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Prolonged Distress in Residents Exposed to a Technological Disaster

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PROLONGED DISTRESS IN RESIDENTS EXPOSED TO A TECHNOLOGICAL
DISASTER

by

Lindsey S. Hieber

A Thesis Submitted in
Partial Fulfillment of the
Requirements for the Degree of

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ABSTRACT

PROLONGED DISTRESS IN RESIDENTS EXPOSED TO A TECHNOLOGICAL DISASTER

by

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The University of Wisconsin-Milwaukee, 2020
Under the Supervision of Professor Raymond Fleming

This study investigated the prolonged emotional and behavioral effects of an ongoing technological disaster, the Flint Water Crisis. Past research indicates that surviving a technological disaster may have prolonged effects, including stress related disorders, even after the initial exposure period has passed. The survey consisted of questions involving knowledge of the effects of lead and Legionnaires' disease as well as questions regarding how to use water filters properly, questions modeled after the Health Belief Model, behavioral changes, and an anxiety, stress, and depression scale. Additionally, there were questions asking participants how well they feel the crisis was handled, how much control they feel they have, how comfortable they are using tap water, and if they feel the crisis is over. Data was analyzed using a series of ANOVAs and regressions where applicable. Results showed that residents of Flint have higher emotional levels and that Health Belief Model scores may play an important role in predicting knowledge scores. These results indicate that a mental health intervention may still be needed due to the prolonged elevated stress, anxiety, and depression levels of Flint residents.

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LIST OF ABBREVIATIONS

WTP	Water Treatment Plant
DWSD	Detroit Water and Sewerage Department
KWA	Karegnondi Water Authority
MDEQ	Michigan Department of Environmental Quality
CDC	Centers for Disease Control and Protection
EPA	Environmental Protection Agency
THM	Trihalomethane
GM	General Motors
GCHD	Genesee County Health Department
ADHD	Attention Hyperactivity Disorder
HBM	Health Belief Model
IRB	Institutional Review Board
DASS-21	Depression Anxiety Stress Scales-21
ANOVA	Analysis of Variance

Technological disasters are unique because technology and human error cause drastic and traumatic consequences for people and the communities they live in (Gill & Picou, 1998). Technological catastrophes reflect a breakdown in human-made technology in which sometimes highly toxic substances are used/stored (Baum, Fleming, & Davidson, 1983). Toxic substances can affect health directly through physical illness or poisoning as well as indirectly through chronic stress and community deterioration. Baum and Fleming (1993) state that technological disasters are likely to result in long-term stress effects, even more so than natural disasters. Another challenge brought on by technological disasters is the contamination of the environment. This challenges the individual's expectation regarding their relationship with nature (Gill & Picou, 1998). The contamination of the environment creates concern regarding the possibility of long-term exposure which could impact individual's health, property, and various resources (Gill & Picou, 1998). Recovery and how to restore what was ultimately destroyed by a technological disaster can remain uncertain as many of them are unprecedented. These disasters force people to reexamine their everyday activities to assess how their lifestyle might have contributed to their own or their family's exposure to toxic substances (Gill & Picou, 1998).

There is very little data on the effects of technological disasters, but the data that has been found forms a pattern of persistent effects of surviving a technological catastrophe. Technological disasters create chronic social-psychological disruption which contribute to the chronic stress felt by the community. For example, the Livingston Train Derailment in Illinois that occurred in 1982 when a train that was carrying hazardous materials derailed and many tank cars either leaked, burned, or exploded. The surrounding community was forced to evacuate their homes for up to 17 days because the fires from these tank cars had burned for 2 weeks (Gill & Picou, 1998). Although the community was considered not contaminated, the disaster still created a

source of uncertainty and concern within the community. Residents, who lived closest to the derailment site, that were evacuated for a longer period expressed the most concern about getting cancer, drinking contaminated water, and being exposed to the hazardous chemicals. In Dauphin County, Pennsylvania 1979, the Three Mile Island Nuclear Generating Station had a partial meltdown. Three Mile Island resulted in very little physical harm to the workers and residents. However, the residents were not convinced that the disaster left them unharmed. They were concerned about past harm they might have been exposed to and the potential future danger of the site. Research on Three Mile Island indicated that many residents continued to feel threatened by the plant more than a year after the accident and continued to feel a variety of stress symptoms as long as 17 months after the accident occurred (Baum et al., 1983). A study done on survivors of the 1942 Cocoanut Grove Fire (which killed nearly 500 people) found that nearly a third of the survivors still displayed nervousness or anxiety over an 11-month period (Gill & Picou, 1998). Those who lost consciousness during the fire did not develop any psychological complications. This indicates that experiences during the event were primarily responsible for subsequent difficulties. Lastly, survivors of the Buffalo Creek dam collapse and flood experienced higher rates of emotional disturbances (i.e., anxiety, depression, and personality changes) more than two years after the event.

