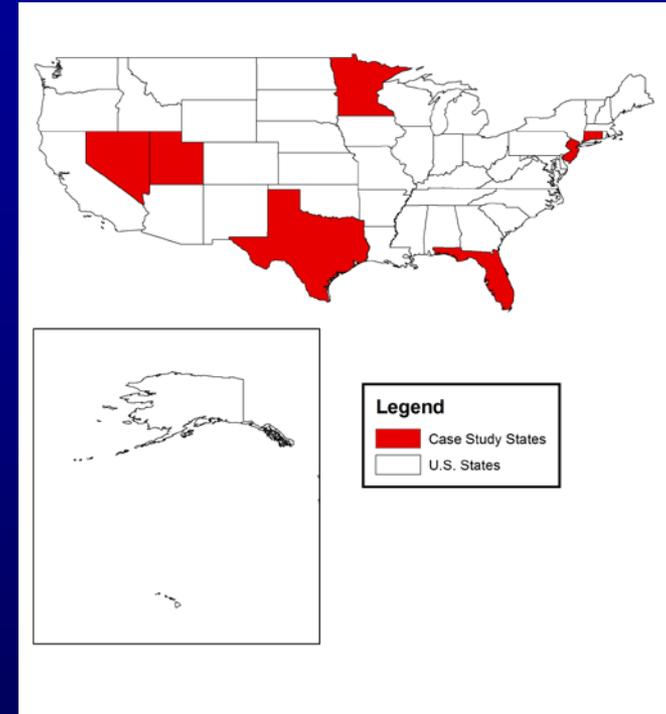
In-depth interviews of existing methods for response to SS

Sampling strategy

8 case studies: 100% participation

Selection by

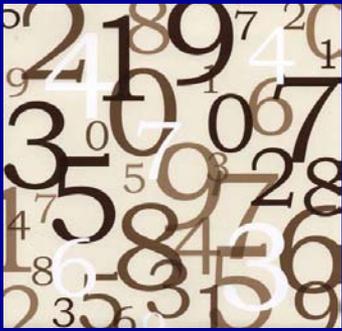
- A. Origin of response
3 levels: local, state, both
- B. Population
2 levels: <5 million, > 5 million
- C. Addition of “high risk” regions



**High risk' defined by DHS Urban Areas Security Initiative Eligibility*

Methods: Phase II

- **Contact list culled from Phase I with snowball sampling**
- **Survey content**
 - Development, implementation and experience with response
 - Quantitative and qualitative elements
- **'Interview guide' informed by:**
 - Published literature
 - Phase I survey
 - Written response protocols
 - Pilot phase II (Duval County, Fla)
- **Full Survey:**
 - In-depth phone Interviews; May-Sept 2008
 - 37 individuals at 30 health departments



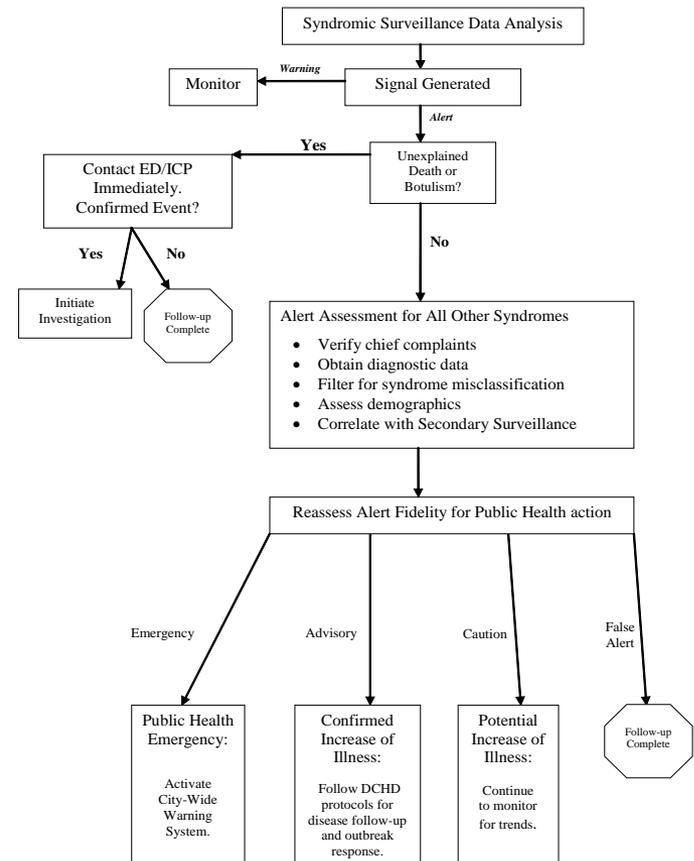
Quantitative Data Elements (Examples)

