

Legionellosis Outbreak-Genesee County, May, 2015 – November, 2015

Summary Analysis

Michigan Department of Health and Human Services
Genesee County Health Department

Draft Legionellosis Outbreak Summary — Genesee County

May 2015 – November 2015

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Legionellosis Outbreak — Genesee County, May 2015–November 2015

Summary

From May 2015 to November 2015, 42 legionellosis cases, all confirmed Legionnaires' disease (LD), were reported in Genesee County, Michigan. Four of these cases have died. The Michigan Department of Health and Human Services (MDHHS) assisted the Genesee County Health Department (GCHD) during their investigation.

Data were collected from patient medical record review, the Michigan Disease Surveillance System case report form, and interviews with case-patients or their proxies with an enhanced legionellosis questionnaire. In an attempt to identify community sources, case-patients or proxies were interviewed about travel, work, and locations visited during the 2 weeks prior to symptom onset (considered the incubation period for LD).

Median patient age was 67 years (range: 35–89); 22 (52%) were male. Illness onset dates ranged from May 4, 2015 to October 29, 2015 and peaked in July and August with 11 cases in both months. Case-patients were interviewed by GCHD using an enhanced questionnaire; interviews were conducted for 39 of 42 (93%) cases.

All 42 cases were laboratory confirmed by *Legionella* urinary antigen test. Eleven respiratory specimens were submitted for culture to the MDHHS Bureau of laboratories (BoL) for pulsed-field gel electrophoresis (PFGE) testing. Three samples were unsuitable for typing due to lack of culture growth or mold contamination. PFGE typing was completed on eight samples; 2 samples had matching PFGE patterns, while 6 had unique patterns.

Healthcare-associated LD was suspected for a subset of cases. Over half of the cases (23/42) had an inpatient (overnight) healthcare facility exposure in the two weeks prior to their illness onset (22 of these were hospitalized at the same healthcare facility). Short-term hospital exposure data, such as outpatient and hospital visits, for the current summary period are in the process of being evaluated.

The source of water at the primary residence was evaluated for all cases. Ten of 42 (24%) cases occurred in people whose residence received City of Flint water. Of the 19 persons (45%) that did not have an inpatient (overnight) healthcare facility exposure in the two weeks prior to their illness onset, three (16%) had residences on the City of Flint water system. Sixteen of 42 cases (38%) had no inpatient (overnight) exposure to a Flint hospital in the 2 weeks prior to illness, nor were their residences on the City of Flint water system.

Questionnaire interview data are currently being further evaluated for other potential common exposures. At this time, beyond the healthcare facility exposure, no other known community exposures have been identified as a potential source of infection.

Enhanced surveillance will continue in 2016. Although in recent months reports of legionellosis cases in Genesee County have declined, MDHHS has recommended continued vigilant legionellosis awareness and surveillance, including interviewing of cases or proxies with the enhanced legionellosis questionnaire within one week of reporting. MDHHS also recommends the assistance of clinical community in LD surveillance through identification, testing, and reporting of all suspect cases. **Obtaining respiratory specimens in addition to urinary antigen testing is of critical importance** in these increased surveillance efforts. Because *Legionella* bacteria are commonly found in the environment, clinical isolates are necessary to interpret the findings of an environmental investigation in an outbreak. MDHHS has distributed updated legionellosis guidance to health care providers via the Michigan Health Alert Network.



Working Case Definitions

Confirmed Legionnaires' Disease (LD) – meets the CDC clinical and laboratory case definition for confirmed LD and illness occurred since May 1, 2015 in residents of Genesee County or those who had visited the Flint area in 2 weeks prior to their illness onset date.

Data Sources

1. Legionellosis Case Report Form in Michigan Disease Surveillance System (MDSS)
2. Medical record review from:
 - a. Hospital A; Flint, MI
 - b. Hospital B; Flint, MI
 - c. Hospital C; Grand Blanc, MI
3. Patient interview using Genesee County-specific Legionellosis Questionnaire

Epidemiology

Number of lab-confirmed cases of Legionnaires' disease: 42

Geographic distribution: 42/42 Genesee County (15/42 City of Flint)

Age:

Range: 35-89 years

Average age: 67.1 years

Median age: 67 years

Sex: Males, 22/42 (52.4%)

Range of illness onset dates (n=42): 5/4/2015- 10/29/2015

Deaths (note added 1/15/16):* 4/42 (9.5%)

*Death associated with legionellosis was defined as one that occurred during hospitalization, within 30 days of hospital discharge, or Legionella was listed as a cause of death on the death certificate.

