Interim Findings from the Shigellosis Outbreak Investigation — Genesee and Saginaw Counties, Michigan, 2016

Shigellosis Investigation Team

Centers for Disease Control and Prevention

Michigan Department of Health & Human Services

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National Center for Emerging and Zoonotic Infectious Diseases

Division of Foodborne, Waterborne, and Environmental Diseases

Today's Presentation

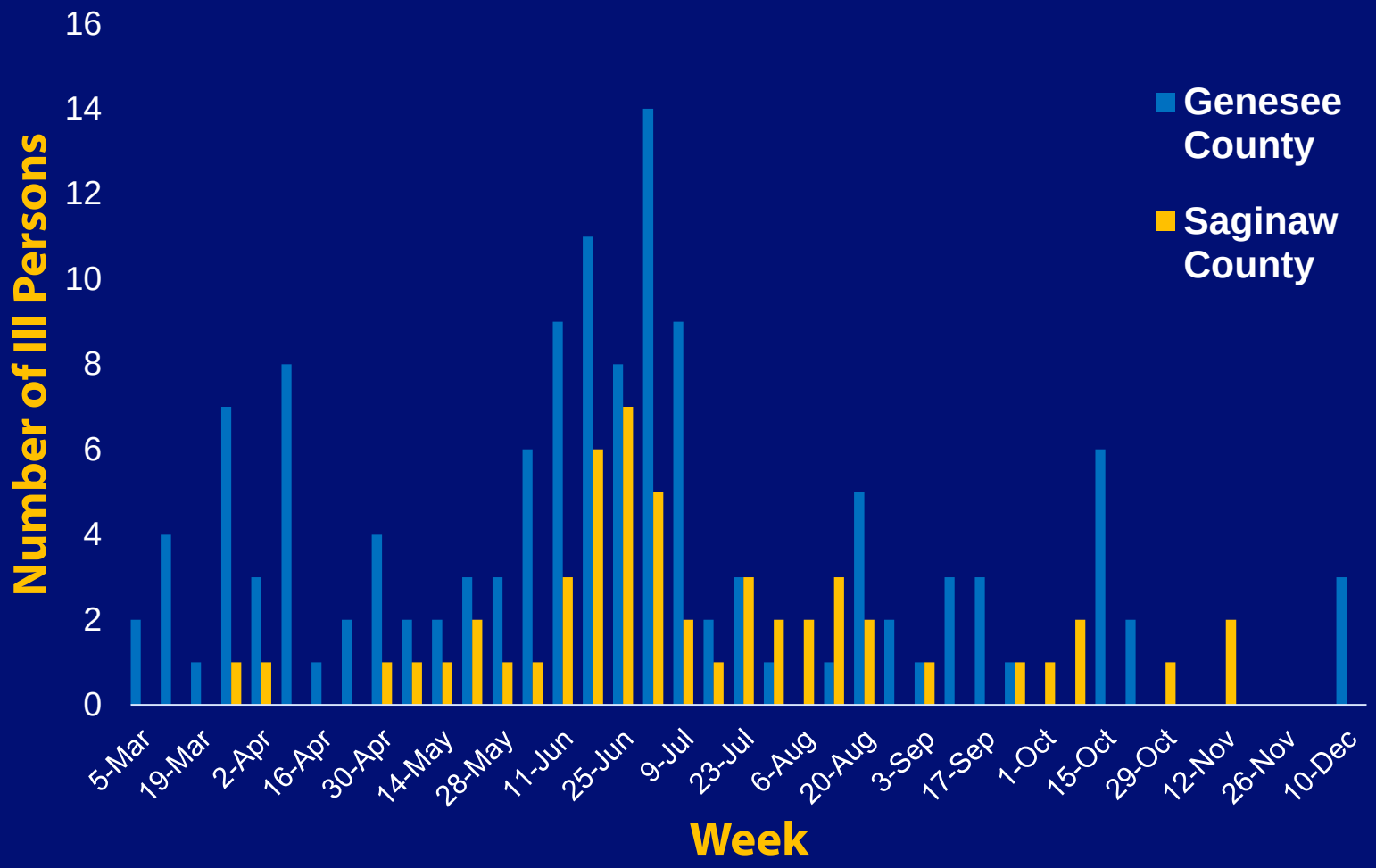
- Timeline
- The outbreak
- The investigation
- Review of main findings
- Summary
- Next steps