These catastrophic events are usually very powerful and sudden with little to no warning. Another factor of technological catastrophes is the duration is unknown. Technological disasters may not end as quickly as people think due to potential unseen physical damage as well as toxicity of the site the disaster happened at (Baum et al., 1983). They may be difficult to predict because they are not supposed to happen. Technology is not built to breakdown, so many potential

warning signs may not be present and, if they are, may be overlooked. Disasters involving technology are also difficult due to the lack of knowledge on how to deal with an accident once it occurs. Many of these events are unprecedented, therefore there is no set plan in place on how to deal with a disaster of that nature.

A potential reason for the long-lasting impact of technological catastrophes is the loss of control that accompanies these events. Technology provides us with control over our environment and we lose that control when technology breaks down thus violating our expectations and may be salient (Baum et al., 1983). Not having control when we expect to appear to have different psychophysiological consequences than not having control when no one expects to have control. Loss of expected control is associated with reactance and arousal like stress. Losing control also impacts people's confidence in future controllability of that technology, which may expand beyond the community affected by the disaster (Baum et al., 1983). Another potential explanation for the lasting effects of technological catastrophes is the lack of "low point" for these events. A low point is a clear point in the disaster where people realize the worst is over (Gleser, Green, & Winget, 1981). Low points allow for closure and for the people affected to start going back to their normal lives. Some technological disasters do not have a clear low point because some may involve exposing people to toxic materials that have long-term consequences. Also, diseases from initial exposure may take years to develop creating long-lasting uncertainty.

Past research suggests that technological catastrophes have more chronic effects than natural disasters. Delays in decontamination of an area, clean-up, and presence of remaining toxic material may be thought of as a continuous threat that may be responsible for chronic stress among those affected. Prolonged clean-up may serve as a constant reminder about what occurred

and how the event is not over yet. The Flint Water Crisis is an example of a recent technological disaster.

Demographics of Flint, Michigan:

Flint is located within Genesee County in mid-Michigan. According to the U.S Census Bureau, the city has a population of about 95,943; with 25.6% of the population being under the age of 18 and 12.5% over the age of 65 (n.d.). The city of Flint is about 52% female and the majority of the city is African American (54%) or non-Hispanic White (37%) (U.S. Census Bureau, n.d.). There are an estimated 40,000 households, between 2 and 3 people per house on average, in Flint with a median household income of about \$27,700.00 (U.S. Census Bureau, n.d.). According to the U.S. Census Bureau, a little over 40% of the residents of Flint live in poverty (n.d.).

Timeline of the Flint Water Crisis:

From approximately 1903 until 1967, Flint used the Flint River as its water supply and treated it at the Flint Water Treatment Plant (WTP). In 1967, Flint signed a long-term water supply contract with the Detroit Water and Sewerage Department (DWSD). In doing so this left the Flint WTP to be used as a backup treatment option. However, the Flint WTP was only turned on four times a year to ensure it still operated (Davis, Kolb, Reynolds, Rothstein, & Sikkema, 2016). During the final 10 years that Flint was using DWSD, their annual cost of water increased 6.2 percent annually (Davis et al., 2016).

Due to the city of Flint's financial hardships, Michigan's Governor at the time, Rick Snyder, appointed an emergency manager on November 8, 2011, with the power to oversee the city's budget and make all the financial decisions for the city. This displaced the democratically-elected public officials of Flint with a non-elected official whom the city had no part in choosing

(Chavez, Perez, Tunney, & Núñez, 2017). To save money, the emergency manager made the decision to join the Karegnondi Water Authority (KWA). This decision was accompanied by a vote of approval from the Flint City Council in April 2013 (Davis et al., 2016). The KWA was formed to develop a water supply pipeline directly from Lake Huron. For Flint, this meant cutting out DWSD as their water supplier. When DWSD (also under Governor-appointed emergency management at the time) found out about Flint's plan, they opted to terminate their current contract effective April 2014. Up until the expiration date, both state-controlled parties tried (and failed) to negotiate terms in order to continue Flint's water supply until the pipeline to Lake Huron was finished. From January to March 2013, when talks of Flint using the Flint WTP as their full-time treatment center were still just talk, several e-mails were exchanged between Michigan Department of Environmental Quality (MDEQ) employees discussing health concerns about the Flint River's water quality. In April 16 and 17, 2014, just days before water was distributed to the public, Michael Glasgow of the Flint Utilities department e-mails MDEQ stating the Flint WTP is not prepared to run 24 hours a day and stating he is under political pressure to start distributing water (Davis et al., 2016).