- # of SS systems monitored; # of supportive systems
- # of years each SS system has been on-line
- Existence of written protocol (yes/no)
- # of SS systems that generate alerts
- # of staff who monitor SS; # who receive alerts
- Average # of alerts generated per week
- % of alerts that are immediately ruled to be false positives; % of alerts that receive a cursory investigation; % of alerts that receive full investigation
- # of cases in last year in which SS alerted health department to an outbreak or situation which required intervention
- # of times per day each SS system is monitored
- # of total hours spent by all staff in systems' monitoring and response
- Estimated operational costs

Qualitative Data Elements (Examples)

- Hierarchy/leadership
- Stakeholder communication
- Role of protocol vs. contextual judgment
- Factors which impact decision-making/models of action
- State/local relationships
- Role of SS in response (w/in context of other surveillance)
- Novel uses of SS
- Feedback on/use of BioSense

Figure 1. Syndromic Surveillance Follow-Up Model



Results: Phase II

Attribute/Policy	Number of Health Depts (n=23) (%)
HDs with written response protocol	11 (48%)
SS detected an event of public health significance (yes/no)	3 (17%)
HDs cannot monitor data after hours/on weekends	5 (22%)
HDs with multiple systems	12 (52%)
HDs using RODs	11 (48%)
HDs using ESSENCE	5 (22%)
HDs using BioSense	5 (22%)

- *Mean number of systems among active users: 1.6 (Range 1-3)*

~ 15% of alerts ever traced beyond the system

Conclusions: Phase II

- **Under-developed written protocols**
 - **Research questions:**
 - **When are written protocols necessary?**
 - **Are protocols too alert-dependent?**
- **SS rarely used for early warning**
 - **Research questions:**
 - **Does changing role of SS (situational awareness) change response?**
- **Down-stream steps of investigation seldom detailed or tested**
 - **Gaps between public health systems and hospitals**
- **Little regionalization and inter-jurisdictional communication/action; important in light of Katrina and movement towards common state-wide systems**
 - **More work needed on “trigger” to notify state or neighboring jurisdictions**

** Presented at ISDS, 2008, In press, DMPHP*

Phase III: Convened *Expert Panel** to Develop Guidance for Public Health Departments

- Outcomes
 - Prioritization, and clarification of Syndromic Surveillance Systems Response Elements
 - Guide for public health departments
 - Consensus Statement on Research Priorities



*Local, state, federal representation

Refining/Prioritizing Response Elements: Delphi Technique

- Assemble list of elements from Phase II
(Team: 50 elements)
 - Review/addition of elements
 - (Expert panel: 73 elements)
 - Rate elements (essential, desirable, not essential)
 - Re-score elements in context of others ratings
- **27 “Essential” Elements Identified for Framework**

Results: Essential Written Protocol Framework Elements

CATEGORIES

1. Description of Systems

2. Monitoring Policies

3. Response Procedures

4. Policies on Protocol Revision

5. Role of SS response protocols w/in additional plans

6. Other

Category 1: Descriptions of Systems

- Description of data sources
- List of participating facilities
- Detection algorithms
- Frequency of data updates/refresh
- Syndrome definitions
- Description of system uses/purposes

