

# Challenges and Resources for Cluster Investigation

2012 Epi Rapid Response Team Conference

July 31, 2012

KCTCS, Versailles, KY

Srihari Seshadri, MBBS, MPH  
Barren River District Health Dept.

*Barren River District*



*Health Department*

# Initial Notification:

3<sup>rd</sup> Week of March, 2011

- Communicable Disease Team nurses notified me that they had investigated a couple of cases of Salmonella in the last few weeks.

# Initial reaction

They're making me work!

# Begin Investigation

- Reviewed all charts of recent Salmonella cases
- Created a line list
- Looked for commonality

# Line List

What would your columns in the line list be?

# Line list

- Name
- Age
- Sex
- County
- KY EPHRS Investigation Id
- Address
- Date of Onset
- Serogrouping

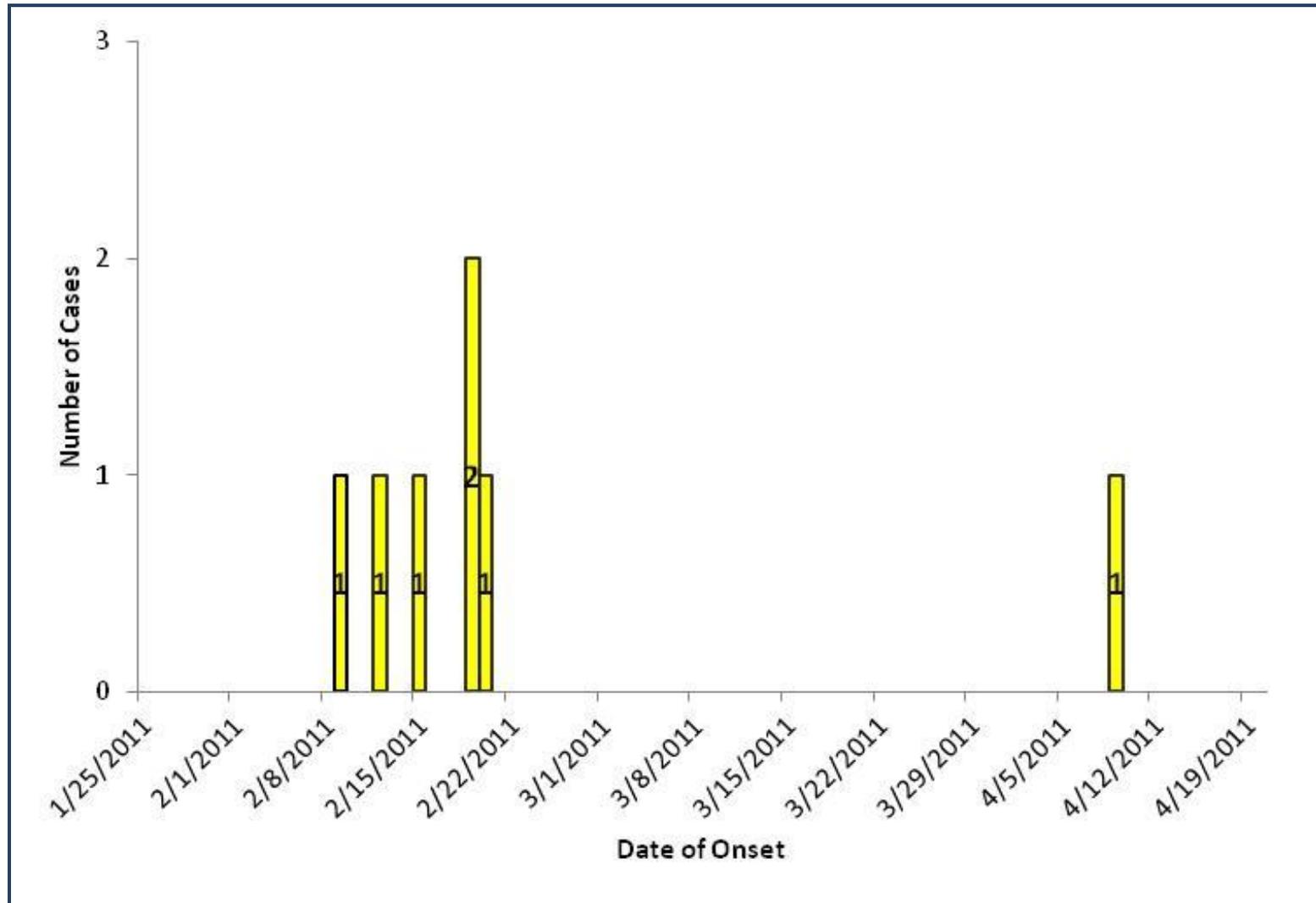
# Line List (Edited)

County	Investigation #	Date of Onset	Serogrouping/Grouping
Hart	000087693	2/9/2011	Enteritidis Group D
Hart	000087954	2/15/2011	Enteritidis Group D
Hart	000087900	2/19/2011	Enteritidis Group D
Hart	000087854	2/13/2011	Enteritidis Group D
Hart	000086877	12/19/2010	Enteritidis Group D
Barren	000087845	2/19/2011	Enteritidis Group D
Barren	000087728	2/12/2011	Enteritidis Group D
Hart	000088252	2/20/2011	