On April 25, 2014, Flint started distributing Flint River water treated by the Flint WTP to residents of the city. Immediately, there were complaints from residents regarding the color, odor, and taste of the water coming into their homes (Hanna-Attisha, Lachance, Sadler, & Schnepf, 2016). Physical side effects, such as skin rashes, were also reported by residents (CDC, 2016). However, the city maintained that the water was safe. It wasn't until July 1, 2014 that the city started running tests on the water, including tests that check for metals such as lead (Davis et al., 2016). In August 15, 2014, the first boil water advisory was issued due to *E. Coli* being found

in the water. The advisory was then lifted five days later. This became a pattern for the city, issuing a boil water advisory and lifting it a few days later even though the problems were still evident. The problems with Flint's new water did not start with high levels of lead, but rather with the city's efforts to disinfect the water. City officials blamed the first round of tests results on "abnormal tests," but after two additional advisories in September (2014), they cited that there may be weaknesses in the infrastructure that were allowing dangerous bacteria to enter the system (CDC, 2016). The city decided to add more chlorine, a highly corrosive substance, to disinfect the water. Since the Flint WTP did not have any corrosion control, a requirement of the Environmental Protection Agency's (EPA) Lead and Copper Rule, the chlorine corroded the lead pipes that distributed the water to the residents' homes as well as the indoor lead plumbing in Flint's buildings. The absence of corrosion control and use of a more corrosive source increased lead leaching from plumbing (CDC, 2016). In May and August of 2014, more sampling revealed excessive levels of a chemical byproduct, trihalomethane (THM), which is created when chlorine reacts to organic matter in the water (Davis et al., 2016). The levels were so high that they violated the federal standard for the Safe Water Drinking Act. Exposure to THM at excessive levels has been associated with negative health issues including cancer (Hood, 2005).

The water being distributed throughout the city of Flint was so corrosive and dangerous that in October of 2014 General Motors (GM) announced that it would no longer be using water treated by the Flint WTP due to fears that the water would corrode their machines and damage vehicle parts (Davis et al., 2016). The very next day Valerie Brader, State Deputy Legal Counsel and Senior Policy Advisor, e-mails several top aides arguing for the city to switch back to DWSD water due to the poor quality of Flint water. Flint's emergency manager, Darnell Earley, maintained that the water quality issues could be resolved, and it would not be cost effective to

return to Detroit water (Davis et al., 2016). Throughout the city's struggle with water quality, the city of Flint's website had a link on their homepage that discussed water quality facts; however, on January 8, 2015 they redesigned their website so that there was no longer any information regarding the water crisis on the front page. In response to water quality concerns, the state installed water coolers and gave the option to use bottled water in states offices in Flint in January 2015.

On February 26, 2015 Mike Prysby of MDEQ e-mails Jennifer Crooks from the EPA stating that all the water samples from the July 1, 2014 through December 31, 2014 testing period were below the EPA action level for lead (15 parts per billion). Residents of Flint continued to complain about the water and in response (on March 3, 2015) the Flint Emergency Manager cites that it would cost \$12 million to return to Detroit water (Davis et al., 2016). It was on April 24, 2015 that the EPA stated they were notified by MDEQ that the city didn't have corrosion control treatment, a treatment required by the EPA, at Flint WTP (Kennedy, 2016). Miguel Del Toral of the EPA confirmed the lack of corrosion control treatment and expressed concern since Flint has lead service lines throughout the city. Even with complaints continuously rolling in, on July 13, 2015 an MDEQ spokesman (Brad Wurfel) went on Michigan Radio and said, "Anyone who is concerned about lead in Flint drinking water can relax. The test of the Walters' residence (104 parts per billion lead content) was an outlier. There is not a broad problem with the water supply freeing up lead as it goes into homes" (Kennedy, 2016).

Virginia Tech did an independent investigation on lead content in Flint water and found that 101 (out 252 samples) had lead content higher than the EPA's action level. Several samples were found to be over 100 parts per billion and one of the samples was over 1,000 parts per bil-

lion (Davis et al., 2016). Virginia Tech researchers concluded that Flint had a very serious problem with lead contaminated water (September 8, 2015). A separate report done by Michigan State University released in late September 2015 found that incidence of lead in children's blood in the city of Flint had increased from almost 2.5% to nearly 5% after the water source change. Reported deaths from Legionnaires' disease also increased after the change in water sources. On October 15, 2015, funding was authorized for Flint to switch back to the Detroit-supplied Lake Huron water (CDC, 2016) and the very next day Flint switched back to Detroit water (Davis et al., 2016). Unfortunately, the damage was already done. The pipes were corroded and contaminating the water with lead and that could not be undone by a water source switch.