Sample Round III Rating Form

1	Framework Elements	Original			Revisions		
		Not Necessary	Desirable	Essential	Not Necessary	Desirable	Essential
2							
3	Description of System			4			
4	<i>Key features</i>	0	1	6			
5	Description of types of data sources	1	2	11			
6	Description of types of users and monitors	4	7	3			
7	Restrictions in access	3	5	6			
8	List of participating facilities	3	2	9			
9	Geographic and population coverage statistics	1	8	6			
10	Detection algorithms	0	6	8			
11	How often data is updated/refreshed	0	6	8			
12	Syndrome definitions	0	1	13			
13	Approach to mapping (options for levels)	2	8	3			
14	Sources of baseline information	3	5	6			

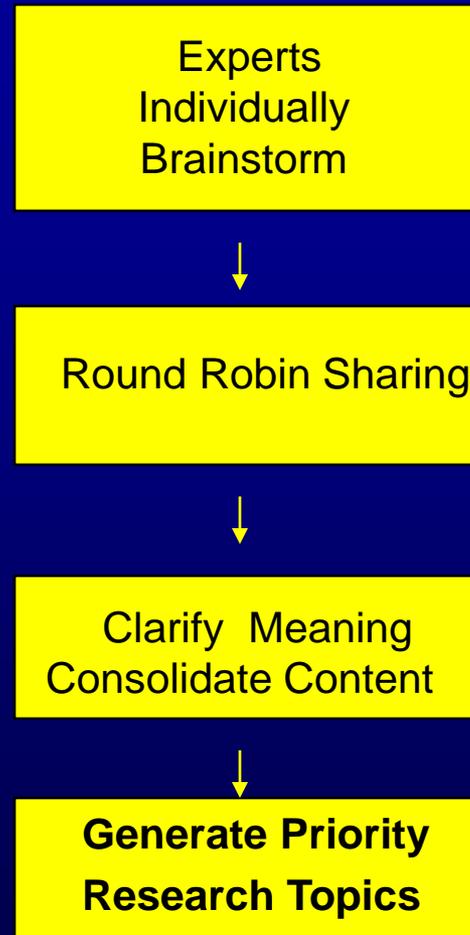
Research Priorities: In Progress

- **Nominal Group Technique:**

Assuming you were the national decision-maker regarding investment of resources into research in syndromic surveillance: What would be your priority list to address GAPS in syndromic surveillance response?



Nominal Group Method: Four Steps



e.g. What are the necessary workforce competencies for SSS analysis/investigation?

Anticipated Outcomes

- Detailed Response Protocol Framework
Guidance for Health Departments
- White paper Identifying Research Priorities



