The Impact of PulseNet on Foodborne Illness in the United States: An Economic Evaluation

Monday, May 23, 12:00–1:00pm ET

Council of State and Territorial Epidemiologists

Housekeeping

- Please note that today's webinar is being recorded
  - The webinar recording and presentation slides will be available in the webinar library on CSTE's website: http://www.cste.org/?page=WebinarLibrary
- All phone lines have been placed on mute
- There will be a question-and-answer session at the end of the webinar
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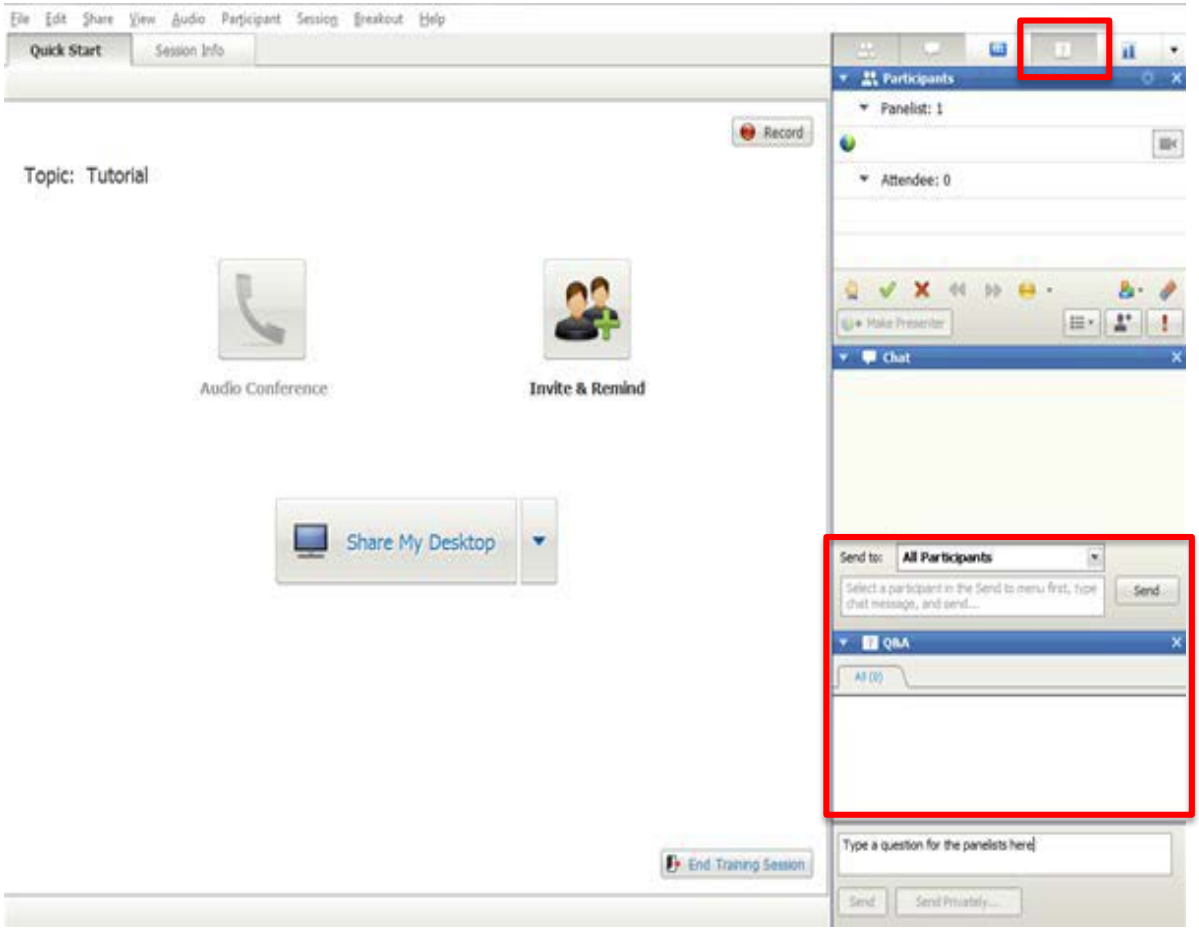

Webinar Agenda

- **Introduction and Welcome**
  - Dr. Kirk Smith, CSTE Food Safety Subcommittee Chair
- **Featured Speakers**
  - Dr. Robert L. Scharff, Ohio State University
  - Dr. Craig W. Hedberg, University of Minnesota
- **Topics**
  - An Overview of the Evaluation
  - Effect of PulseNet on Illness: The Process Change Model
  - Effect of PulseNet on Illness: The Recall Model
  - The Economics of PulseNet: Benefits and Costs
  - Conclusions/Implications
- **Q&A Session**

An Economic Evaluation of PulseNet, a Network for Foodborne Disease Surveillance

Published in
American Journal of Preventive Medicine, *50*(5), S66-S73.