On December 14, 2015, the city declared a state of emergency due to the contaminated water. The state of Michigan followed suit less than a month after. President Obama then declared a state of emergency for the city of Flint and Genesee County a month later (CDC, 2016). The city was forced to notify its residents that water samples had shown a violation. The notice they released stated that the water was not a health risk for most people and that they had already implemented measures to improve the water quality for the next testing period.

Effects of Lead Poisoning and *Legionella*:

Lead dissolves into water meaning you cannot see, taste, or smell it in drinking water. Ingesting large amounts of lead can cause damage to the brain, red blood cells, and kidneys. Lead usually doesn't affect healthy adults. The people at the highest risk of the effects of lead are pregnant women, elderly people, children, and those with compromised immune systems. The lead pregnant women are exposed to can be passed down to their fetuses which can lead to several adverse effects, including premature birth, learning difficulties, and slow growth. Children's bodies can absorb up to 50% of the lead they consume, while healthy adults only absorb 3 to

10% of the lead that enters their body (Genesee County Health Department (GCHD), 2015). There can sometimes be immediate physical consequences of lead poisoning in children including stomachaches, muscle weakness, and paleness of skin (GCHD, 2015), but often, children suffering from lead poisoning often do not show any outward symptoms. However, just because no symptoms are physically showing, that doesn't mean children are in the clear. Exposure to lead can lead to the development of learning disorders, it may cause Attention Deficit Hyperactivity Disorder (ADHD), and has also been proven to reduce IQ. Hanna-Attisha and colleagues (2016) found elevated blood levels of lead in 4.9% of Flint children post water change, significantly greater than the 2.4% pre-change with elevated defined as $> 5\mu\text{g/dL}$. Additionally, before the water crisis began, the percentage of Flint's students who qualified for special education was 15%; now it has nearly doubled at 28% for the 2019 school year (Green, 2019). According to the National Center for Education Statistics, the national average for students who qualified for special education is 13.8% (2019).

Legionnaires' disease is a respiratory condition that is caused by bacteria, *Legionella*. The bacteria are naturally in the environment and grows best in warm water. The people most at risk for Legionnaires' disease are people over 50, smokers (and former smokers), people with any chronic lung disease, those with weakened immune systems (i.e., cancer patients), and people who are taking medications that weaken the immune system (GCHD, 2016). Legionnaires' is contracted by breathing in mist/vapor of a contaminated water source. However, it cannot be spread from person to person and it cannot be contracted by drinking water with *Legionella* in it (GCHD, 2016). After the 2014 switch, several cases of Legionnaires' Disease also occurred in Flint possibly caused by the Flint Utilities Department, which flushed water mains for days potentially disrupting the biofilm, the protective slime coating inside the water supply (Davis et al.,

2016). Laurel Garrison of CDC stated that the Legionella outbreak that took place in Genesee County is one of the largest in the past decade (Davis et al., 2016).

Past Research on Flint:

In the six years since the Flint Water Crisis began, there have been a few published articles focusing on how residents gathered information on the water and the psychosocial effects of the crisis on Flint residents. Chavez et al. (2017) focused on how the residents were informed of the crisis during the time between September 2, 2015 (the release date of Virginia Tech's report of lead in the water) and January 16, 2016 (when President Obama declared a state of emergency in Flint). There was a total of 253 articles regarding the water contamination in Flint that were analyzed for aspects of the crisis being reported. These articles came from the New York Times, Detroit Free Press, and Flint Journal/MLive (Flint Journal's online counterpart). The overwhelming theme of articles from all three media outlets was government actions (Chavez et al., 2017). The least mentioned theme for Detroit Free Press and Flint Journal/MLive was the health risks associated with the water crisis and health risks were not mentioned at all in the New York Times (Chavez et al., 2017). Residents remained unsure about the health risks of the contaminated water even after weeks' worth of local and national media coverage. Information on the water crisis was most commonly received through television (about 77%), and through their neighbors, friends, and/or family (about 33%) (CDC, 2016). However, the most trusted source of information was the news media (26%), which is unfortunate given that the analyzed media (Chavez et al., 2017) hardly mentioned health effects, if they did at all.