(Ref. Mykietiuk A et al. Clin Infect Dis. 2005 Mar 15;40(6): 794-9.)

Cases interviewed: 39 (38 completed plus 1 partial interview) /42 (92.9%)

Cases hospitalized: 42/42 (100%)

Cases with an inpatient (overnight) hospital exposure in the 2 weeks prior to illness onset: 23/42 (54.8%)

Cases with ≥ 1 co-morbidity: 33/41 (80.5%)

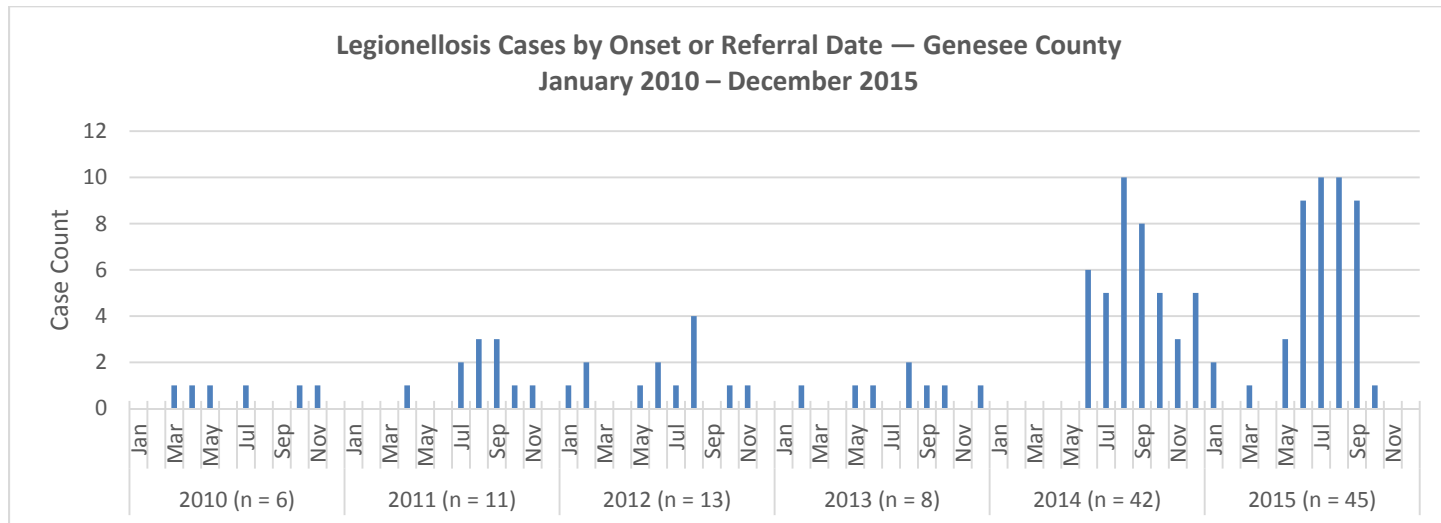
Cases who are current or former smokers: 29/41 (70.7%)

Cases with residence on City of Flint water system: 10/42 (23.8%)