Timeline

- **Aug 26:** GCHD consults CDC about shigellosis in Genesee County
- **Sep 7 and 26:** Calls with GCHD, MDHHS, and CDC
- **Oct 7:** Official request for CDC assistance
- **Oct 12:** CDC team arrives to assist with investigation
- **Oct 25-Nov 1:** Case series interviews
- **Nov 4:** Exit briefing; CDC team departs
- **Nov 17:** Preliminary results presented
- **Dec 15:** In-person presentation of interim results

THE OUTBREAK

Number of persons with shigellosis reported to MDHHS, by week — Genesee and Saginaw Co., Michigan, Mar 1–Dec 10, 2016 (N=185)



THE INVESTIGATION

Goals of the Investigation

1. Describe the outbreak
2. Identify risk factors for shigellosis
3. Determine the need for further study
4. Engage the community, incorporate input, provide updates

The Investigation: 3 Complementary Parts

- Case series
- Laboratory testing
- Mapping analysis

REVIEW OF MAIN FINDINGS

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1. *Shigella* bacteria appear to have spread from person to person.

Households in the outbreak were larger than the average household.

	Saginaw & Genesee Co. (N=83)	Saginaw Co. (n=29)	Genesee Co. (n=54)
Average household size			
Households affected by shigellosis	**4.3***	**4.1***	**4.3***
General population‡ (ref)	2.5	2.5	2.4
Average number of ill people per household	1.9	2.0	1.8

The risk for person to person spread of Shigella bacteria within households is greater for larger households than smaller households.

* *P*<0.001

‡ 2015 American Community Survey, 1-year estimates

In each county, people who got sick were significantly younger than the general population.

Median age (years)	Saginaw Co.	Genesee Co.
People with shigellosis*	**12‡**	**10‡**
General pop. (ref)	40	39.1

Shigella bacteria can spread easily between young children who are still learning to use the toilet and wash their hands thoroughly.

* Saginaw County, n=59; Genesee County, n=99; ‡ *P*<0.0001

The majority of sick people either wore diapers, had direct contact with diapers, or had direct contact with a person with diarrhea who did not live with them

	Saginaw & Genesee Co. (N=83)	Saginaw Co. (n=29)	Genesee Co. (n=54)	Flint (n=24)
Contact with diapers* or with a person with diarrhea	68%	79%	62%	74%

Shigella could have been passed from the feces (poop) of sick people to their siblings, friends, or caregivers.

* Includes diaper contact inside or outside the home

REVIEW OF MAIN FINDINGS

2. Based on data collected thus far, *Shigella* bacteria did not appear to spread through drinking water.

Households affected by shigellosis from Flint were significantly less likely to consume tap water than those from greater Genesee or Saginaw County