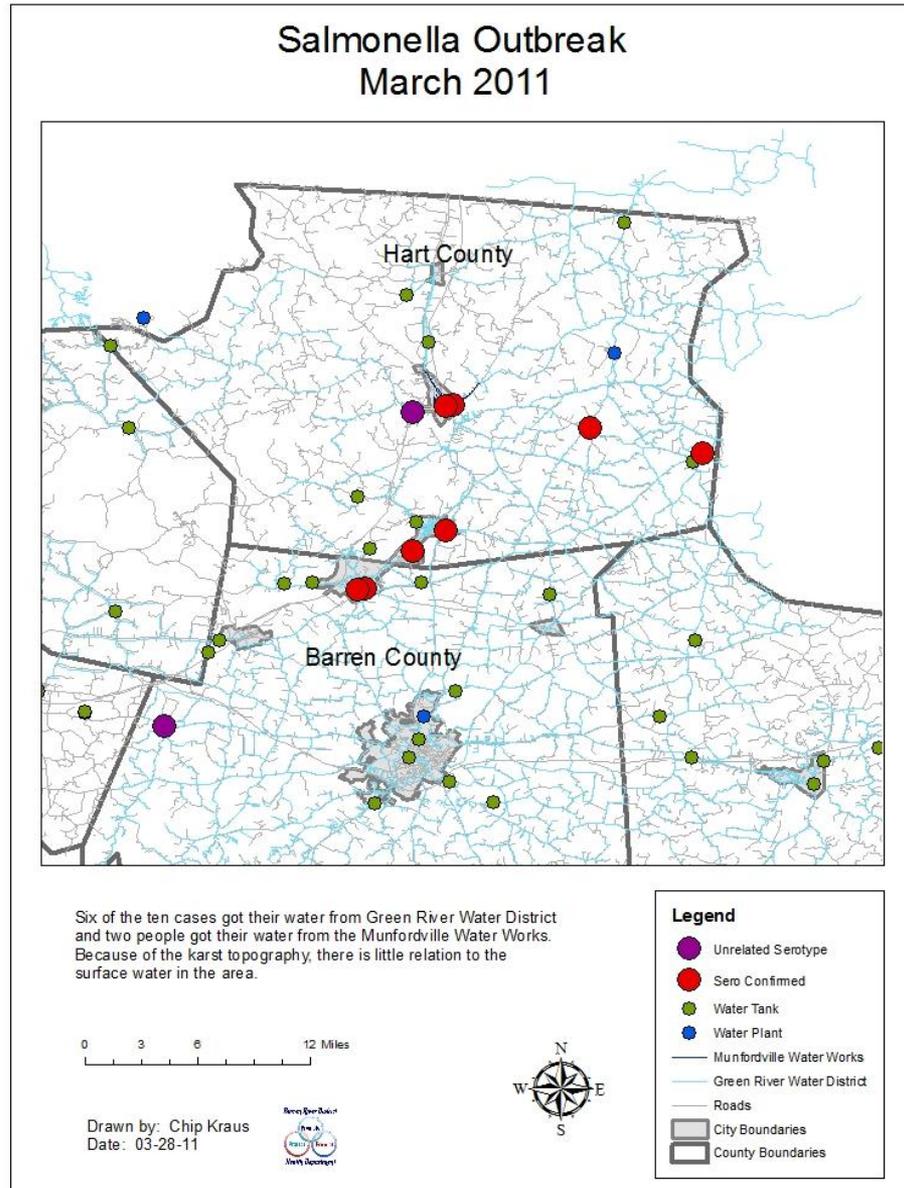
# Epi Curve

What about HISTOGRAM?

