

Characterizing Dermatological Concerns Among Adults and Children Affected by the Flint Water Crisis

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Background and Aims

Between April 2014 and October 2015, residents of Flint, Michigan were exposed to a myriad of contaminants and irritants in their drinking water including lead, bacteria, excessive chlorine, total trihalomethanes, legionella, and increased corrosivity. Early manifestations of water concerns included skin conditions such as rashes and hair loss, yet few studies have examined these dermatological outcomes. The Flint Rash Investigation, completed in 2016, interviewed 390 Flint residents who had reported rashes; of which, 122 were examined by dermatologists. Of the 122 patients examined, 19.7% had rashes that were determined to be unrelated to the water exposure. This leaves over 80% of skin concerns that may have been related to the water.

Aims:

- To characterize the number of self-reported dermatological issues related to water usage, specifically with bathing/showering
- Report on open-ended responses related to worsened skin, hair, and/or nail findings

Methods

The Flint Registry gathers data to better understand the impact of the Flint Water Crisis and to connect participants to resources. Criteria for inclusion were those who were exposed to the water because they lived, worked, and/or attended school in Flint between April 2014 and October 2015. As part of the Flint Registry, participants completed an extensive questionnaire that included questions on skin conditions and rashes. Specifically, respondents were asked about rashes that developed during or after the water exposure and whether they were diagnosed by a healthcare provider. Demographic data was also collected. Frequency and Chi-square analysis was performed.

	Adults (N= 9,514)	Children (N=4,388)
Sex		
- Female	68.6%	48.7%
- Male	31.2%	51.2%
Race (select all that apply)		
- Black/African American	62.2%	74.0%
- White or Caucasian	35.3%	31.2%
- Mixed (more than one category selected)	26.6%	17.6%
Income		N/A
- <\$15,999	44.7%	
- \$16,000-\$49,999	34.6%	
- \$50,000-\$124,999	12.3%	
- \$125,000+	1.9%	
Education		N/A
- High school graduate or GED or less	42.0%	
- Some college or Associate degree or technical school	39.0%	
- College graduate (>4 years) or higher	18.7%	
Lived in Flint April 2014- October 2015	91.1%	91.9%
Insurance		
- Medicaid, Flint Medicaid, Medicaid Expansion or any government assistance plan	5,997	3,684
- Medicare	2,411	N/A
- Employer, partner's employer, or union	2,678	739
- Other	792	73

Results

Figure 1. Self-Reported Rashes in Adults by Initial Time of Observation (n=3,376)