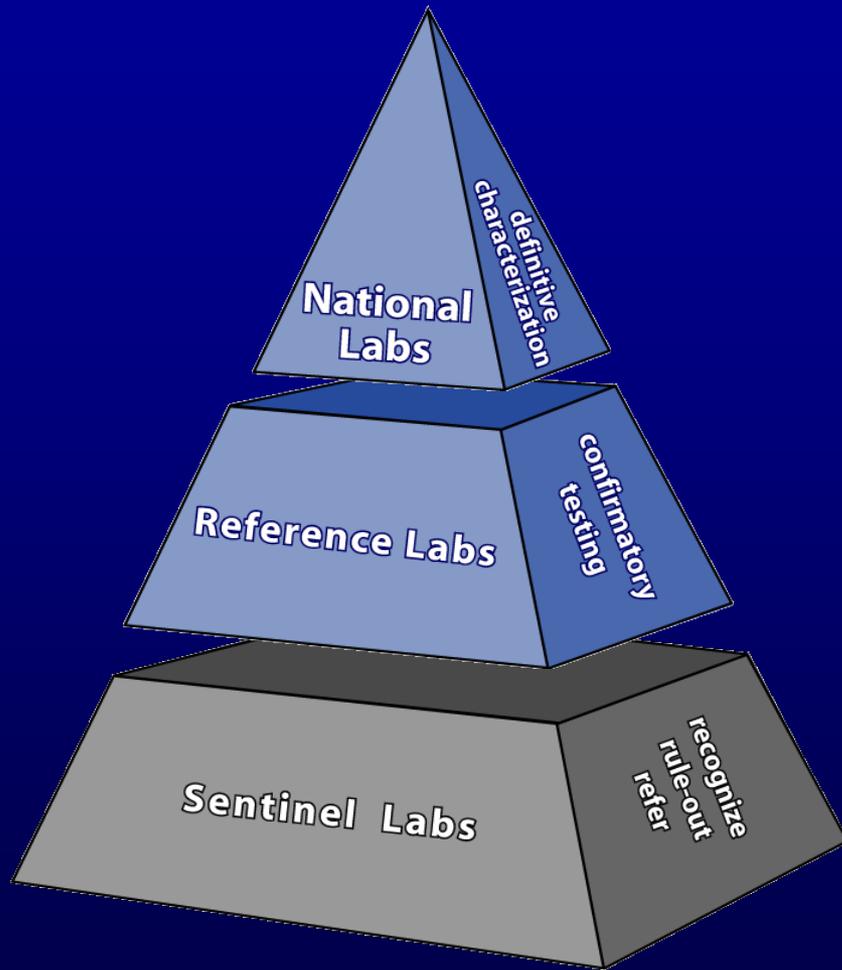
Planned special session APHA: PACER/ISDS

Objective II

**Describe infrastructure and gaps in
communication and response within
*The Laboratory Response Network***

Brian Kalish, MD, MPH

Laboratory Data and Systems: LRN



National responsible for specialized strain characterizations, bioforensics, select agent activity, and handling highly infectious biological agents.

Reference laboratories responsible for investigation and/or referral of specimens(>140 state and local public health, military, federal, and international laboratories)

Sentinel laboratories provide routine diagnostic services, rule-out and referral steps in the identification process (not equipped to perform the same tests as LRN reference laboratories).