Epi Curves

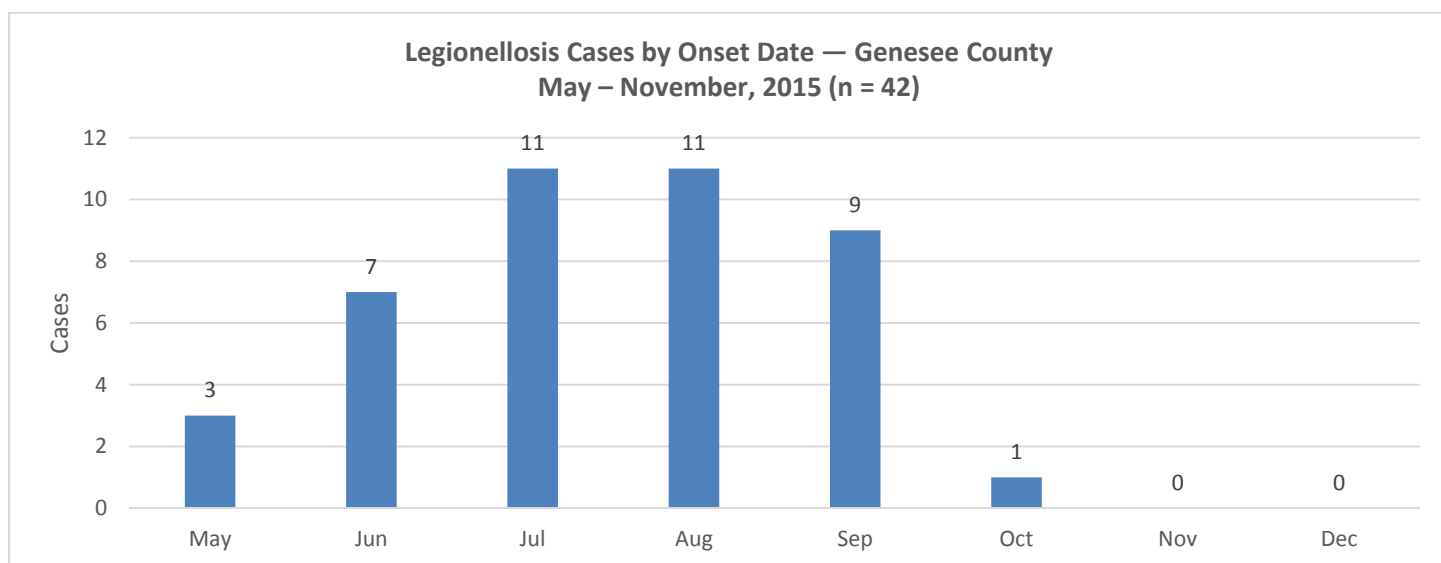
Five-year History



Note: If onset date was not available, referral date was used (i.e., date that the case was referred to public health). Cases in 2014 include one non-Genesee County resident associated with the 2014 outbreak.

Cases Analyzed in Current Report

This report summarizes data collected from 42 confirmed legionellosis cases that were reported May, 2015 through November, 2015. The final case included in the analysis had an illness onset at the end of October, but was reported the beginning of November.



Residence Water Source

Residence water source refers to the source of tap water at a patient's home residence during the 14 days before symptom onset and was determined by patient interview and verified by City of Flint water distribution map. Of the 42 cases, one case had exposure to both a private well and other municipal source during the 14 days prior to onset, accounting for the increase in the total (n = 43) in the table below.

Water Source at Residence	Total n = 43	
	n	%
City of Flint water	10	23.3
City of Flint Township water	0	0.0
Other municipal water system	14	32.6
Private well	17	39.5
Unknown*	2	4.7

*Represents two questionnaires that were not completed. Per the water distribution map, neither of these residences is on the City of Flint water system; it is unknown if the residence water sources were private wells or other municipal systems.

Inpatient Healthcare Exposure

A case was defined as having an inpatient healthcare exposure if they stayed overnight at Hospital A, B, or C in the Flint, Michigan area. Short-term exposures, such as outpatient and hospital visits, for the current summary period are in the process of being evaluated.

Inpatient Healthcare Exposure by Residence Water Source

	Total n = 42		Inpatient healthcare exposure n = 23		No known inpatient healthcare exposure n = 19	
	n	%	n	%	n	%
City of Flint Water	10	23.8	7	30.4	3	15.8
Other water at residence	32	76.2	16*	69.6	16	84.2

*One person who spent significant time at a hospital, but did not stay overnight, was included in the inpatient healthcare exposure category and calculations.



Prior Inpatient Hospitalization by Length of Stay and Residence Water Source

Location	n	Length of Stay	
		Median (days)	Range
Hospital A*	21	5	1–10
City of Flint water at patient residence	6	9	1–9
Other water at patient residence	15	4	1–10
Hospital A and Hospital C (residence on Flint water)	1		
Hospital A		1	
Hospital C		6	
Total	22**	5	1–10

Note: Length of stay = Number of days hospitalized during 14 days prior to symptom onset date.

*One person was also an inpatient at a hospital outside of Genesee County for 11 days during the 14 days prior to symptom onset date.

**The person who spent significant time at a hospital, but did not stay overnight, was excluded from the length of stay calculation.



Enhanced Questionnaire Data

Water Changes at Residence

Question Prompts:

Q4. During the last year, has the water pressure at your residence changed?

Q5. During the last year, has the water quality (appearance, taste, smell) at your residence changed?

Q6. Prior to your illness, did you make any recent plumbing changes or repairs at your residence?

Q7. Prior to your illness, were there any water main breaks or other water line issues that affected the water at your residence, including boil water advisories?