# Epi Curve



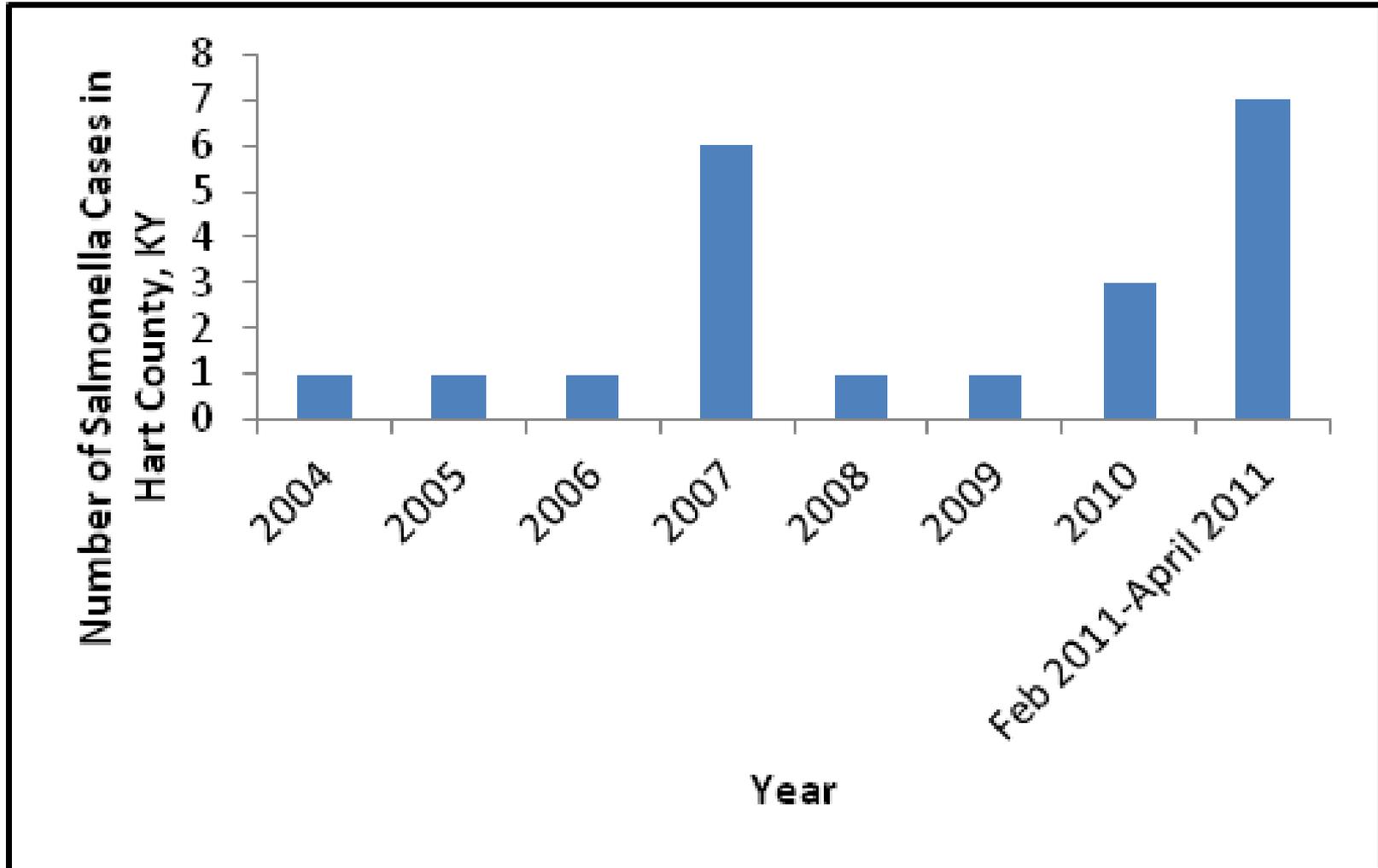
# GIS Map



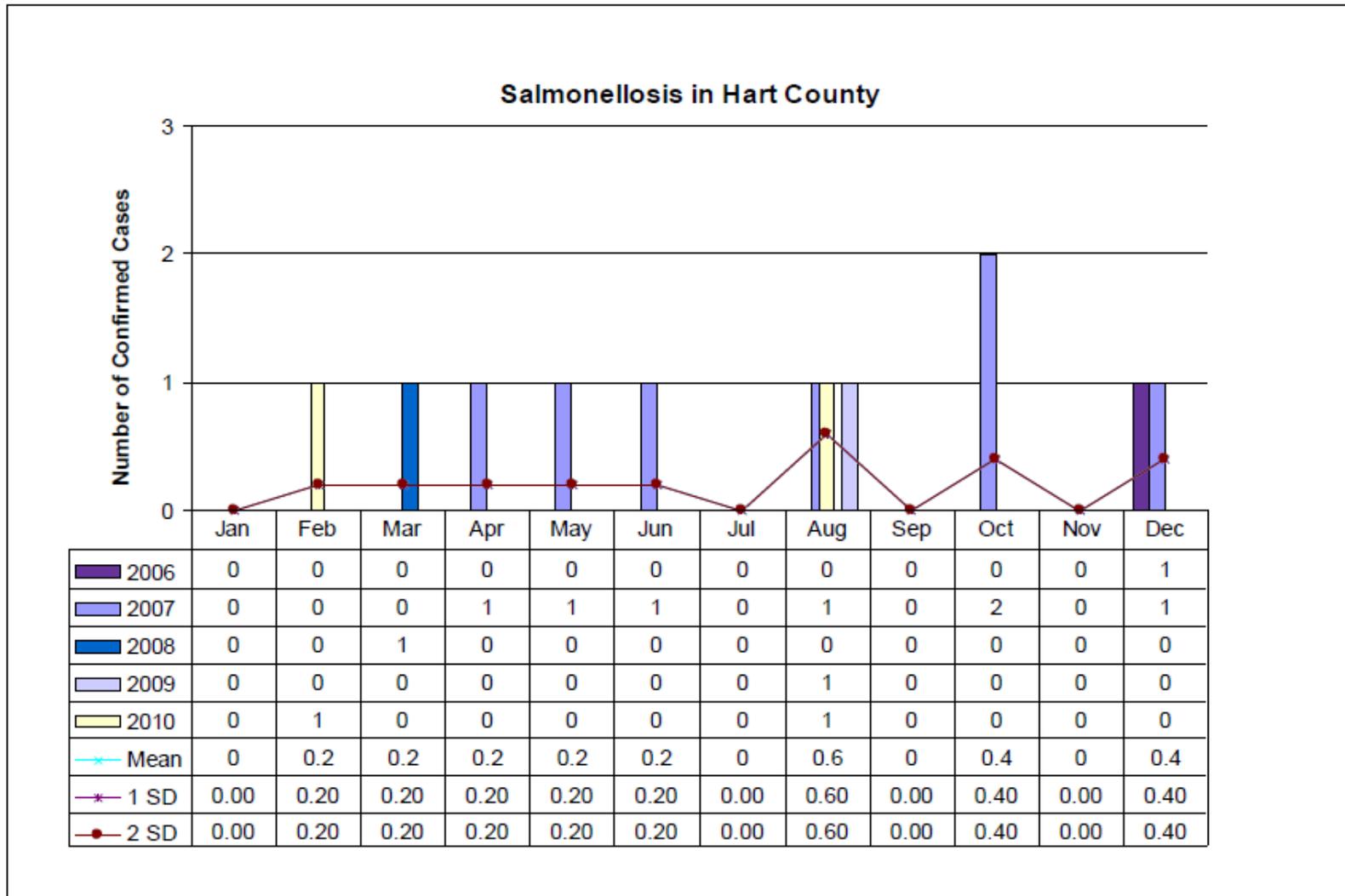
# Baseline Data for Reportable Diseases



# Baseline Data *(simple)*



# Baseline Data *(detailed)*



# E-mailed Division of Epidemiology, KY DPH: March 29, 2011



# Initial Response: March 29, 2011

- No unusual increase in your district
- An increase in enteric diseases this year in KY
- *Salmonella* Enteritidis is one of the most common serotypes, it is possible they would not be a PFGE match
- Lab scientists in the PFGE lab at DLS will alert us if they see a match

# KY DPH e-mail: March 30, 2011

- *S. Enteritidis* outbreak in Barren River and Lincoln Trail District
- Currently have 6 cases that are a match to a national cluster reported by Wisconsin
- PFGE lab reports this as being a rare *S. Enteritidis* pattern
- IL and WI epidemiologists are investigating a cluster of 3 *S. Enteritidis* isolates that may be linked to Guinea pig exposure