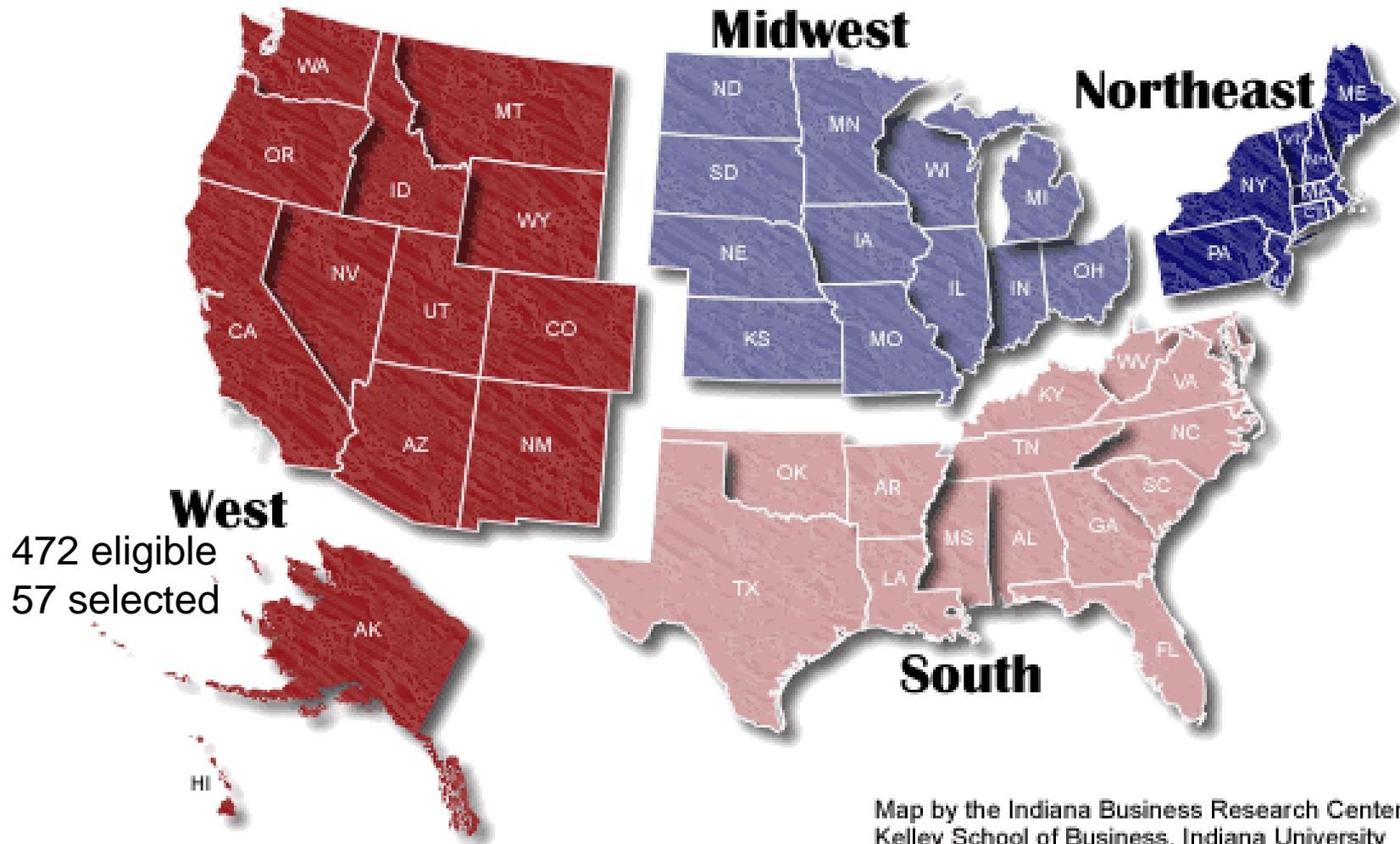
Foundation of the Pyramid

Survey Content Areas

- Personnel
 - Designation of personnel to coordinate bioterrorism response
- Training
 - Participation in biothreat detection drills and educational exercises
- Communication
 - Methods of signaling reference labs

Sampling Strategy (N=300)

U.S. Census Regions



RESULTS (selected)

70% response rate

- 29.0% reported any previous emergency alert experience
11.7% within the last two years
- Personnel:
 - ~ 25% no designee to LRN reference laboratory
- Training
 - Only 20% have internal drills
- Communication
 - 80% rely on phone-only communication of results

Conclusions

- **Although 75% of respondents felt confident that they had sufficient personnel, equipment, and training to respond to a biological terrorism event significant gaps were identified**
- **LRN laboratory designee perceptions:**
 - **Inadequate training (51%)**
 - **Inadequate personnel (28%)**
- **Findings will inform development of laboratory preparedness metrics**
- **Findings highlight potential gaps which could be addressed by arming sentinel laboratories with intrinsic diagnostic capacities**

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CENTER OF EXCELLENCE

Questions



Results (Cont)