		City of Flint Water at Residence n = 9		Other Water Source at Residence n = 30		Total n = 39	
		n	%	n	%	n	%
Q4. Noticed changes in water pressure	Yes	2	22.2	6	20.0	8	20.5
	No	4	44.4	23	76.7	27	69.2
	Unknown	3	33.3	1	3.3	4	10.3
Q5. Noticed changes in water quality	Yes	7	77.8	6	20.0	13	33.3
	No	1	11.1	23	76.7	24	61.5
	Unknown	1	11.1	2	6.7	3	7.7
Q6. Made recent plumbing changes or repairs at residence	Yes	0	0.0	0	0.0	0	0.0
	No	9	100	30	100	39	100
	Unknown	0	0.0	0	0.0	0	0.0
Q7. Experienced water main breaks or water line issues that affected residence	Yes	1	11.1	1	3.3	2	5.1
	No	8	88.9	26	86.7	34	87.2
	Unknown	0	0.0	3	10.0	3	7.7



Work and Travel

Question Prompts:

- Q8. During this 2 week period (exposure period), did you work or volunteer, either full or part time?
- Q10. Visit, reside, or work in a long term care facility, nursing home, assisted living facility, or senior living facility?
- Q11. In the 2 weeks before you before you got sick, did you spend any nights away from home (excluding healthcare settings)?

	Total n = 39	
	n	%
Q8. Work outside of the home	8	20.5
Auto factory worker		
Bank teller		
Communications company worker		
Community health coach		
Construction company office worker		
Line worker		
Train engineer		
Yard worker/landscaper		
Q8. Volunteer outside of the home	0	0.0
Q10. Reside or visit an assisted living facility or rehab facility	3	7.7
Q11. Spend nights away from home	4	10.3



Community Exposures

Question prompt:

Q12. In the 2 weeks before you before you got sick, did you visit any of the following community venues?

	Total n = 38*	
	n	%
Hotel but did not stay overnight	1	2.6
Auditorium	1	2.6
Barbershop or Hair Salon	9	23.7
Car Wash	2	5.3
Casino	0	0.0
Place of Worship	11	28.9
Gym or Work-out Facility	2	5.3
Grocery	25	65.8
Home Improvement Store	9	23.7
Spa or Nail Salon	1	2.6
Mall or Department Store	4	10.5
Movie Theater	3	7.9

*One person refused to answer this portion of the interview

Question prompt:

Q13. In the 2 weeks before you got sick, did you have exposure to any of the following water sources, either **at home** or while **away from home**?

Water Exposures in the Home

	Total n = 38*	
	n	%
Shower	35	92.1
Use a detachable shower head or hose	18	47.4
Hot tub, whirlpool spa, Jacuzzi tub	2	5.3
Sat NEAR hot tub or whirlpool spa	0	0.0
Steam room or wet sauna	0	0.0
Humidifier	6	15.8
Respiratory therapy machine	3	7.9

*One person refused to answer this portion of the interview



Water Exposures Outside of the Home

	Total n = 38*	
	n	%
Showered outside the home	6	15.8
Use a detachable shower head or hose	4	10.5
Hot tub, whirlpool spa, Jacuzzi tub	1	2.6
Sat NEAR hot tub or whirlpool spa	0	0.0
Humidifier	0	0.0
Pool/splash pad/waterpark	1	2.6
Recreational or cooling misters	2	5.3
Steam room or wet sauna	0	0.0
Decorative fountain	0	0.0
Outdoor watering hose or sprinkler	6	15.8
Beach, lake, pond, river, creek	1	2.6

*One person refused to answer this portion of the interview

Patient or Proxy Reported Comorbidities

	Total n = 41*	
	n	%
≥1 comorbidity	33	80.5
Chronic kidney disease	9	22.0
Immunocompromised	9	22.0
Diabetes	16	39.0
Chronic lung disease	7	17.1
Asthma or chronic bronchitis	6	14.6
Heart disease or congestive heart failure	26	63.4
Liver disease	1	2.4

*Includes medical record data for 2 cases where an interview was unable to be completed



Patient or Proxy Reported Health Behaviors

	Total n = 41*	
	n	%
Smoking Status		
Never smoker	10	24.4
Current smoker	12	29.3
Former smoker	17	41.5
Lives with smoker	1	2.4
Drinks alcohol		
Yes	13	31.7
No	18	43.9
Not specified	8	19.5

*Includes medical record data for 2 cases where an interview was unable to be completed

Laboratory Testing

	Total n = 42	
	n	%
Urinary Antigen Positive	42	100
Sputum Culture Positive		
Yes (<i>Legionella pneumophila</i> – serogroup 1)	8	19.0
No (Specimen not suitable for culture/typing at MDHHS Lab)	3	7.1
Specimen culture not collected or not received at MDHHS Lab	31	73.8