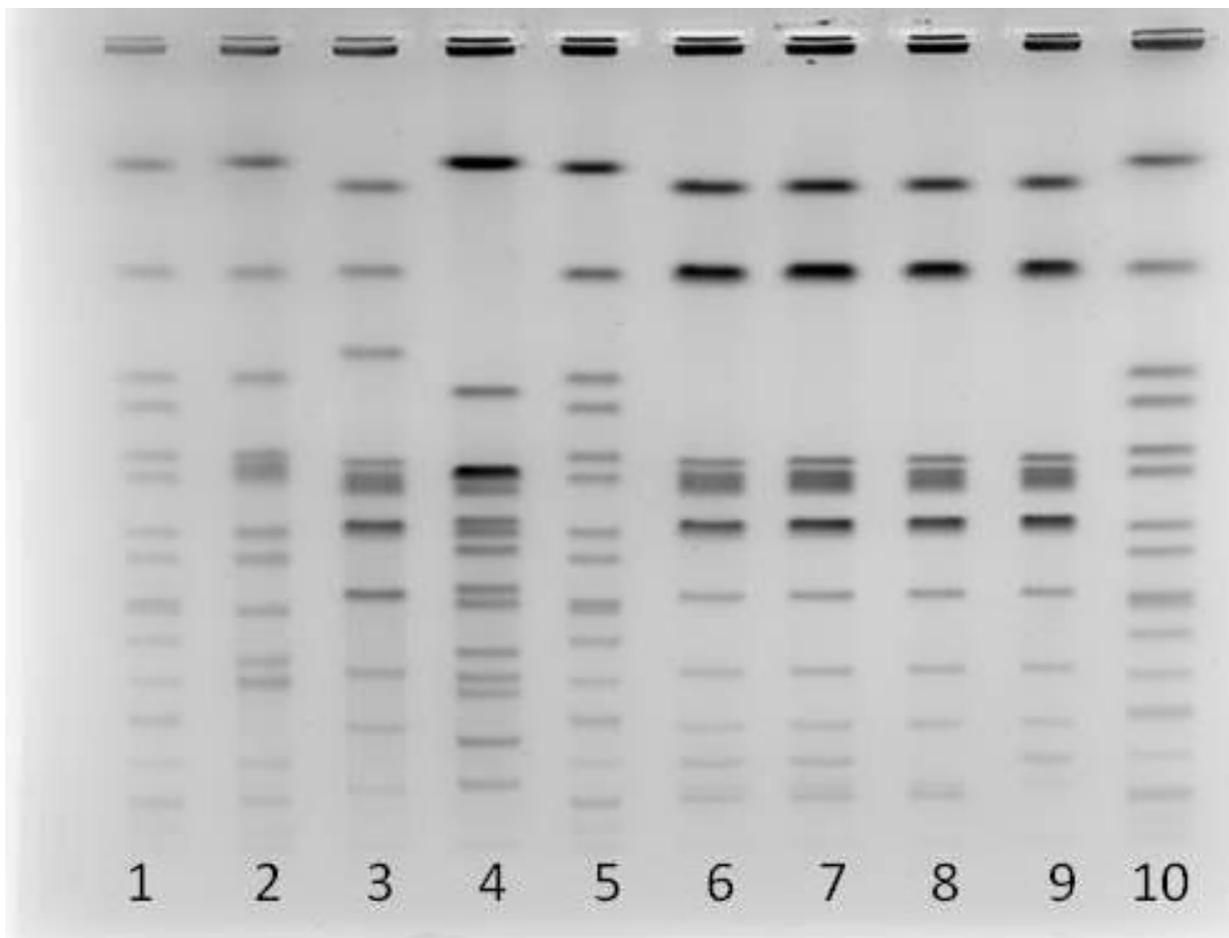
# KY DPH e-mail: April 5, 2011

- Discussion with CDC epi-contact for this cluster
  - They have closed the investigation at this point unless new cases develop.
  - The 6 KY cases that matched were an xbal-pattern match which is the 1<sup>st</sup> enzyme for PFGE
  - They are only looking at the blnl-pattern matched cases which is the 2<sup>nd</sup> enzyme for PFGE, CDC is not considering ours to be a match.
  - DLS PFGE lab only performs 2<sup>nd</sup> enzyme testing when it is requested by CDC.

# Pulsed-Field Gel Electrophoresis: PFGE

- Serotyping analysis
- Transfer to PFGE lab for PFGE process
- Image captured using a Bio-Rad Gel Doc XR imaging system
- Resulting image is analyzed using BioNumerics software and uploaded to **PulseNet**
- CDC then assigns a **PFGE Pattern & Cluster Code**
- The whole process, from receipt of samples in Bacteriology to final image upload to PulseNet takes about **10 days**

# Image of PFGE



DLS identified **8** cases (5 in Hart, 2 in Barren and 1 in Laure County) of *Salmonella* Enteritidis with PFGE pattern **JEGX01.0021** and cluster code **1012WIJEG-1** in April 2011

*(Isolates 6 and 7 are a match)*

Share your work!

The slide features a solid dark blue background. A thick red horizontal bar spans the width of the slide, positioned below the text. Below this red bar, the background transitions to white. On the right side of the white area, there are several horizontal lines of varying lengths and colors, including red and white, creating a decorative graphic element.

# Communicate with Healthcare Providers

## WARREN COUNTY MEDICAL SOCIETY

PO Box 717, Bowling Green, KY 42102

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### Improving the Quality of Medical Care in Warren County, Kentucky

The mission of the Medical Society is to provide a forum of colleagues for discussions about the ever-changing face of medicine. In addition, the physicians of the Medical Society strive to seek continuing medical education for our members, and to improve the quality of medical care in Warren County.

The Medical Society supports the community through student scholarships and sponsorship of specific worthwhile causes.

Members, please  
note: we have a new  
mailing address:  
PO Box 717  
Bowling Green, KY  
42102

#### 2012 Meeting Schedule (First Tuesday, 6:30 PM, at Mariah's)

Jan 3	July: No meeting
Feb 7	Aug 7
Mar 6	Sep 4
Apr 3	Oct 2

#### THE PULSE

#### of Warren County

A weekly update of reportable diseases from the Barren River District Health Department  
By Sri Seshadri, MPH

#### Public Health Advisories

[FDA MedWatch](#)

[Download health advisory podcasts](#)

[Warren County MRSA Study](#)

#### Medical Society Sponsors Pirates of Chemo

For 2011, the Medical Society will be sponsoring the PTK production of Pirates of Chemo, which explores the complex issues surrounding cancer therapy.

# Communicate with Healthcare Providers

## EPI Report



### Communicable Disease Reports for Barren River District

[06/29/12](#)

[06/22/12](#)

[06/15/12](#)

[06/08/12](#)

[06/01/12](#)

[05/25/12](#)

[05/18/12](#)

[05/11/12](#)

[05/04/12](#)

[04/27/12](#)

[04/20/12](#)

[04/13/12](#)

[04/06/12](#)

[03/30/12](#)

[03/23/12](#)

[03/16/12](#)

[Final 2011 Report-Revised 03/30/2012](#)

[Final 2010 Report-03/18/11](#)

[Final 2009 Report-Revised 08/02/10](#)

[Final 2008 Report](#)

[Final 2007 Report](#)

[Final 2006 Report](#)

[Final 2005 Report](#)

[Final 2004 Report](#)

[Historic Baseline Data for Reportable Diseases](#)

Questions? Contact [Sihari Seshadri](#), BRDHD Epidemiologist

270-781-8039 Ext. 164

# YTD Epi Report (updated weekly)

2011 Year to Date Report of Reportable Disease-Region 4 - Srihari Seshadri, Regional Epidemiologist, (270) 781-8039 ext 164

January 1, 2011 to December 31, 2011

Name of the Disease	Allen	Barren	Butler	Edmonson	Hart	Logan	Metcalf	Monroe	Simpson	Warren	Total
Campylobacteriosis	3		1		3		2		2	12	23
Cryptosporidiosis				1		2		1		1	5
Ehrlichia chaffeensis (HME)		1	1	1	1					1	5
Group A Streptococcal Infection, Invasive			1							1	2
Haemophilus Influenzae, Invasive disease						1				3	4
Hepatitis A										1	1
Hepatitis B, acute		1	1					1		4	7
Hepatitis C, acute		1	1		1			1	1	3	8
Histoplasmosis	1	2				1		1	1	2	8
Influenza A H1N1			3							1	4
Influenza Isolates	2	1				1					4
Legionellosis		3							1	3	7
Listeriosis										1	1
Perfringens		4		1							5
Rabies, Animal					1					1	2
Rabies, post exposure Prophylaxis		2	1	1	6	1			5	5	21
Rocky Mountain Spotted Fever										1	1
Salmonellosis	1	9	2	1	9	4		5	4	11	46
Shiga Toxin-Producing E. Coli (STEC)	2	2		1							5
Shigellosis										1	1
Streptococcus Pneumoniae Invasive disease	1									4	5
Unusual/ Other									1		1
<b>Total</b>	<b>10</b>	<b>26</b>	<b>11</b>	<b>6</b>	<b>21</b>	<b>10</b>	<b>2</b>	<b>9</b>	<b>15</b>	<b>56</b>	<b>166</b>