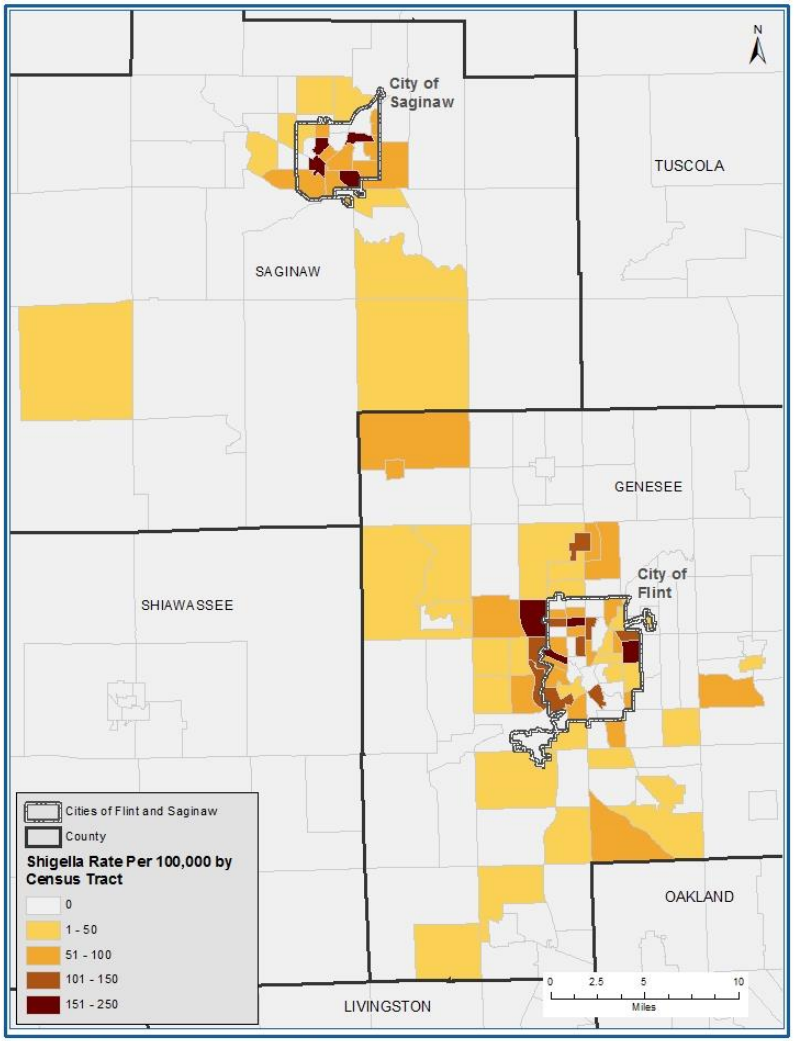
Tap water consumption*	Saginaw Co. (n=29)	Genesee Co. (n=54)	Flint {ref} (n=24)	Greater Genesee Co. (n=30)
Either filtered or unfiltered water	**100%‡**	50%	**33%**	**63%‡**
Unfiltered water	**93%‡**	20%	**8%**	**30%‡**

Because so few sick people in Flint were drinking tap water, it is unlikely that the drinking water system was the source of the outbreak.

* Tap water consumption included using tap water for drinking, mixing cold drinks, or using ice made with tap water; ‡ $P<0.05$

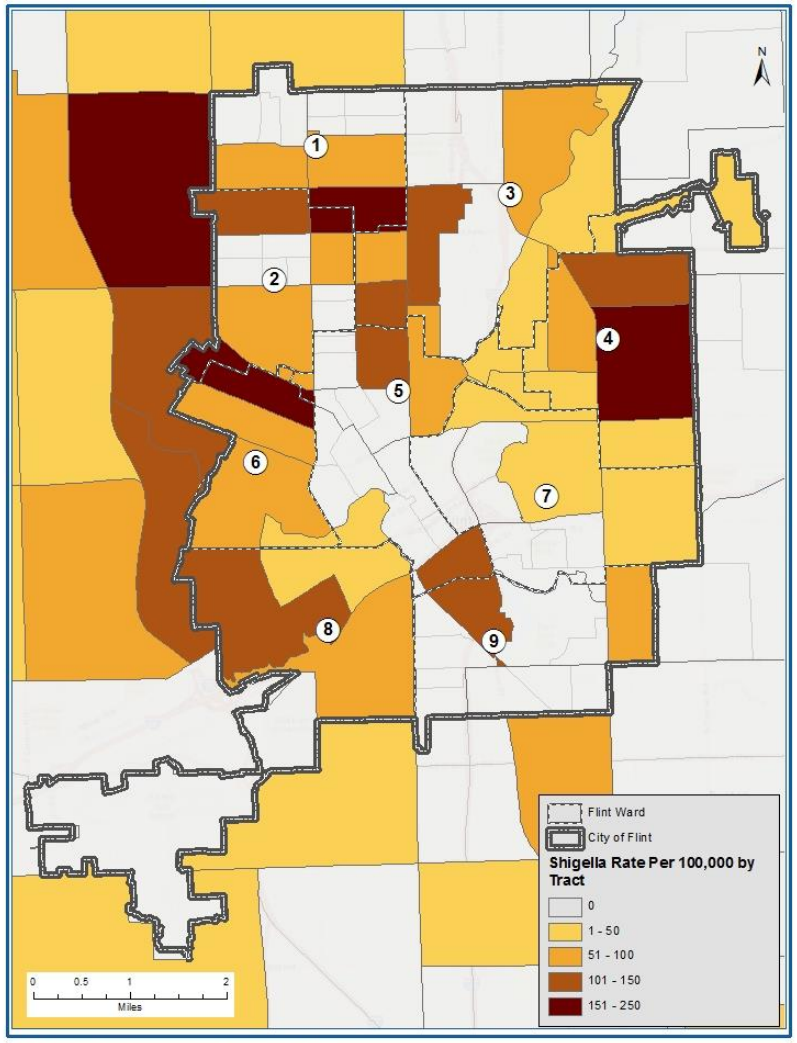
Rate of shigellosis per census tract as reported to MDSS — Saginaw and Genesee Counties, Michigan, Mar 1–Dec 10, 2016