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The PulseNet Benefit-Cost Analysis

Goal:

To assess the benefits and costs of PulseNet

Benefits:

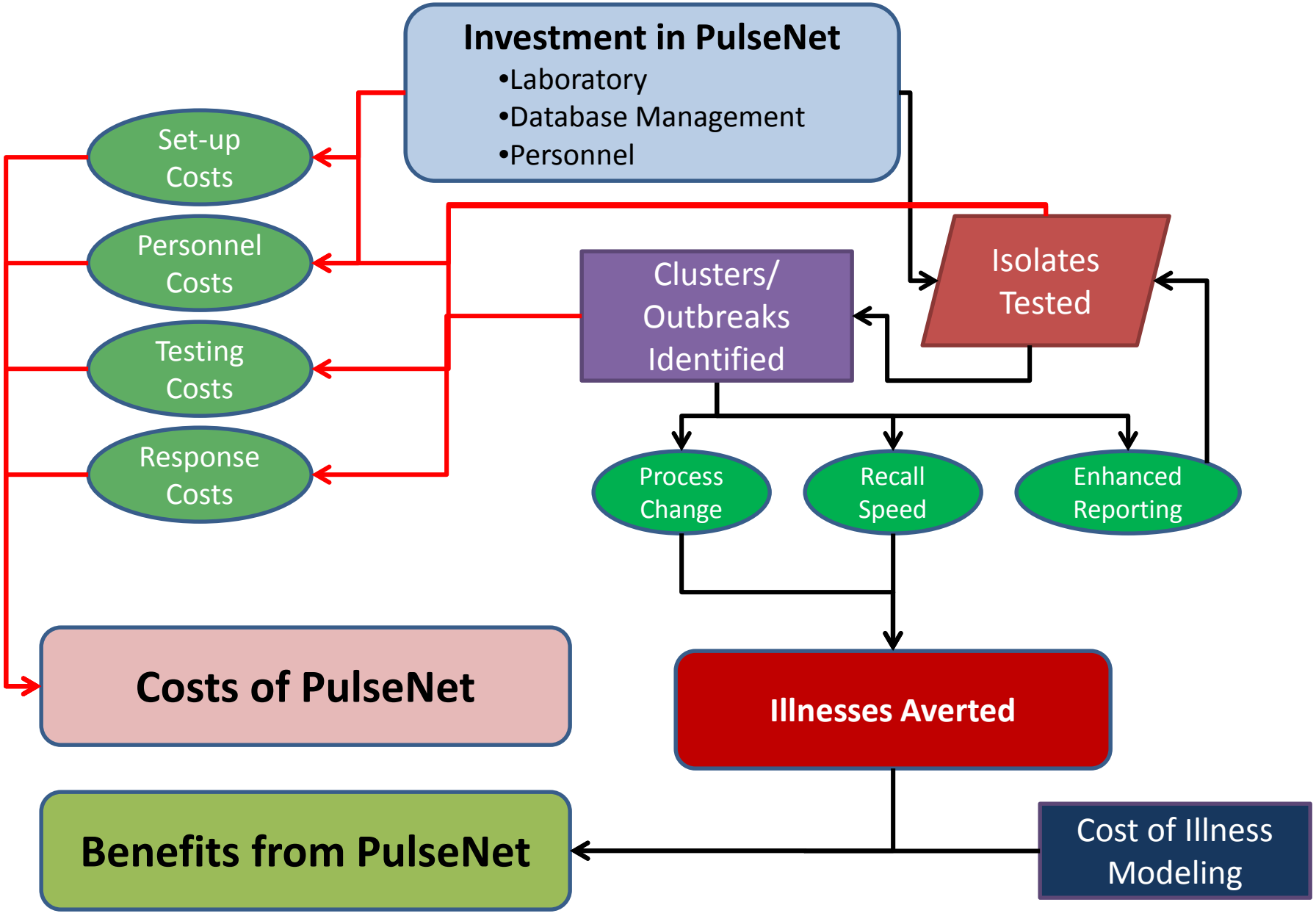
Focus on reduced foodborne illness

- from faster recalls
- from process change brought about by industry accountability