# Poster Presentation: 7<sup>th</sup> Annual OutBreak Net Conference: Long Beach, CA

## Outbreak Investigation of Human *Salmonella* Enteritidis Infection:

Using Geographic Information System (GIS) and Pulsed Field Gel Electrophoresis (PFGE) Uploaded to PulseNet

Robert "Chip" Kraus III, BS; Srihari Seshadri, MBBS, MPH

Barren River District Health Department

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### Introduction



The Barren River District Health Department (BRDHD) serves an eight county area in South Central Kentucky. Through an active partnership with local medical providers, the BRDHD Communicable Disease Team (CD Team) is able to maintain a baseline for reportable diseases. This

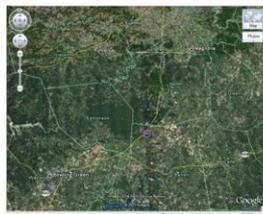
investigation was conducted in Hart County, a rural farming community with a population of 18,199.

For February, 2011 six cases of Human *Salmonella* Enteritidis were confirmed. With accurate baseline data, we were able to use Geographic Information Systems (GIS), and Pulsed Field Gel Electrophoresis (PFGE) to confirm an outbreak.

### Geographic Area



Barren River Health District

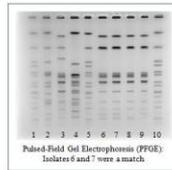


### Methods and Materials

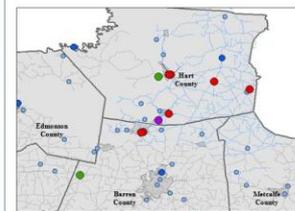
The BRDHD Epidemiologist maintains a reportable disease database for our health district in order to identify any unusual situations. As part of our routine investigation the CD Team reviewed medical records of confirmed cases and conducted telephone interviews. The information was tabulated into Excel and analyzed using Epi Info. We used ESRI's ArcView 9.3 GIS software to compare case locations with natural and manmade ground features including surface water, water treatment plants, waterlines, etc. PFGE lab testing was performed by the Kentucky Division of Laboratory Services.

### Results

This outbreak was initially identified as a typical cluster, but after GIS analysis revealed geographic proximity of the cases, further analysis was performed. The Kentucky Division of Laboratory Services identified eight cases of *Salmonella* Enteritidis with a Pulsed Field Gel Electrophoresis (PFGE) pattern matching the xba1-pattern. Five cases were in Hart County, two in Barren County and one in Laure County, which borders Hart County.



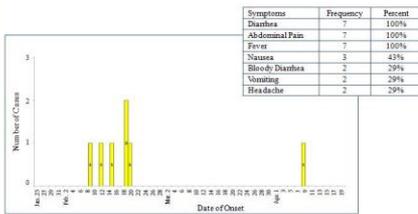
Salmonella Enteritidis Outbreak in Hart County Kentucky



Six of the ten cases drew their water from Green River Valley Water District and two people got their water from the Manfordville Water Works which contracts with Green River Valley for their water treatment. Because of the karst topography, there is little relation to the surface water.

- Salmonella Enteritidis
- Salmonella Enteritidis, not PFGE Match
- Non-Salmonella Enteritidis
- Water Plant
- Water Tank
- Water Line
- Manfordville Water Works
- Green River Valley Water District
- City Boundary
- County Boundary

Drawn by: Chip Kraus  
Date: 03-28-11



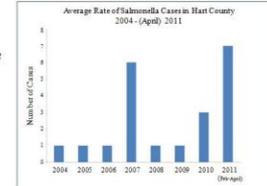
Symptoms	Frequency	Percent
Diarhea	7	100%
Ab-dominal Pain	7	100%
Fever	7	100%
Nausea	3	43%
Bloody Diarrhea	2	29%
Vomiting	2	29%
Headache	2	29%

Age Group	Number of Cases
<1	1
2-4	0
5-17	2
18-24	0
25-49	2
50-64	0
≥65	2

### Conclusion

This situation illustrates the importance of local health departments maintaining epidemiology capability, establishing baseline data on all reportable diseases, and working closely with their state lab.

Tools like GIS and PFGE can be used to identify relationships that are often overlooked. Disease investigators should correlate epidemiological investigation with laboratory findings and modern technology to assure a thorough investigation.



### References

PFGE from Kentucky Division of Laboratory Services  
Kentucky Reportable Disease Desk Reference  
Aerial photography from Google Maps

### Acknowledgements

Dr. Kraig E. Humbaugh, MD, MPH, State Epidemiologist  
Dr. Robert L. Brawley, MD, MPH, FSHEA, Chief, Infectious Disease  
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Dr. Joshua Tobias, Ph.D., Laboratory Scientist II  
William Grooms, B.S., Laboratory Scientist I  
Laura Iwig, MPH, Epidemiologist I  
Teresa Casey, BSN, R.N., Nurse Program Manager  
Sharon Ray, R.N, Public Health Nurse  
Megan Davidson, BSN, R.N, Public Health Nurse  
Carolyn Lyons, BSN, R.N, Public Health Nurse  
Tina Loy, R.N, Public Health Nurse  
Beth Siddens, Health Planner



### Contact Information

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Bowling Green, KY 42101  
www.BarrenRiverHealth.org  
(270) 781-8039



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Srihari Seshadri      Srihari.Seshadri@ky.gov      Ext. 164

Oral Presentation:

64<sup>th</sup> Annual KPHA Conference: Louisville, KY

Welcome to....  
the 64th Annual Meeting of the

**Kentucky  
Public  
Health  
Association**

Held jointly with the

**Southern  
Health  
Association**

Where we've been.  
Where we are.  
Where we're going.