The locations of households where people got sick are not *clustered around a single drinking water source*



* U.S. Census Bureau; American Community Survey, 2015 American Community Survey 5-Year Estimates by Census Tract, Data column HC01_EST_VC01. Accessed 8 December 2016.

Rate of shigellosis per City of Flint ward as reported to MDSS — Flint and Surrounding Genesee County, Michigan, Mar 1–Dec 10, 2016

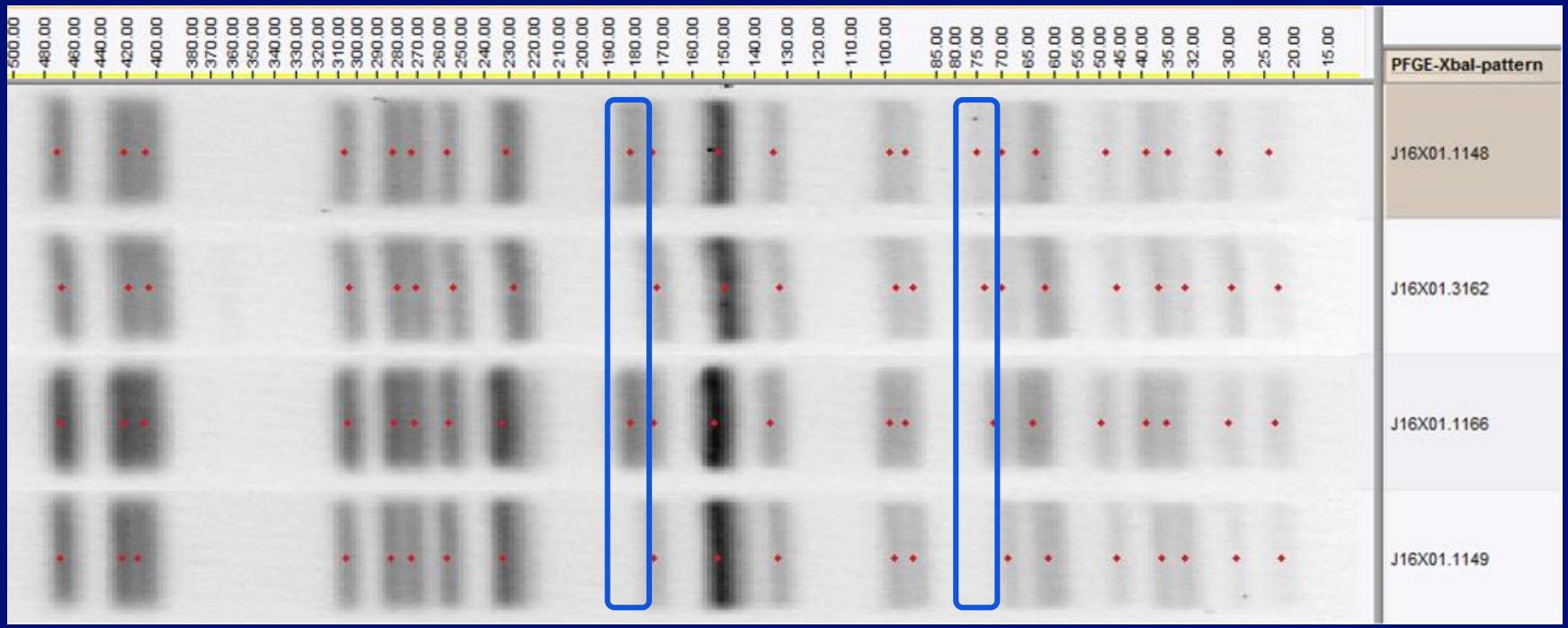


* U.S. Census Bureau; American Community Survey, 2015 American Community Survey 5-Year Estimates by Block Group, Table B01001e1. Accessed 8 December 2016.