In addition to health effects from lead exposure, there were concerns about the behavioral health consequences of the Flint Water Crisis for Flint residents, such as anxiety, depression, and substance abuse. The CDC (2016) released a survey in Flint to research both physical health and

behavioral health consequences of the water crisis. Of all the households surveyed (n=182), about 51% reported at least one person in their household believed their physical health was worsened by the crisis. The most common reported health condition was skin rash/irritation (about 50%). Within households that reported one or more members to be under the age of 21 (n=81), 54% reported at least one member of that age group had one or more behavioral health concerns since the start of the crisis. The most frequently reported behavioral health issues were with sleeping (39%) and aggressiveness (38%). About 52% of the those that reported behavioral health concerns stated the member needed services to help cope (CDC, 2016). However, those households needing services reported several barriers they felt were preventing them from seeking help; including having issues trusting providers (47%), price of services being too expensive (30%), and lack of transportation (26%). For households with members 21 or older, nearly half reported issues with anxiety or stress and 43% reported depressed mood. There was also reported fears of drinking and cooking with the filtered tap water in their home as well as fears of bathing and brushing their teeth with the unfiltered water in their restrooms. Half of the total households surveyed reported feeling overlooked by decision makers and half of the sample also felt strongly that the crisis would never be fixed (CDC, 2016).

Another researched topic was the change in behaviors regarding the use of water. Before the crisis started, the most common source of water was unfiltered tap water (78%). Between April 2014 and October 2015, 59% of participants reported still using unfiltered tap water as their main source of water (CDC, 2016). The second most common source of water was bottled water from the store (49%). At the time the CDC administered their survey, the main water source reported were a water distribution site (75%) and bottled water from the store (52%). About 17% of the surveyed households reported difficulty obtaining enough bottled water for

their family; the most common reported reason for this was a lack of transportation to distribution sites (CDC, 2016). Additionally, 41% of households stated they used filtered tap water from their home for drinking and cooking (CDC, 2016). Due to the Flint Water Crisis, many households have changed their behaviors surrounding hygiene and water usage, including reducing water usage, decreasing the duration and frequency of bathing, and changing how they bathe (i.e., using baby wipes or hand sanitizer for washing instead of tap water).

Starting in 2014, data on the Flint Water Crisis was collected at a university in Flint, MI by Dr. Thomas Wrobel, Lindsey Hieber, and Dr. Nancy Wrobel. Variables being investigated were knowledge, behaviors, attitudes, and emotional effects regarding the Flint Water Crisis, lead, and Legionnaires' disease. Many questions in this study were based on the Health Belief Model (perceived susceptibility, perceived severity, cues to action, perceived benefits of action, perceived barriers, and perceived self-efficacy) (Rosenstock, 1974). This study was done using an anonymous, online survey including 24 questions regarding knowledge of lead contaminated water and Legionnaires' disease. The sample studied was 710 members of a college community within the area serviced by Flint water. Of the 710 participants, 238 (30.4%) were male and 469 (59.8%) were female. Within this sample, there were 153 (19.5%) who lived in the city of Flint and 551 (70.3%) who did not. There were 195 (25%) participants who stated they had one or more children at home. Data was analyzed by residents versus non-residents as well as parents versus non-parents. Results indicated that parents had a greater knowledge of the effects of lead, $F(1,670)=14.88, p<.001$, and of Legionella, $F(1,657)=23.01, p<.001$. Residents had significantly greater knowledge of lead effects, $F(1,670)=13.70, p<.001$, but there was no significant difference in knowledge of Legionella between residents and non-residents. There was a significant

main effect by residence on comfort with drinking water at home, $F(1,682)=203.79, p<.001$. The current study is a replication and continuation of this study.

It is hypothesized that, since the Flint Water Crisis is no longer in the news, the current data will show a greater disparity between the resident and non-resident knowledge scores than the data collected from 2014-2016. It is also predicted, based on past data collected, that residents will still have greater knowledge scores than non-residents. We hypothesize that the attitudes and behavior section will serve as moderator for knowledge scores. Based on past literature, we hypothesize that there will still be elevated scores of anxiety, stress, and depression. Additionally, it is predicted that Milwaukee residents will have higher knowledge scores than the rest of the non-residents of Flint due to issues with water quality within the city of Milwaukee. In relation to the past data, it is predicted, the current knowledge scores will be lower than those of 2014-2016 due to the Flint Water Crisis no longer being in the news daily.