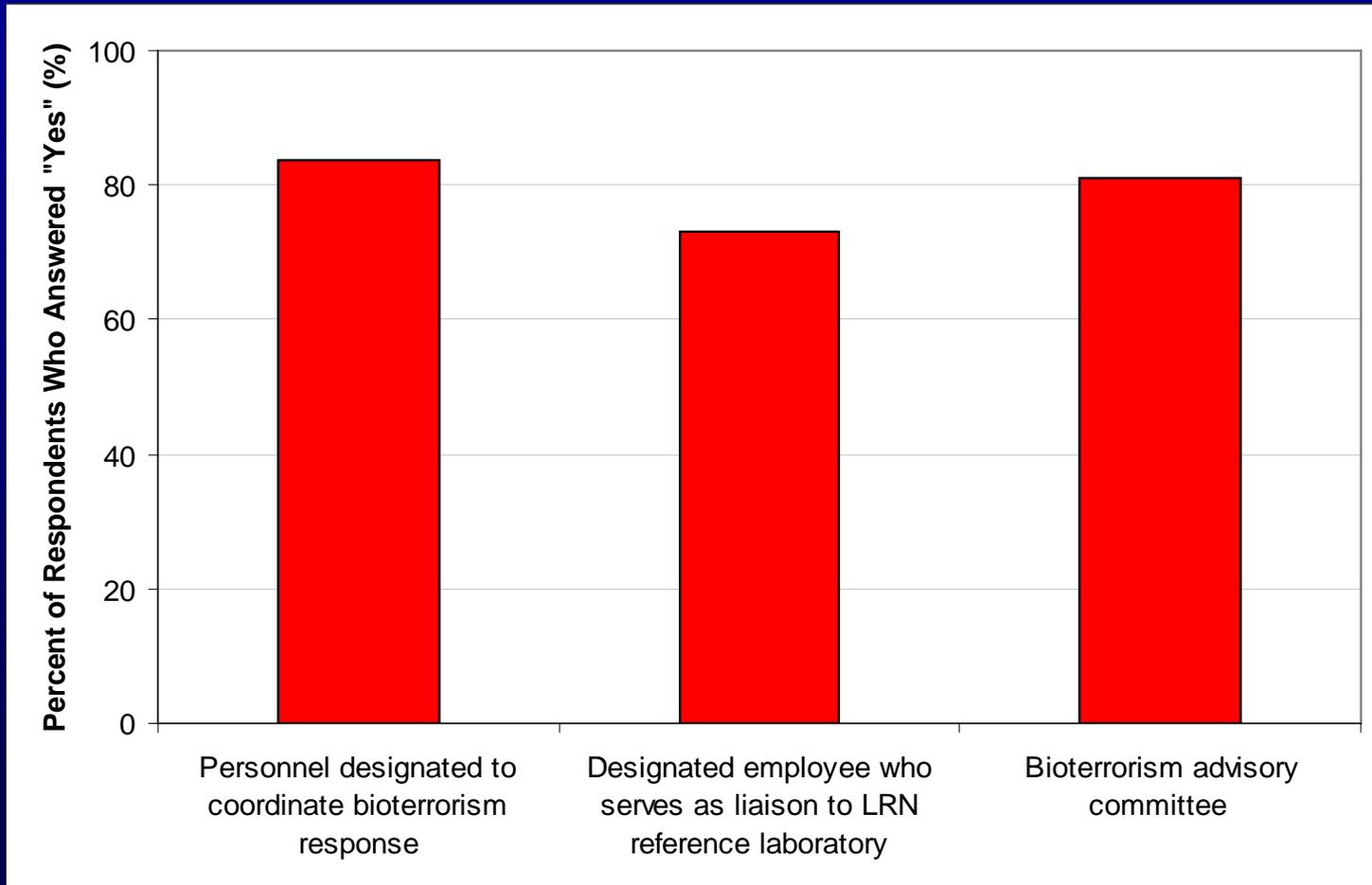
Description of SS System Monitoring Among Active Users (N=23)

Health Dept Attribute	State HDs (n=7) Median (range)	Local HDs (n=15) Median (range)
Number of Systems Monitored	1(1-2)	1 (1-3)
Number of Years (oldest) System in Place	6 (4-7)	4 (1-6)
Number of Data Monitors	3 (1-7)	2 (1-40)
Number of Alerts Received (per month)	12 (1-250)	4 (1-200)
Number of Staff Hours in Monitoring (hours/week)	2 (.2-6)	2 (1-12)