PFGE Testing Summary

Number of legionellosis cases with PFGE performed: 8

Geographic residence distribution: 3 Flint, 3 Burton, 1 Mount Morris, 1 Grand Blanc

Age range: 45-85 years

Average age (median): 60.3 years (56 years)

Sex: Males, 50% (4/8)

Number of (%) cases interviewed: 6 completed + one partial (75% complete)

-6/8 specimens had unique patterns:

Onset	Hospitalization within 2 weeks prior to onset?	Residence on City of Flint water?	Enhanced questionnaire interview able to be completed?
July, 2015	No	No	Yes
July, 2015	No	No	Yes
July, 2015	No	No	Yes
August, 2015	No	No	Yes
Sept, 2015	Yes- Hospital A & Hospital C	Yes	Yes
Sept, 2015	No	No	Partial interview

-2/8 specimens had matching patterns:

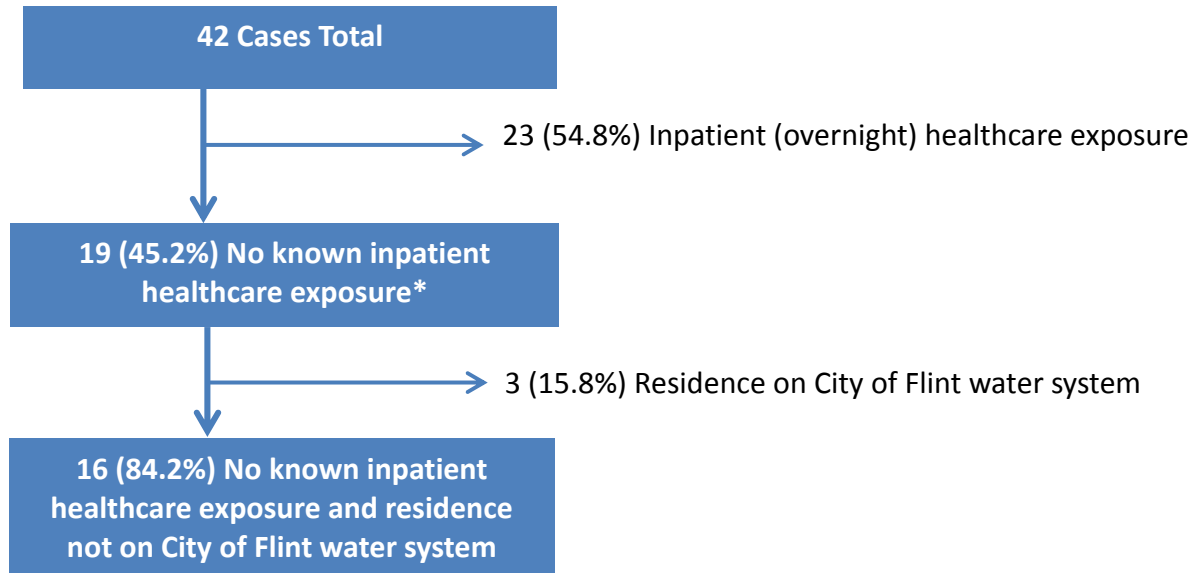
Onset	Hospitalizations within 2 weeks prior to onset?	Residence on City of Flint water?	Enhanced questionnaire interview able to be completed?
May, 2015	Yes- Hospital A	No	Yes
August, 2015	No	No	No

Out of 42 cases, 11 specimens were received at the MDHHS BoL for additional testing. Eight of 11 specimens were able to have PFGE typing completed at the MDHHS BoL (3 specimens were unsuitable for typing). Two of these cases had inpatient hospitalizations in the 2 weeks prior to the onset of illness; one case also had a residence on the City of Flint water system. While the number of samples available for additional testing increased relative to the previous year (cases from June, 2014- March, 2015), the samples represent only 19% of the current cases (May-Nov, 2015). A potential reason for the low number of samples may be that physicians are treating cases presumptively with antibiotics early in the course of illness, decreasing the likelihood that a positive culture specimen will be able to be obtained. The collection of respiratory culture specimens remains a priority for the continued surveillance in 2016.



Cases with No Known Healthcare Exposure and Residence not on Flint Water Supply

Case Flow-chart



*Outpatient and visitor healthcare exposures for the current summary period are in the process of being evaluated.

Epi Curve