Method

This study obtained IRB approval from the University of Wisconsin-Milwaukee. A short consent form was at the beginning of the survey stating how long the survey would take, what it was about, and that they were free to quit at any time (see Appendix 1). The question following the consent form stated that participants were required to be 18 years old or older and participants had to (self-report) confirm that they were 18 or over. At the end of the survey was a debriefing form that gave information regarding where they could get mental health services, if a participant felt they needed it after taking the survey. There were also links to websites where they could find more information regarding the Flint Water Crisis.

Participants

Flint Residents:

There were 37 residents of Flint that participated in this survey. These participants were recruited from Flint community events. The mean age of this sample was 52.20 (SD=15.90); most of this group identified themselves as female (63.9%). Almost all this group identified as either African American (48.6%) or White/European-American (43.2%). A total of 27 (73.0%) residents reported having at least one child. 94.6% of Flint residents had prior knowledge of the Flint Water Crisis before participating in this study. 13 (36.1%) of residents stated they felt like leaving Flint due to the water crisis. 72.2% reported that the water pipes outside of their home had been investigated and/or replaced; however, 51.4% reported that the water pipes inside of their home had not been investigated or replaced. The majority of participants (61.1%) reported using unfiltered Flint water in the past 5 years (since the water crisis began). 89.2% of Flint residents stated they had a water filter installed at their home. See Table 1 for more details.

Commuters to Flint:

There were 10 participants, also recruited at Flint community events, who reported they did not live in Flint. The mean age of this group was 60.5 years of age and they were 70% female as well as 70% Caucasian. 60% of this sample reported having at least one child. 60% of the commuters also reported using unfiltered Flint water since the water crisis began. 50% of commuters reported having a water filter installed at their home.

Milwaukee Residents (control):

A total of 154 participants were recruited via University of Wisconsin-Milwaukee's SONA website; however, 23 of the participants' scores were not used because they took the survey after the COVID-19 outbreak, which could have potentially impacted their DASS-21 scores.

The remaining 131 participants were used in data analysis study; they had a mean age of 21.31 (SD= 3.43). Most of these participants identified as female (81.6%) and nearly 70% of the Milwaukee sample was Caucasian. Only 4.8% of this sample reported having at least one child. 77.6% had heard of the Flint Water Crisis prior to taking the survey. 14 (11.2%) of Milwaukee recruited participants stated they had been to Flint before and 3 (21.4%) reported using unfiltered Flint water; however, none of them had ever lived in Flint. 68.0% of this sample reported they had a water filter at home.

Survey

Demographic Section:

The demographic section of the survey contains 10 questions. These questions ask participants report their age, gender, and race. A subsection of the demographics portion is parental status. Participants are asked to report whether they had children and if they were currently expecting (pregnant) or not. If participants stated they did have children, they were asked how many children they had and how many were under the age of six. We also asked if they lived in an area that uses Flint water and if they worked in Flint. If a participant stated that they lived in Flint, they were sorted into the Residents of Flint group. If they didn't live in Flint, but worked or had been to Flint, they were considered a Commuter to Flint. Commuters are considered to still have some risk of being exposed to the toxic Flint water due to their time spent in the community. The Milwaukee residents were considered the control group.

Health Belief Model Section:

The Health Belief Model (Rosenstock, 1974) inspired section included questions regarding participants' attitudes and behaviors regarding water usage. This section had a total of 41

questions and has a Cronbach's Alpha for this section is .86. Questions regarding perceived susceptibility (i.e., if they used Flint water between 2014 and 2016) were asked; the range of possible scores for this section was -4 through 16. We also asked how comfortable they were in using Flint water for a variety of purposes (bathing, cooking, drinking, etc.) and how severe of a threat they felt the water was to their health which fall into the perceived severity section (range of possible scores fell between -4 and 15). The perceived barriers section (possible score of between -30 and 30) of the Health Belief Model was used to address how difficult participants felt it was to get a home water filter installed, the degree of difficulty participants experienced when trying to get enough bottled water to meet their needs, and how much participants trusted sources of information. Participants were asked if they felt having a home water filter limited the risks of drinking tap water (perceived benefits; possible score range of -4 to 4). Participants were also asked about their level of concern for being exposed to water with lead in it and what their sources of information were regarding Flint water (cues to action, possible score range of -4 to 12). Lastly, the self-efficacy influenced questions regarding how much control participants felt they had in avoiding contaminated water (possible score range of -8 to 11).