Costs:

Focus on costs to the public health system

Benefit-Cost Analysis of the PulseNet System



The Cost Model

Annual state costs estimated for:

– Laboratory space at state health labs	$731,276
– Equipment needed	$547,045
– Reagents	$504,931
– Sample Transport	$2,216,150
– Labor (epidemiologist & technician)	$1,625,111
CDC costs	$1,650,000
Total Cost	**$7,274,513**

A Model of Benefits from Process Change

State level data (1994-2009)

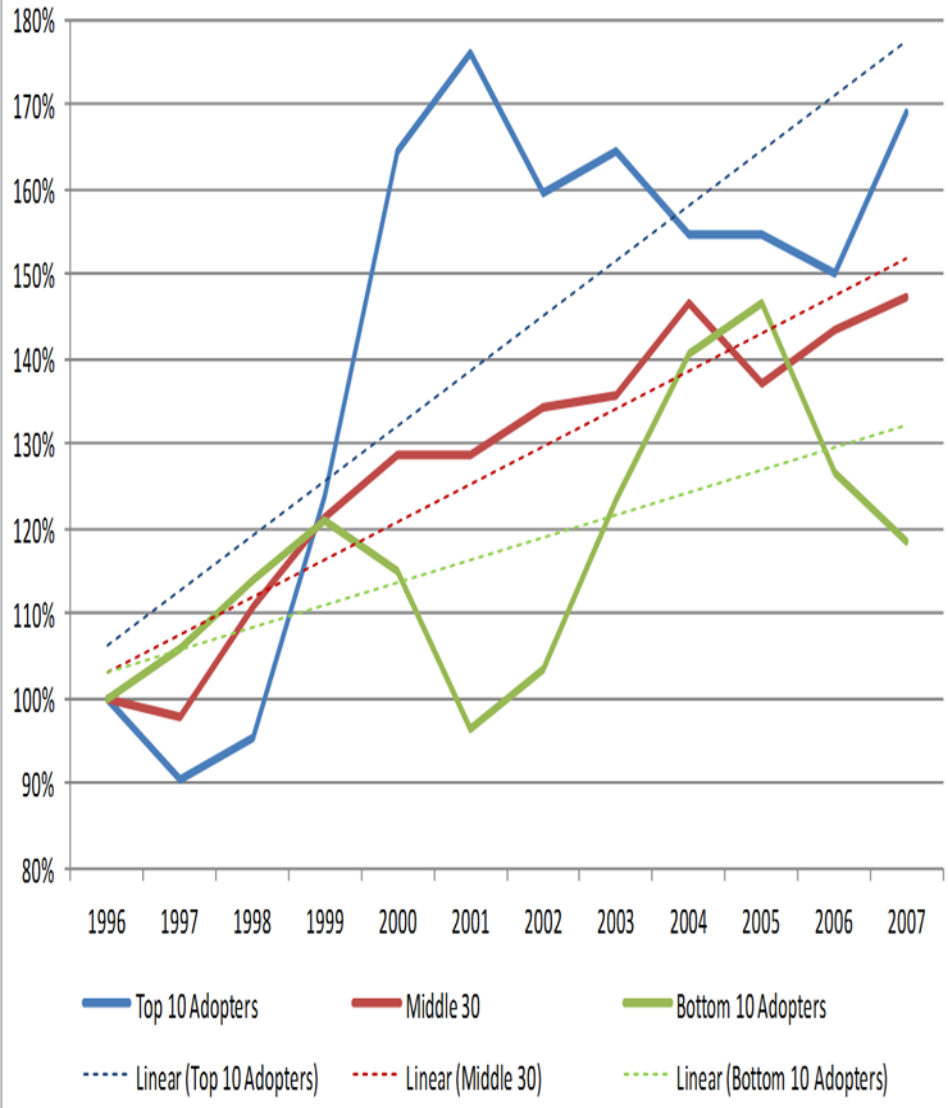
Reported NNDSS illnesses modeled as a function of:

- PulseNet presence (d.v.)
- Isolates tested
- Population
- Year

Linear Regression Models

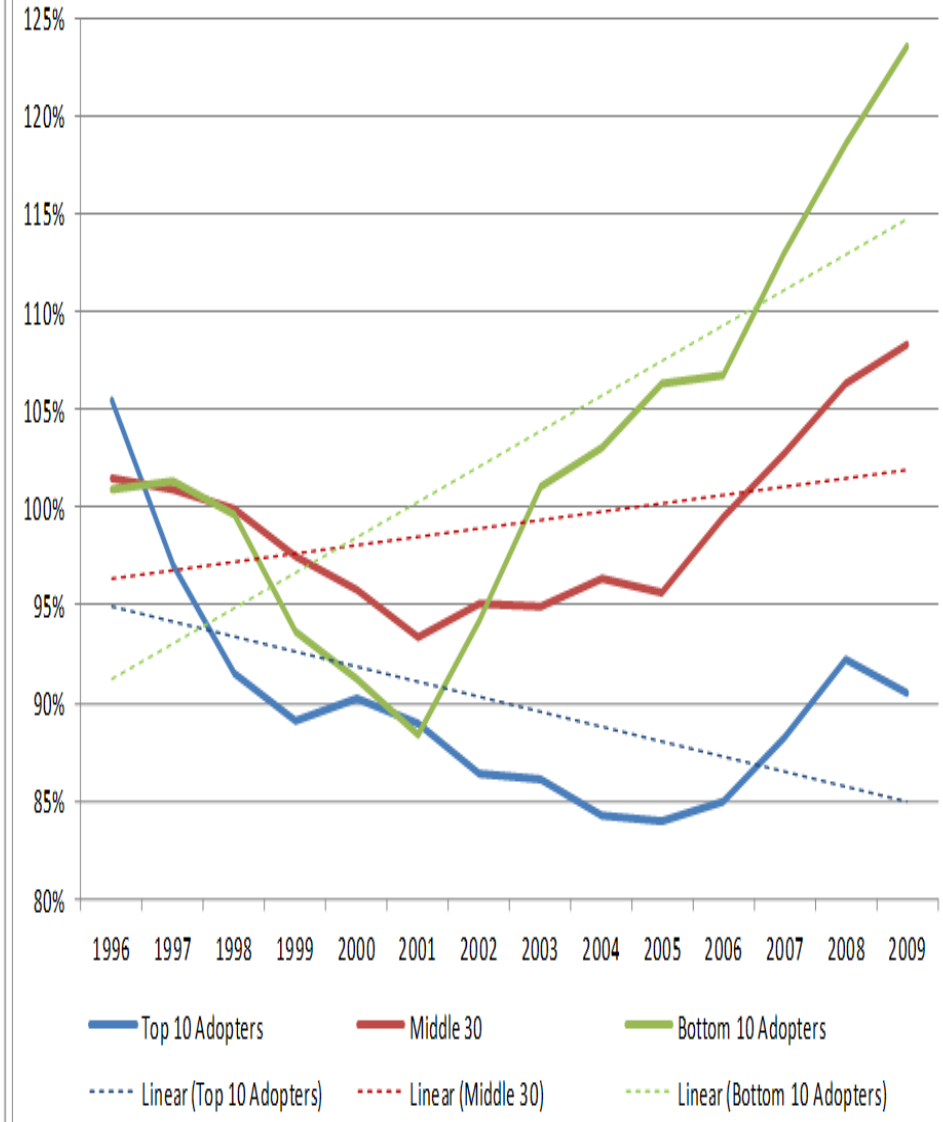
Salmonella Outbreaks for PulseNet Adopters

(relative to 1994-96 baseline - 3 year moving average)



Reported *Salmonella* Illnesses for PulseNet Adopters

(relative to 1994-96 baseline - 3 year moving average)



Estimated Numbers of Cases Prevented by Outbreak-Associated Recalls of E. coli O157:H7 and Salmonella Infections, 2007–2008