March 27-30, Crowne Plaza Hotel, Louisville, KY

# A New Outbreak Investigation January-February 2012

Monroe County

# Email to KY DPH on 1/27/12 (Friday)

Age	Sex	Date of Specimen collection	Specimen Source	Collected at	Remarks	Local ID
8	F	1/23/2012	Stool	T.J. Samson Community Hosp	Isolate sent to KY State Lab for confirmation	OBS10204571KY01
32	M	1/23/2012	Blood	T.J. Samson Community Hosp	Isolate sent to KY State Lab for confirmation	OBS10204593KY01
40	F	1/20/2012	Stool	Monroe County Medical Center	Presumptive positive for Salmonella - sent to State Lab to confirm. This isolate (or specimen) was referred to your public health laboratory for additional testing and/or confirmation.	OBS10205034KY01

## KY DPH to PFGE Lab (1/27/12)

- Positively identified 3 cases. Please initiate PFGE analysis asap to determine if these cases are a match due to potential outbreak

# We did not wait for Serotyping

- Discussion with Monroe Co. HD nurses:
  - Stressed the importance of completing the KY DPH Enteric Disease Investigation Form
  - Encouraged them to ask questions related to travel, eating out (document name and location); parties, church activities etc.

# Serotype Identified: January 31, 2012

- Serotype for the 2 specimens received by our DLS: ***Salmonella* Enteritidis.**

# Monroe Co. HD Nurses findings: January 31, 2012

- There were 2 cases that had eaten at the same restaurant 5 days prior to illness.
- The restaurant opened about a month ago and most everyone has been trying it out; it is packed pretty much every day.

# Mexican Restaurant of Interest

- Environmental Inspection and follow up
  - New restaurant
  - Owner resident of TN
  - Fresh produce procured from TN and delivered every Wednesday.
  - They purchase fresh onion, tomato, avocado, jalapeno, pepper, lettuce, lemons, cilantro and pinto beans from this company

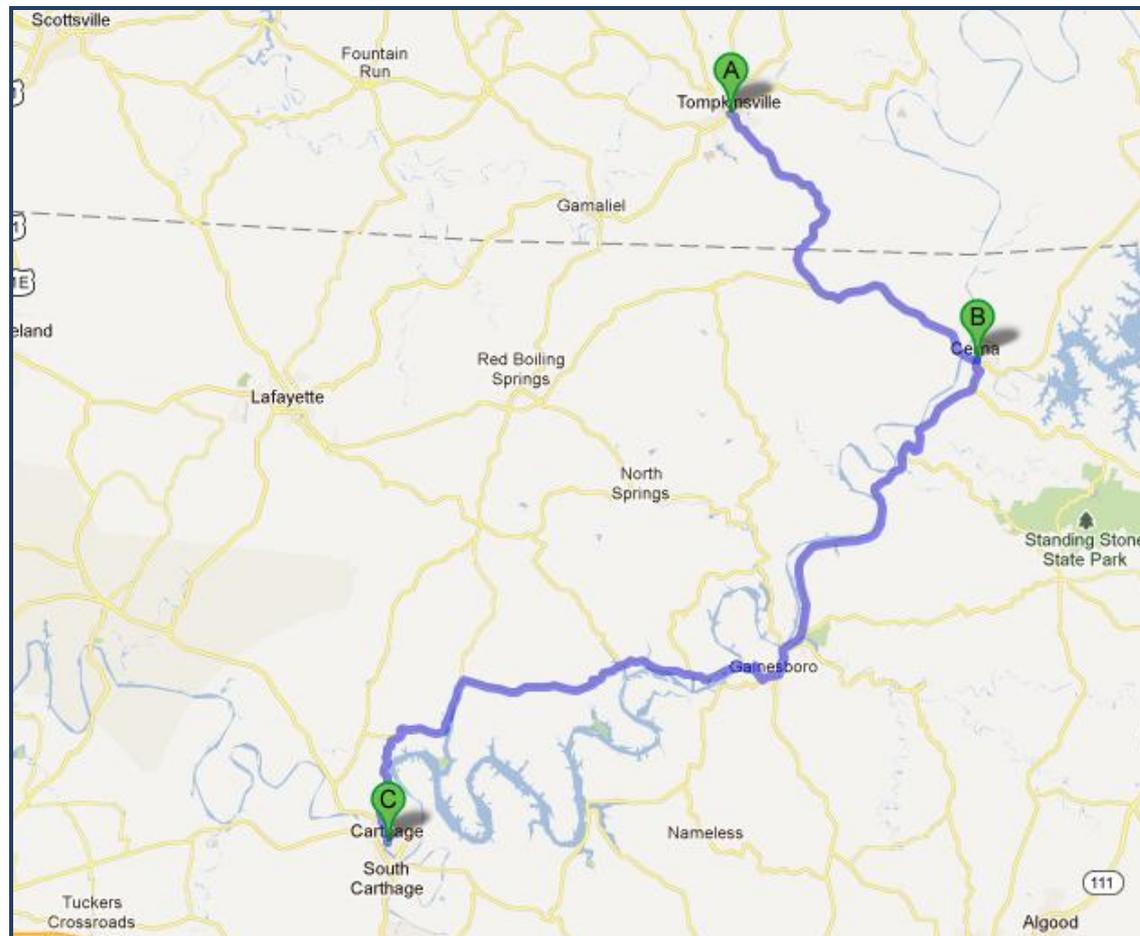
# Monroe Co. HD Nurses findings: February 2, 2012

- Nurse interviewed the 5<sup>th</sup> suspected case: nothing suspicious and no connections with the other cases
- This client had only eaten at home
- A lot of talk about a “virus” going around, spoken to others that had similar symptoms but did not seek medical care
- The commonalities are chicken, lettuce, tomato, etc. but the grocery store varied with each of them

# Feedback from KY & AL PFGE lab: Feb 3, 2012 (Friday)

- KY PFGE Lab: 2 of them are 100% match
- AL PFGE Lab:
  - The isolate is an Enteritidis and is a 100% match to pattern **JEGX01.0005** in AL database.
  - The isolate from Celina, TN has the same pattern

# Is Celina, TN close to cases in KY?

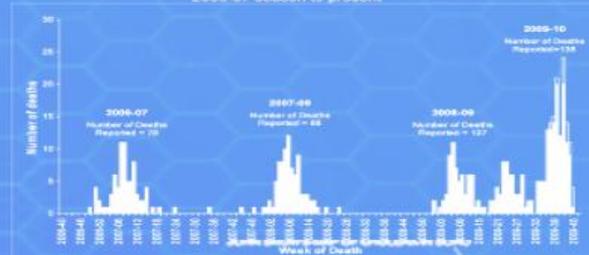


# EPI INFO 7



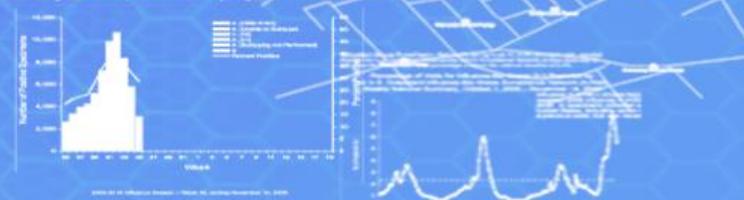
Number of Influenza-Associated Pediatric Deaths by Week of Death, 2006-07 season to present.