Knowledge Section:

The knowledge section of this survey asked 34 true/false questions regarding the effects of consuming lead (17 questions), various questions about Legionnaires' disease (9 questions), and, new to the survey, questions regarding how to properly use a water filter (8 questions). The knowledge portion of this survey has a Cronbach's Alpha of .52. The questions for this section were formed for this study using various handouts posted by the Genesee Health Department. All knowledge questions were in true/false format. An example of a question regarding the effects of lead is "Human skin can absorb lead in water." A question for Legionnaires' disease is "You can

get Legionnaires' disease from drinking contaminated water." An example of a question of the water filter portion of the knowledge section is "Aerator screens in all faucets should be cleaned weekly." This section was scored by totaling how many questions each participant got correctly (we created a new variable to do this). The maximum total score a participant could get is 34.

DASS-21:

DASS-21 (Depression, Anxiety, Stress Scales-21) was used to assess levels of depression, anxiety, and stress in the participants. This battery has 21 questions and has been used in several studies before (Lovibond & Lovibond, 1995). Cronbach's Alpha for the Depression section ranges from .91 to .97, the Anxiety section ranges from .81 to .92, and the Stress section ranges from .88 to .95 (Gloster et al., 2008). This section was scored using the published manual and we created new variables to represent each participant's total score for each subsection of the DASS-21. We used the questions verbatim and asked the participants to answer each question by how much each one applies to them since finding out about the Flint Water Crisis.

Retrospective Section:

This section of the survey contains 23 questions and was not used for the initial data collection (from 2014-2016). This new section asks participants a variety of questions asking them to look back at the crisis in terms of how they felt it was handled and if they felt their voices were heard. This section also includes questions regarding if they fear an event similar to the water crisis will happen in Flint again and if they feel the crisis is over. Other questions in this section are related to continued behaviors and attitudes regarding the water. For example, if they feel the water is safe now and if they still use a water filter. Participants will also be asked if they've attended any rallies, fundraisers, protests, or city hall meetings regarding the Flint Water

Crisis to assess their level of involvement in the crisis. I will also be asking when they last visited a water distribution center and if they would use mental health services if they were made available to them.

Procedure

The same survey used in the previous study (Wrobel & Hieber, 2019) will also be utilized in this study; however, there will be several questions added to the survey that will investigate attitudes towards how the crisis was handled, who they think is to blame, if they think the crisis is over, and if they feel the crisis could happen again. In total, there will be 26 additional questions. The survey includes a demographic section (i.e., Do you live in an area serviced by Flint Water?), a knowledge section for lead and Legionnaires' disease (i.e., Human skin can absorb lead in water), a Health Belief Model section (i.e., How concerned are you about being exposed to water with lead in it?), and a depression, anxiety, stress scale (DASS-21). The additional 26 questions will be at the end of the survey as they are more retrospective. The study will be administered online, in addition to being administered in person to people attending Flint community events. This survey will also be released in Milwaukee as the city is serviced by 95,000 lead pipes. There will be no identifying information (such as name or address) collected in this study so there is no way to trace data back to specific participants.

Data Analytic Plan

The analytic plan for this study is to import all the online surveys from Qualtrics to SPSS (a statistical analysis software). The surveys taken on paper, in person will be manually entered into SPSS. An additional SPSS file was created combining both the current data and the data from two years ago; with a new "Origin" variable to keep track of which dataset each participant

was from. There will be three groups analyzed in this current study: Flint Residents, Commuters to Flint, and Milwaukee (control). A series of ANOVAs will be run to compare differences between scores on the knowledge, DASS-21, and HBM portions of the survey. A series of regressions will also be run to investigate if DASS-21, HBM, and the interaction between those 2 variables are predictors for knowledge scores. The current study data will also be compared to the data previously collected. Frequencies for each group will be reported. As well as frequencies for various demographic questions (i.e., gender, race, residency, and parental status). We will also report on the frequency of exposure to Flint Water (without a filter) and whether respondents currently have/use a water filter.

Results

The commuters group had the highest total knowledge score ($M=25.90$, $SD=3.54$) of the 3 groups, followed by Flint residents ($M=25.04$, $SD=4.40$), and then the Milwaukee control group ($M=23.09$, $SD=2.71$) (see Table 2). There was a significant difference between these scores, $F(2,150)=7.15$, $p=0.001$. Flint residents had significantly higher stress scores ($M=10.17$, $SD=11.33$) than commuters ($M=7.11$, $SD=10.11$) and the Milwaukee resident group ($M=5.57$, $SD=8.65$), $F(2,163)=3.31$, $p=0.039$. Residents of Flint also had higher anxiety scores ($M=8.12$, $SD=9.43$) than the other two groups and the difference was nearly significant, $F(2,164)=2.96$, $p=0.054$. Most of the DASS-21 means (see Table 2) for this sample fall into the normal range of DASS-21 scoring, except for the residents of Flint group's anxiety score, which fell into the mild range. Although group means, for the most part, were in the normal range, there were participants who had DASS-21 scores that fell into mild to extremely severe categories for depression anxiety, and stress (see Table 3).