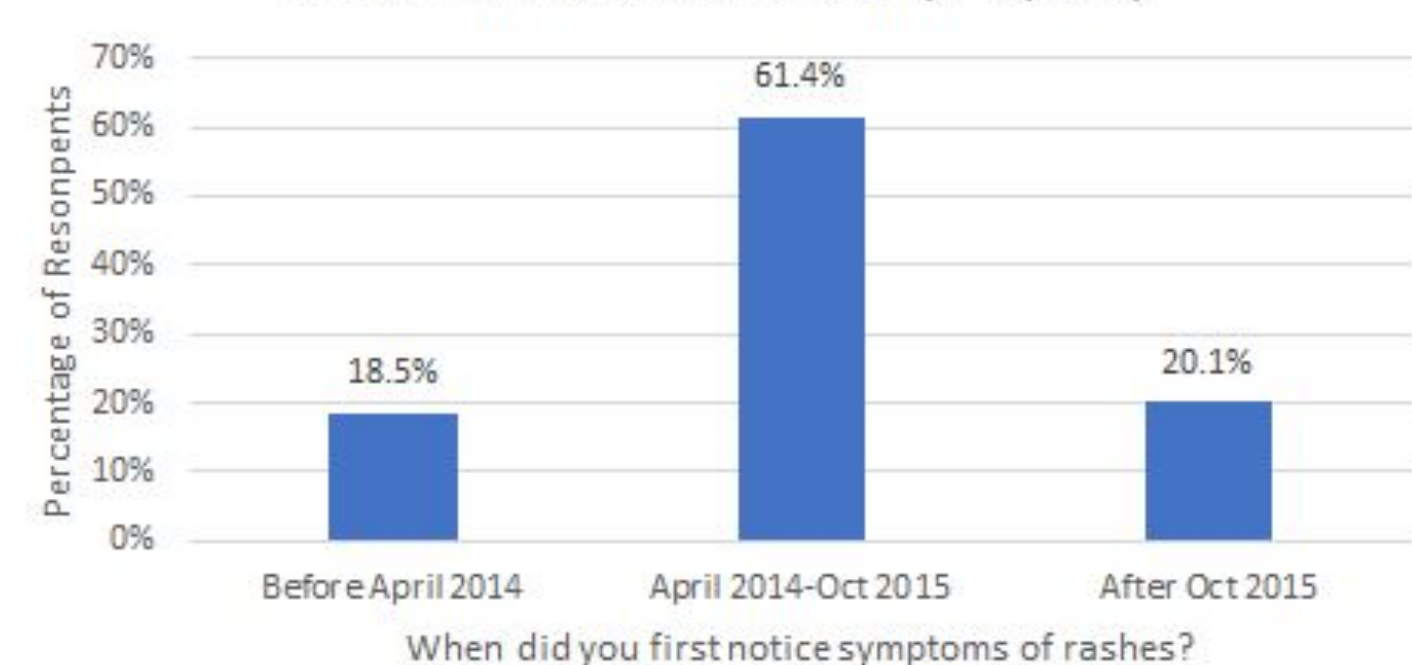


Figure 2. Relationship of Water Use by Self-Reported New Rash Development and Worsening Among Adults