Agent	Vehicle	No. outbreaks	No. outbreak cases reported	No. reportable cases prevented	90% credible interval
E. coli O157:H7	Ground beef	15	276	108	95, 266
Salmonella outbreaks					
Wandsworth, Typhimurium	Veggie Booty	1	87	49	32, 67
I 4,[5],12:i:-	Pot pies	1	401	72	19, 132
Litchfield	Cantaloupe	1	51	0	0
St. Paul	Jalapeno, serrano peppers	1	1,500	345	50, 714
Typhimurium	Peanut butter, products	1	714	114	27, 214

Effect of Isolate Testing on Number of Illnesses

(Salmonella Poisson Regression Model)

Variable	Basic Model[a]	Spillover Effects[a,b]
PulseNet (d.v.)	-13.573**	-10.747**
Lagged Isolates Tested (#)	-0.166**	-0.122*
Net Illnesses Averted (90% C.I.)	**9,096** ** **(8,504-9,686)**	**11,291** ** **(5,628-16,948)**
Adj. for Underreporting	**266,522**	**330,840**
Adjusted R-Squared	0.86	0.90
Number of Obs.	809	809

[a]Variables included, but not reported, are: population, year, eight census division dummy variables, current period isolates tested, and a constant.

[b]Includes variables for lagged E.Coli and lagged Listeria isolates

** significant at 1%

* significant at 5%

Effect of Isolate Testing on Number of Illnesses

(E Coli Poisson Regression Model)

Variable	Basic Model[a]	Spillover Effects[a,b]
PulseNet (d.v.)	0.008	0.025*
Lagged Isolates Tested (#)	-0.092**	-0.076**
Net Illnesses Averted **(90% C.I.)**	**364**** **(274,453)**	**670**** **(451,889)**
Adj. for Underreporting	**9,489**	**17,475**
Adjusted R-Squared	0.81	0.84
Number of Obs.	561	561

[a]Variables included, but not reported, are: population, year, eight census division dummy variables, current period isolates tested, and a constant.
[b]Includes variables for lagged Salmonella and lagged Listeria isolates
** significant at 1%
* significant at 5%

Effect of Isolate Testing on Number of Illnesses

(Listeria Poisson Regression Model)

Variable	Basic Model[a]	Spillover Effects[a,b]
PulseNet (d.v.)	0.013	0.015
Lagged Isolates Tested (#)	-0.023	-0.019
Net Illnesses Averted **(90% C.I.)**	**27** **(-38,92)**	**73** **(-26,172)**
Adj. for Underreporting	**56**	**153**
Adjusted R-Squared	0.80	0.82
Number of Obs.	501	501

[a]Variables included, but not reported, are: population, year, eight census division dummy variables, current period isolates tested, and a constant.
[b]Includes variables for lagged E.Coli and lagged Salmonella isolates
** significant at 1%
* significant at 5%

Alternative Illness Reduction Estimates

	Salmonella	E Coli	Listeria
Base			
Random effects	15,784**	310	113**
Fixed Effects	19,758**	489*	113*
Poisson	9,096**	364**	27
Spillover Effects			
Random effects	21,249**	2,673**	151**
Fixed Effects	25,181**	1,597**	75
Poisson	11,291**	670**	73

** significant at 1%

* significant at 5%

Assigning Value to Illness Reduction

- Determine illnesses averted for each pathogen
- Chart probabilistic disease outcome trees
- Assess costs for each outcome node
- Derive expected cost of illness for each pathogen
- Characterize uncertainty using Monte Carlo simulations

The Expected Cost of Illness

Medical Costs

- Doctor's Visits
- Medication
- Hospitalization

Productivity Losses

- Lost Productivity for Ill Person
- Lost Productivity for Caregivers

The Cost Per Case of FBI ($)

@Risk Used to Perform Monte Carlo Simulations

Pathogen	Mean	Confidence Interval 5%	95%
E Coli O157:H7	2,154	1,464	2,295
Listeria m.	156,019	81,003	254,934
Salmonella (non-typh)	1,792	1,461	2,295

Alternative Benefits Estimates

(Poisson Regression Model, $ million)

	Salmonella	E Coli	Listeria	Total	90% C.I.
Base					
Reported	16.3	0.8	4.2	**21.3**	**11-34**
Adjusted	477.5	20.4	8.8	**506.8**	**410-646**
Spillover Effects					
Reported	20.2	1.4	11.4	**33.1**	**14-55**
Adjusted	592.8	37.6	23.9	**654.4**	**340-1,002**
Recall Model					
Reported	1.0	0.2	0.0	**1.3**	**0.5-2**
Adjusted	30.4	6.1	0.0	**36.5**	**13-65**

Are the Costs of PulseNet Justified?