REVIEW OF MAIN FINDINGS

3. *Shigella* bacteria from Saginaw and Genesee counties are related to each other, suggesting they are part of the same outbreak

Closely related DNA fingerprinting patterns from *Shigella* samples from the outbreak



The DNA fingerprints of the bacteria are related, but not identical, meaning that the outbreak was more likely spread from person to person rather than originating from a common source, like drinking water.

REVIEW OF MAIN FINDINGS

4. The use of hand sanitizer or cleaning wipes for cleaning hands did not contribute to the outbreak differently in one location versus another.

Use of hand sanitizer and cleaning wipes for cleaning hands was similar across locations

Method of cleaning hands	Saginaw Co. (n=29)	Genesee Co. (n=54)	Flint (n=24)	Greater Genesee Co. (n=30)
Hand sanitizer	31%	20%	17%	23%
Cleaning wipes	3%	6%	0%	10%
Unfiltered tap water	93%	54%	50%	57%
Filtered tap water	0%	22%	42%	7%
Bottled water	0%	4%	8%	0%
Boiled water	0%	2%	4%	0%

Use of hand sanitizer and cleaning wipes for cleaning hands was similar across locations

Method of cleaning hands	Saginaw Co. (n=29)	Genesee Co. (n=54)	Flint (n=24)	Greater Genesee Co. (n=30)
Hand sanitizer	31%	20%	17%	23%
Cleaning wipes	3%	6%	0%	10%
Unfiltered tap water	93%	54%	50%	57%
Filtered tap water	0%	22%	42%	7%
Bottled water	0%	4%	8%	0%
Boiled water	0%	2%	4%	0%

Households did not report using hand sanitizer or cleaning wipes for bathing/showering

Method of bathing/showering	Saginaw Co. (n=29)	Genesee Co. (n=54)	Flint (n=24)	Greater Genesee Co. (n=30)
Hand sanitizer	0%	0%	0%	0%
Cleaning wipes	0%	0%	0%	0%
Unfiltered tap water	97%	63%	58%	67%
Filtered tap water	0%	19%	29%	10%
Bottled water	0%	2%	4%	0%
Boiled water	0%	0%	0%	0%

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Method of bathing/showering	Saginaw Co. (n=29)	Genesee Co. (n=54)	Flint (n=24)	Greater Genesee Co. (n=30)
Hand sanitizer	0%	0%	0%	0%
Cleaning wipes	0%	0%	0%	0%
Unfiltered tap water	97%	63%	58%	67%
Filtered tap water	0%	19%	29%	10%
Bottled water	0%	2%	4%	0%
Boiled water	0%	0%	0%	0%

There is no significant difference in the use of hand sanitizer and cleaning wipes between cases from Flint and those from other locations

	Saginaw Co. (n=29)	Genesee Co. (n=54)	Flint (n=24)	Greater Genesee Co. (n=30)
Hand sanitizer and cleaning wipe use*	59%	43%	38%	47%

* For handwashing, bathing self, bathing others, cleaning a diaper changing station, dishwashing, cleaning countertops, and rinsing fruits, vegetables, and other food

Summary of Main Findings

1. *Shigella* bacteria appear to have spread from person to person.

2. Based on data collected thus far, *Shigella* bacteria did not appear to spread through drinking water.

3. *Shigella* bacteria from Saginaw and Genesee counties are related to each other, suggesting they are part of the same outbreak.

4. The use of hand sanitizer or cleaning wipes for handwashing did not contribute to the outbreak differently in one location versus another.

Summary of Additional Findings

- **Overall, information was collected on 158 ill people from 83 households**
- **Characteristics that did not differ by location:**
  - Age, gender, the proportion of people who got sick in each household
- **Factors that were similar across counties:**
  - Travel, dining outside the home, recreational water exposure
- **No single event or establishment was identified as the source of the outbreak**

Next Steps

- **Laboratory testing**
  - Processing additional *Shigella* samples from greater Michigan
  - Analyze the samples to better understand how *Shigella* bacteria in different parts of the state are related to each other
- **Mapping analysis**
  - Collecting and mapping the final pieces of data
  - Determining whether there are any links between shigellosis cases and locations with known water quality issues, like water main breaks and low chlorine levels