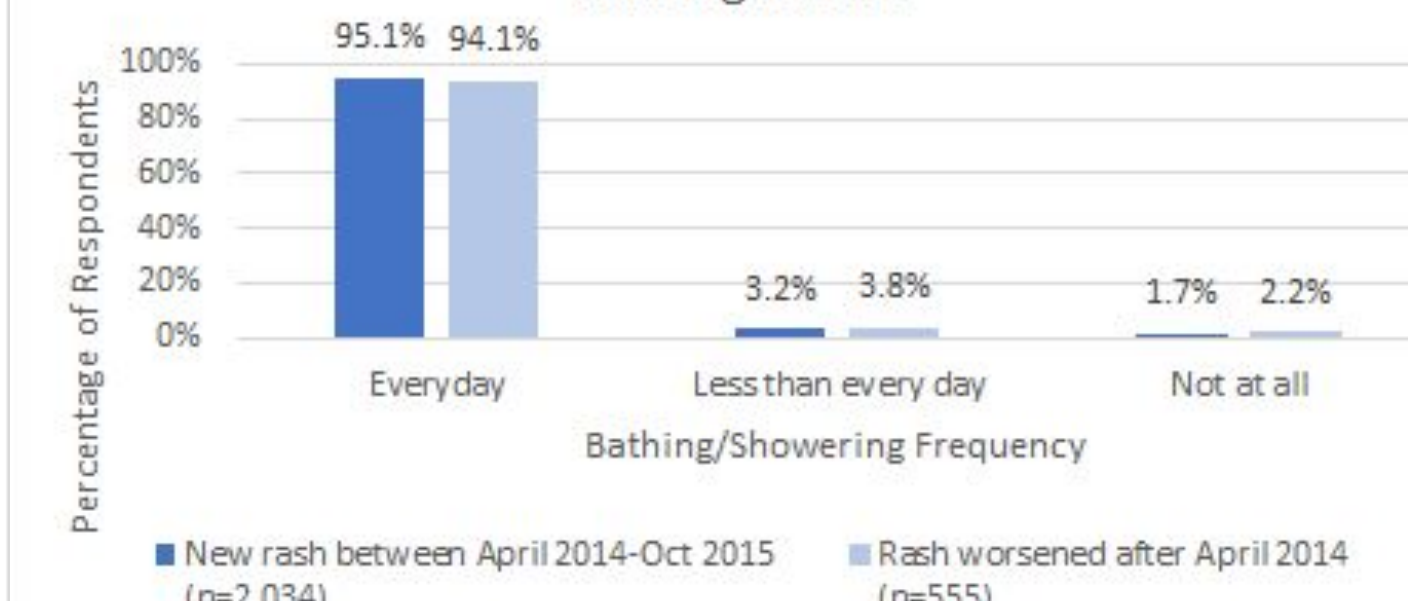


Figure 3. Rash Diagnosis

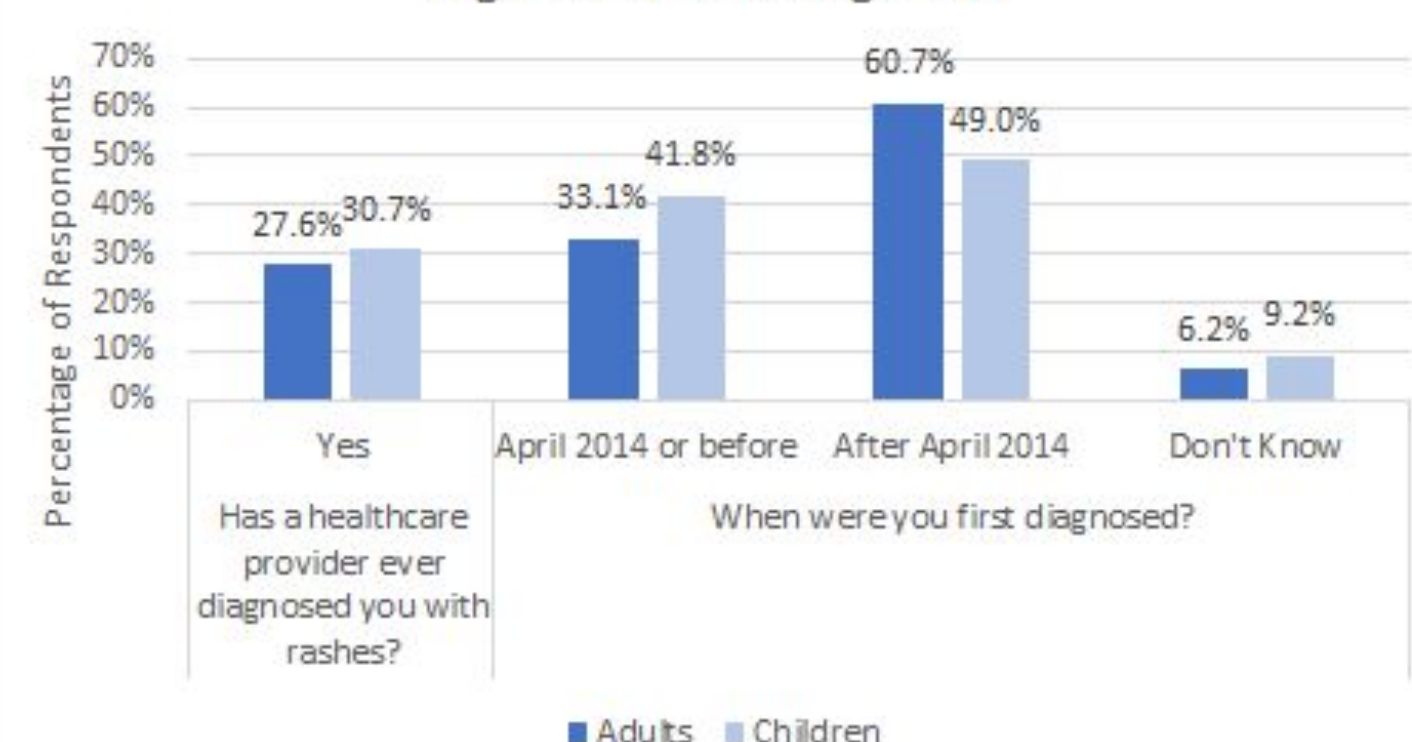


Figure 4. Current Status of Diagnosed Rash

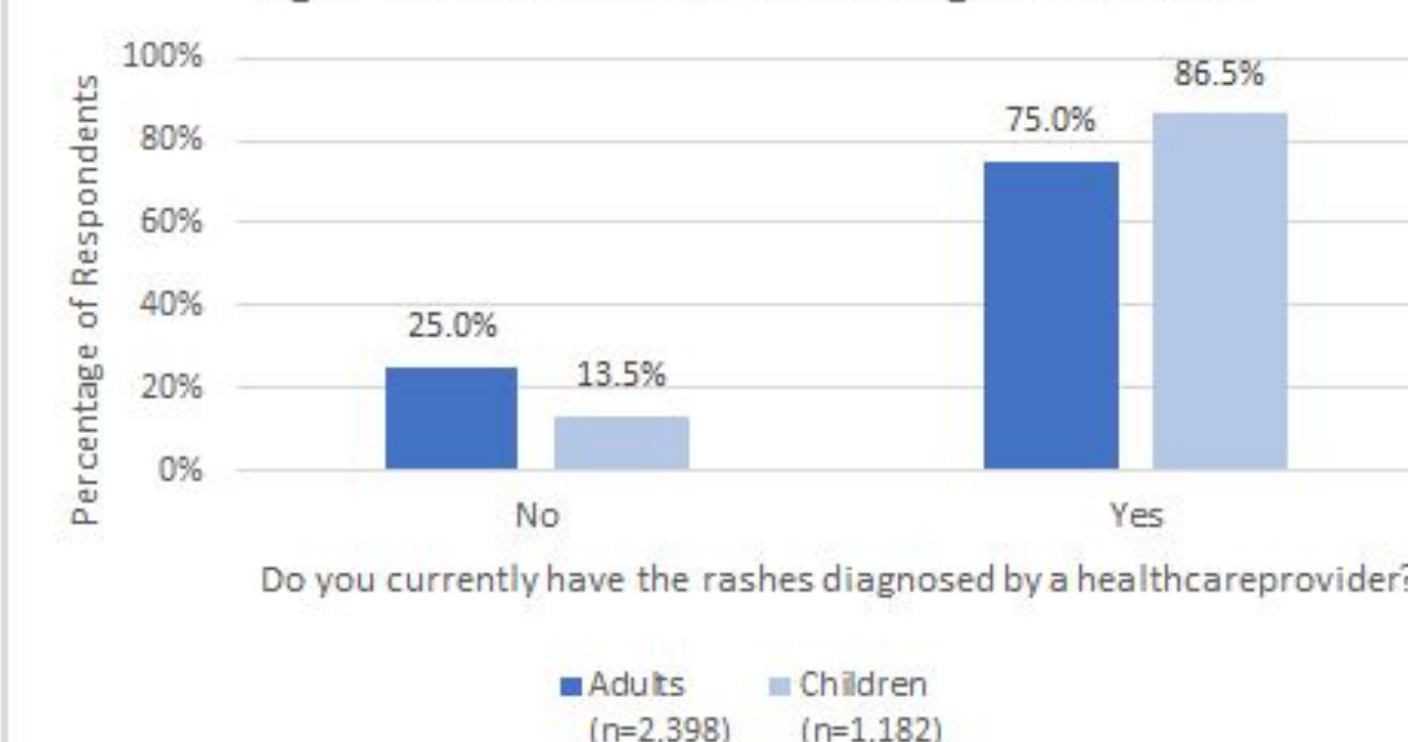


Figure 5. "What health conditions were created or worsened by the Flint water crisis?"

"I am a teacher so I am constantly washing my hands. On my palms I have a rash but the doctor does not know how to treat it. I have taken medicine and put topical cream on them and still have the rashes on my palms. I still work in a Flint school and the schools have not had their pipes replaced as well as no filters."

"Hair loss and rashes whenever I bathed or washed my hair. It happened as soon as the water hit my skin."

"I have developed a form of eczema called dyshidrotic eczema...it affects my hands, soles of feet...dark painful rashes all over my legs and feet."

"I started getting rashes when I would take a shower. It would feel like needles in my back. My back would be very itchy."

"I was breaking out every 3 mos. My hand had black rashes on it. My hair fell out. Skin rashes all over my body."

"Rashes and hair loss (patches) that would not respond immediately to medications or shampoo. Had multiple visits to the dermatologist to get the under control. I began washing my hair at my church, dad's and brother-in-laws homes (all in Flint Twp). Then saw less hair loss within weeks. Also improvement/relief from scalp itching."

"I used to take showers, my skin used to peel a lot, my back and arms would rash up."

"Since moving to Flint in 2004, I have experienced blisters/rashes on both arms during the warmer months that likely syncs with chemicals used in the water supply in general. These outbreaks of blisters have gotten worse since 2014 and now include my chest. I have heavy scarring on my arms and chest from these blisters that eventually erupt into chronic sores. When I leave on vacation, they improve and I have never had this condition before."

Discussion and Conclusion

Interpretations: The effect of the water on skin rashes was not previously well known. Now, it is seen to be extensive. Overall, of all adult respondents that self-reported rashes or other skin conditions, 61.4% reported the skin rash was present between April 2014 and October 2015. Of those who self-reported a new skin rash between April 2014 and October 2015, 95.1% reported bathing daily and of those who had previous