Annual **Cost**:

$7.3 million

Annual **Benefits**:

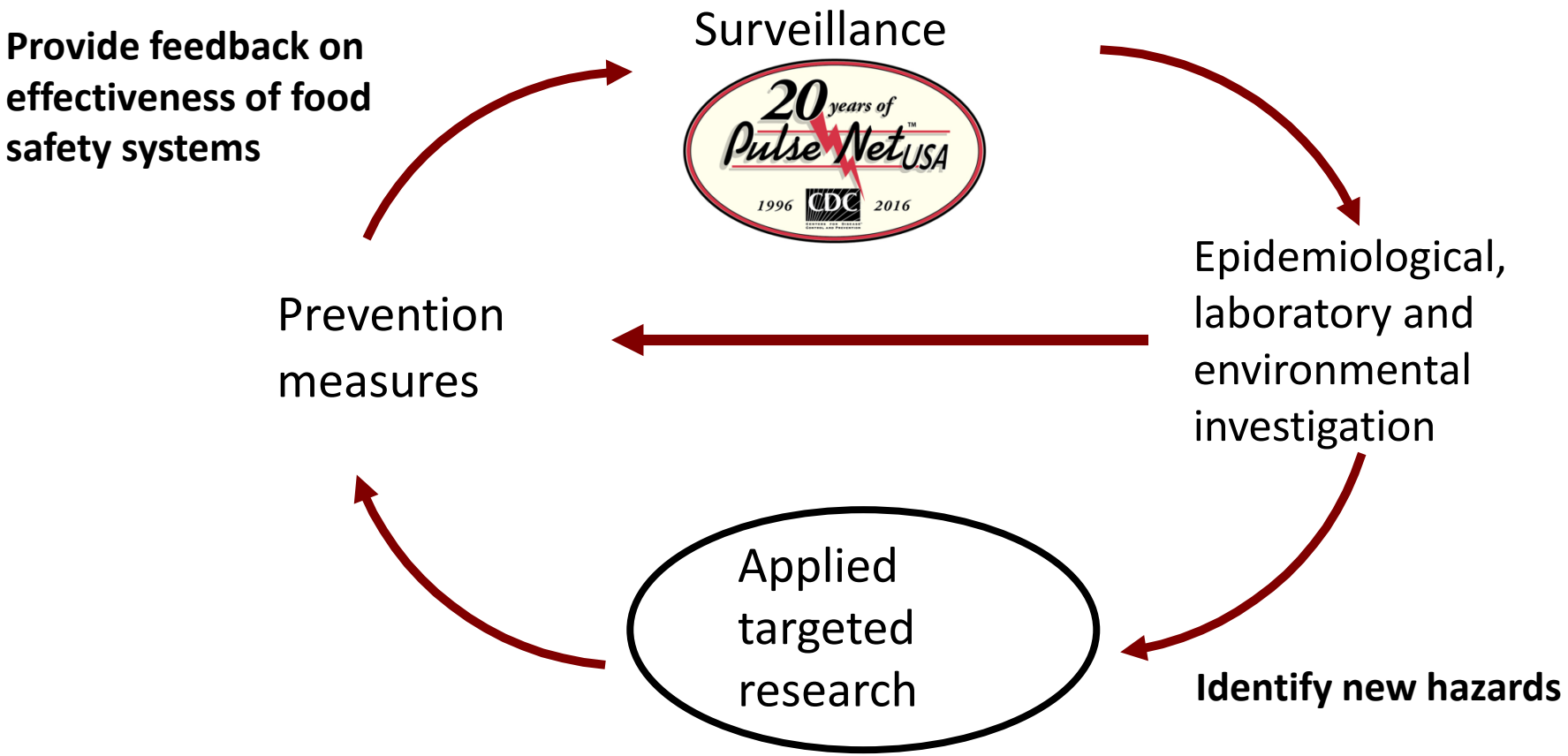
$21 million to $654 million

$1.3 to $36.5 million related to improved recalls

Conclusion: PulseNet improves social welfare

The Cycle of Public Health Prevention

Humans are the ultimate bioassay for the food supply



Caricature of Joseph Bazalgette.