U.S. Weekly Surveillance (WIS) and SERSIS (sentinel sites) report influenza A (H1N1) deaths to CDC. CDC uses a number of surveillance systems to monitor influenza activity and deaths. The results of surveillance during 2009 are:

Category	Number
No. of specimens tested	10,100
No. of positive specimens (%)	3,100 (30.7%)
Percent positive by specimen type	
Nasal (10,100)	3,100 (30.7%)
A (containing and performed)	2,100 (20.8%)
A (not for subtyping)	1,000 (9.8%)
B (10,100)	2,000 (19.8%)

Influenza Pandemic Trends Reported to CDC by U.S. InfluenzaVISE Collaborating Laboratories, National Survey, August 18-September 14, 2009



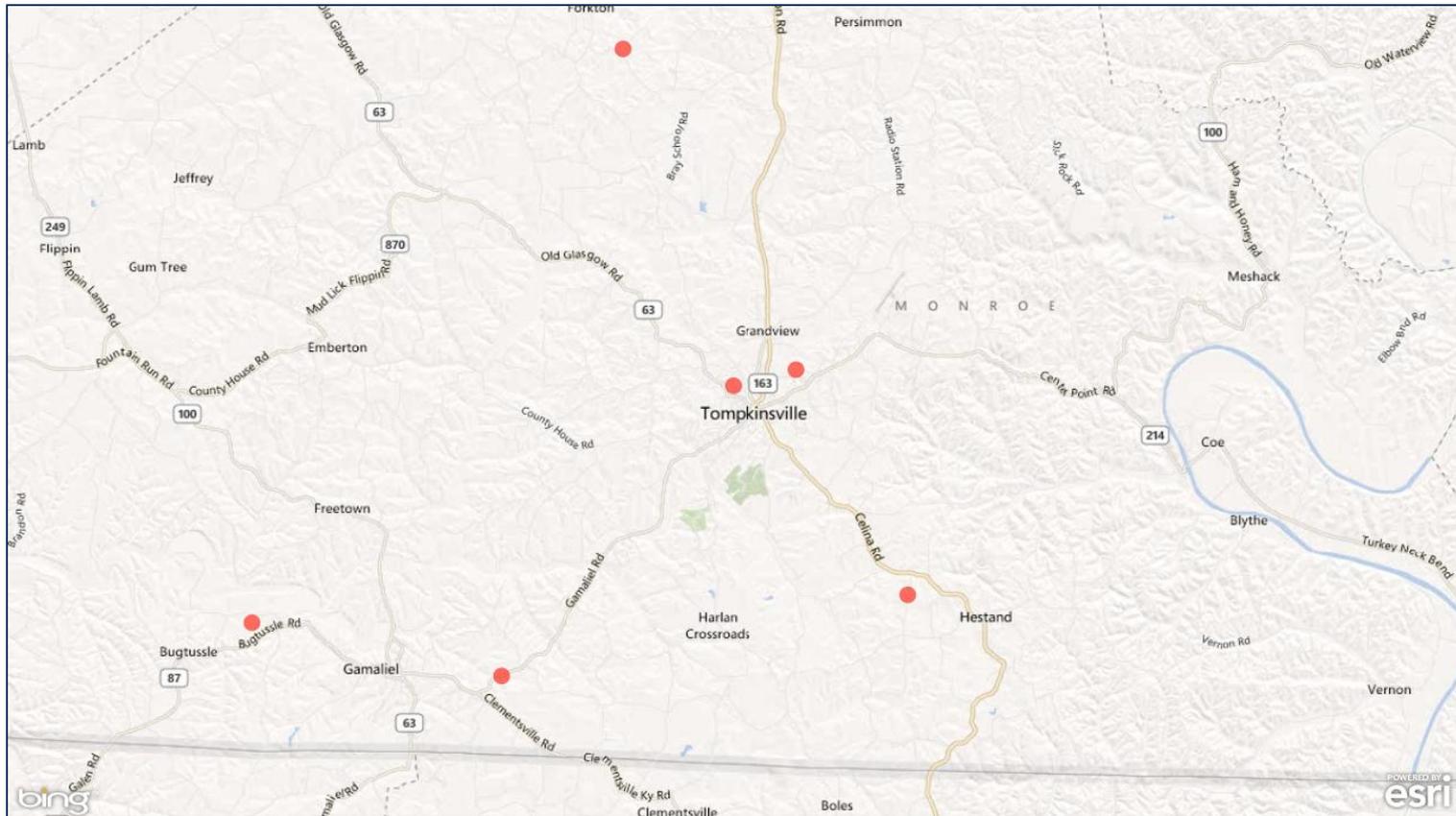
WIS and SERSIS

Region	Country	% Positive	No. of specimens tested	No. of positive specimens	% Positive	No. of specimens tested	No. of positive specimens	% Positive
Region 1	Canada	35.2%	1,000	352	35.2%	1,000	352	35.2%
Region 2	Canada	35.2%	1,000	352	35.2%	1,000	352	35.2%
Region 3	Canada	35.2%	1,000	352	35.2%	1,000	352	35.2%
Region 4	Canada	35.2%	1,000	352	35.2%	1,000	352	35.2%
Region 5	Canada	35.2%	1,000	352	35.2%	1,000	352	35.2%
Region 6	Canada	35.2%	1,000	352	35.2%	1,000	352	35.2%
Region 7	Canada	35.2%	1,000	352	35.2%	1,000	352	35.2%
Region 8	Canada	35.2%	1,000	352	35.2%	1,000	352	35.2%
Region 9	Canada	35.2%	1,000	352	35.2%	1,000	352	35.2%
Region 10	Canada	35.2%	1,000	352	35.2%	1,000	352	35.2%

# EPI INFO™



# Case Cluster Map from EPI INFO 7



# TN Dept. of Health Notified by KY DPH: February 3, 2012 (Friday)

Outbreaks almost always happen on Friday afternoon...