rashes and reported them worsening, 94.1% reported bathing daily. Less than half of the adults and children reported receiving a rash diagnosis from a healthcare provider and among those diagnosed with rashes, most reported being diagnosed after April 2014. Moreover, for those reporting a rash diagnosis, 75% of adults and 86.5% of children reported currently still having the rash at the time of the survey. When asked in an open-ended question about other health conditions that were created or worsened by the Flint water crisis, many respondents reported skin, hair, and/or nail conditions that developed or worsened following exposure.

Implications: The Flint Rash Investigation was unable to generalize to the entirety of Flint due to the small sample size and convenience sampling. The Flint Registry data provides a much larger sample size. We are able to see the amount of self-reported conditions and afflictions in both adults and children as well as if these were diagnosed by a provider. Additionally, this data can be understood in context of reported water use, including frequency of bathing.

Strengths and Limitations: The largest limitation is that the rash is self-reported and relationship to the water crisis is based on reported timing data by the respondent. There is no way to know the true correlation between the two. Also, in children especially, they do not always bathe daily and may even be less likely to do so if they have a condition such as eczema. This makes examining the correlation between the water use and rash occurrence difficult. Additionally, information on diagnosis by a provider was also self-reported and must be cautiously interpreted as actual diagnosis is unknown and over half of reported rashes were never diagnosed by a medical provider. Strengths of the study included that the questionnaire was available in English and Spanish, it was accessible online, in print, and over the phone making it widely available, and there were over 13,000 responses.

Future Directions: Further investigation needs to be done to understand and characterize the types of rashes being reported and the potential treatment for those affected. Additionally, an analysis of barriers that might have existed may help to elucidate trends in demographic differences to obtaining dermatologic care in Flint is necessary.

References

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