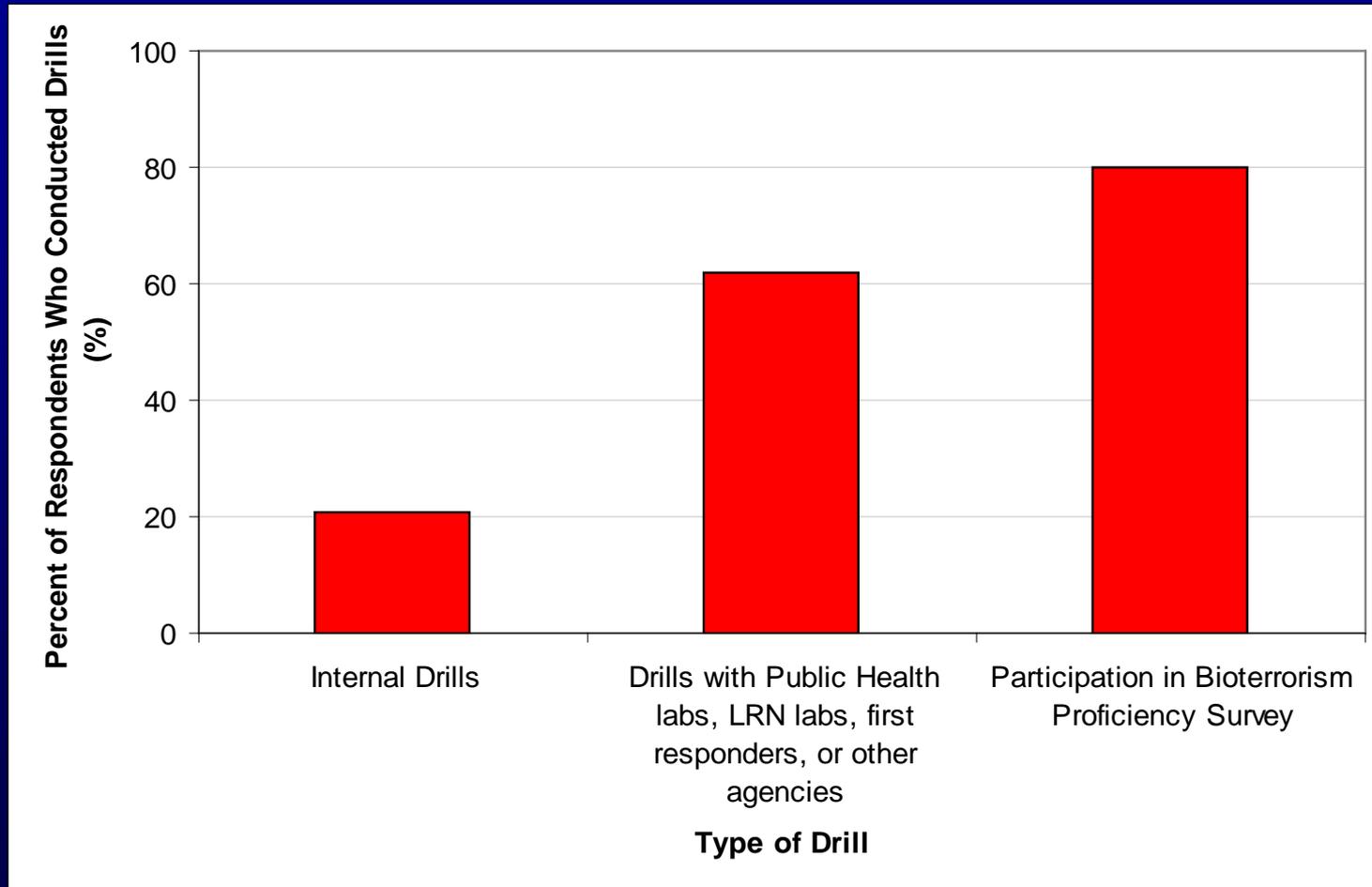
METHODS

- **List of hospitals obtained from American Hospital Directory with >250 beds and an ED (N=2472)**
- **Stratified random sample (N=300 hospitals)**
 - **Weighted by geographic region**
- **Eligibility: Sentinel lab**
- **Survey Format: Phone (fax/electronic if requested)**

RESULTS: Personnel



RESULTS: Training



RESULTS:

Methods of Communication