# KY Food Safety Branch Notified: February 6, 2012 (Monday)

... or sometimes, first thing Monday morning.

# Feedback from TN Dept. of Health: February 6, 2012 (Monday)

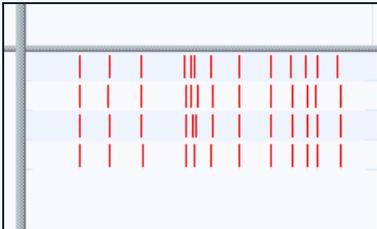
- *S. Enteritidis* 0005 is a common pattern in TN
- Since January 1<sup>st</sup> they had 3 cases with SE 0005.
- The cases are from
  - Davidson Co (Nashville)
  - Lincoln Co. (Fayetteville)
  - Shelby Co. (Memphis)
- Two of the three cases have been interviewed, and neither case mentioned eating at a Mexican restaurant

# Increase in Salmonella cases in Barren County: Mid Feb 2012

Monroe County cases had  
consumed food in Barren County  
Restaurant

# Epidemiology in Action

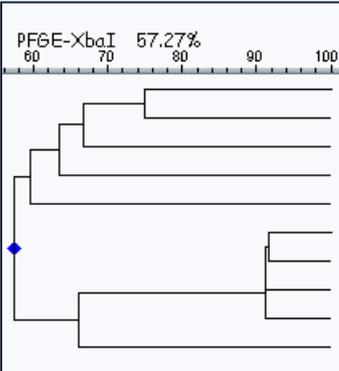
The three Salmonella isolates that have been pulsed are a CDC confirmed Match, additionally these isolates are a match to an isolate from Hopkins County. This has been reported as a cluster to Pulsenet/CDC, as there is no national increase at this time it has been deemed local to KY. We are continuing to monitor, if the 3 other isolates match these, the status may change.



Key	Serotype	PFGE-XbaI-p...	SourceCounty	SourceCity	IsolatDate	
12-20939595-0005	Enteritidis	JEGX01.0005	Hopkins	Dawson Springs	2011-12-29	100.0
12-21652290-0062	Enteritidis	JEGX01.0005	Monroe	Tompkinsville	2012-01-23	100.0
12-21652469-0061	Enteritidis	JEGX01.0005	Monroe	Tompkinsville	2012-01-23	100.0
12-21724165-0074	Enteritidis	JEGX01.0005	Monroe	Gamaliel	2012-01-26	96.0



Key	Serotype	PFGE-XbaI-p...	SourceCounty	SourceCity	IsolatDate
12-21652290-0062	Enteritidis	JEGX01.0005	Monroe	Tompkinsville	2012-01-23
12-21652469-0061	Enteritidis	JEGX01.0005	Monroe	Tompkinsville	2012-01-23
12-21724165-0074	Enteritidis	JEGX01.0005	Monroe	Gamaliel	2012-01-26
12-21962939-0101	Enteritidis	JEGX01.0034	Barren	Glasgow	2012-02-01



Key	Serotype	PFGE-XbaI-p...	Outbreak	Sour...	SourceCity	IsolatDate
11-15114182-0370	Newport	JJPX01.0422		Barren	Cave City	2011-06-07
11-19004182-0956	Thompson			Barren	Glasgow	2011-10-17
11-12888423-0160	Montevideo	JIXX01.0043		Barren	Smiths Grove	2011-03-28
11-15914322-0500	Urbana			Barren	Glasgow	2011-07-06
11-16803527-06...	Typhimurium	JPXX01.0919		Barren	Glasgow	2011-08-08
12-21962939-0101	Enteritidis	JEGX01.0034		Barren	Glasgow	2012-02-01
11-11613839-0078	Enteritidis	JEGX01.0021	1012WIJEG-1	Barren	Cave City	2011-02-14
11-11847794-0092	Enteritidis	JEGX01.0021	1012WIJEG-1	Barren	Cave City	2011-02-21
11-16098027-05...	Enteritidis	JEGX01.0004		Barren	Cave City	2011-07-14
11-18122524-0812	Aqona	JABX01.0056		Barren	Glasgow	2011-09-15

# Friday, February 24, 2012

- Notified by Minnesota DPH coincidentally they have a chicken breast isolate that matches Barren County's *S. Enteritidis* pattern JEGX01.0034

# March 9, 2012

County	Age	Sex	Date of Onset	Date of Collection	Hospitalized	Serogroup	PFGE pattern	Lab
Monroe	8	F	1/20/2012	1/23/2012	No	Salmonella Enteritidis Group D	JEGX01.0005	KSPHL
Monroe	40	F	1/20/2012	1/20/2012	Yes	Salmonella Enteritidis Group D	JEGX01.0005	Lab Corp
Monroe	32	M	1/17/2012	1/23/2012	Yes	Salmonella Enteritidis Group D	JEGX01.0005	KSPHL
Monroe	3	M	1/25/2012	1/26/2012	Yes	Salmonella Enteritidis Group D	JEGX01.0005	KSPHL
Monroe	63	F	1/21/2012	1/28/2012	No	Salmonella Enteritidis Group D	?	Lab Corp
Monroe	26	F	1/17/2012		No	Salmonella Enteritidis Group D	?	LabCorp
Barren	60	F	2/4/2012	2/6/2012	Yes	Salmonella Enteritidis Group D	JEGX01.0034	KSPHL
Barren	19	M		2/1/2012	No	Salmonella Enteritidis Group D	JEGX01.0034	KSPHL
Barren	33	F	1/31/2012	2/5/2012	No	Salmonella Enteritidis Group D	JEGX01.0004	KSPHL
Simpson	62	F	2/2/2012	2/5/2012	Yes	Salmonella Enteritidis Group D	JEGX01.0004	KSPHL
Hart	70	M		2/20/2012	Unknown	Pending	Pending	Lab Corp
Barren	6 months	M	2/7/2012	2/8/2012	Yes	Salmonella-Newport Group C2	JJPX01. 0689	KSPHL

# Conclusions & Recommendations/ Acknowledgements

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# Conclusion

- Routine Public Health Surveillance was key
- With the help of tools like GIS and PFGE we were able to conclude it was an outbreak
- This also illustrates the importance of LHDs maintaining epi capability and working closely with Reportable Disease Section and State lab.

# Take home messages

- Maintain accurate baseline data.
- Anything above baseline generally needs further investigation.
- Modern technology can be useful during outbreak investigations (but don't totally rely on them).
- Disease investigators need to correlate epi investigative findings with lab findings.
- Communication is important before, during and after an outbreak.

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# Questions

Thanks!