Credits:Wellcome Library, London.

As Chief Engineer on London's Metropolitan Board of Works, Bazalgette was primarily responsible for the creation of the extensive network of sewers under the streets of central London. The new sewers made probably the single greatest contribution to improving the health of Victorian Londoners and the bulk of the system remains in use today.

http://www.sciencemuseum.org.uk/broughttolife/people/josephbazalgette.aspx

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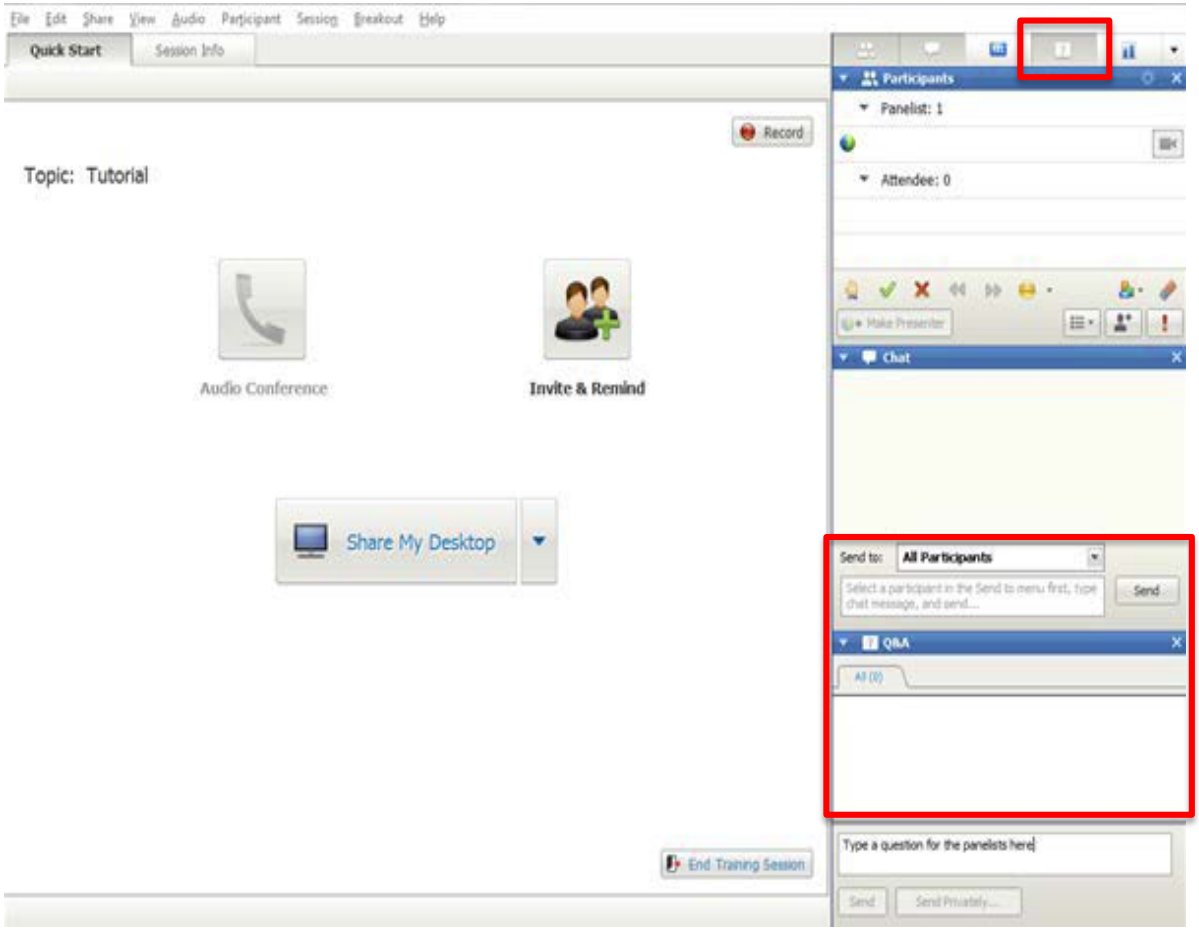

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