For the perceived severity scores (from the HBM section, see Table 4), Flint residents had the highest mean with 10.12 points (SD= 3.24); the Flint residents group's score was significantly higher than the rest of the sample, $F(2,158)=5.89, p=0.003$. Differences in means for perceived susceptibility was also significant ($F(2,121)=14.31, p<0.001$), with commuters having the significantly higher mean (M=7.40, SD=2.70). Average cues to action scores were also significantly different between groups, $F(2,170)=55.57, p<0.001$; the residents group had the highest mean (M=8.50, SD= 3.10). Perceived self-efficacy was also significantly different between groups with Milwaukee residents (M=4.77, SD=2.62) having the highest score, $F(2,166)=7.03, p=0.001$. Residents of Flint (M=2.78, SD=3.56) had significantly lower self-efficacy scores than the rest of the sample, $F(2,166)=7.03, p=0.001$. Additionally, total barriers to action scores were significantly different within the sample ($F(2,134)=4.04, p=0.020$); residents of Flint had the highest score (M= -0.96, SD=12.32).

As mentioned previously, there were 14 participants that lived in Milwaukee, but had been to Flint before. Although there were not significant differences in knowledge between Milwaukee residents who had been to Flint and those who had not, there were significant differences in average DASS-21 scores between them. Milwaukee residents who reported having been to Flint had significantly higher depression (M=9.57, SD=11.69, $F(1,122)=7.21, p=0.008$), anxiety (M=10.14, SD=11.91, $F(1,122)=8.82, p=0.004$), and stress scores (M=12.62, SD=12.04, $F(1,120)=10.40, p=0.002$).

Of the 13 options for sources of information (see Figure 1) regarding the Flint Water Crisis, there were significant differences in how much each group trusted 7 of those sources. Those 7 sources included: city government ($F(2,150)=12.95, p<0.001$), state government ($F(2,148)=12.25, p<0.001$), federal government ($F(2,149)=5.55, p=0.005$), physicians

($F(2,148)=7.51, p=0.001$), religious community ($F(2,148)=15.54, p<0.001$), community resources ($F(2,149)=3.54, p=0.031$), and local health department ($F(2,148)=3.61, p=0.030$).

Health Belief Model as Moderators for DASS-21 and Knowledge

A series of linear regressions were run to investigate if an interaction between DASS-21 variables and HBM variables significantly predicted variability in knowledge scores for the entire sample. For these statistical tests, centered variables were used as well as the product score (or interaction) of these centered variables. There was a separate regression run for each facet of DASS-21 and each HBM facet; in total, there were 18 separate linear regressions run for this section. The total knowledge score served as the dependent variable, the independent block one was the centered score for the one of the DASS-21 facets and the centered score for one of the HBM facets, and the independent block two was the interaction (or product) variable of the DASS-21 facet and HBM facet used in block one. For example, when examining the HBM facet of perceived severity as a moderator for DASS-21 depression scores and knowledge, independent block one would be the centered score for perceived severity and the centered score for depression and independent block two would be the interaction (or product) of depression and perceived severity centered scores. The variables of self-efficacy and perceived benefits to action did not significantly predict variation in knowledge scores, neither did their interactions with DASS-21.

Perceived Barriers to Action:

Barriers to action was significant ($\beta=0.26, t=2.75, p=0.007$) when in a model (R Square=0.062, $F(2,115)=3.82, p=0.025$) with stress (not significant), but the interaction between barriers and stress was found to be an insignificant addition. Both total perceived barriers to action

($\beta=0.30, t=3.165, p=0.002$) and anxiety ($\beta=-0.24, t=-2.52, p=0.013$) were significant in accounting for 9.9% of total variance in knowledge scores ($R=0.31, F(2,115)=6.31, p=0.003$), the addition of the interaction variable to this model was not significant and it made the anxiety variable insignificant ($\beta = -0.19, t = -1.77, p=0.080$). The interaction between perceived barriers and depression was not significant.

Perceived Cues to Action:

Total cues to action ($\beta=0.28, t=3.09, p=0.002$) was found to be a significant predictor for 6.2% of total variation in knowledge scores ($R=0.25, F(2,144)=4.77, p=0.010$), however, stress scores and the interaction between stress and cues to action were not significant. While anxiety scores ($\beta = -0.22, t = -2.53, p=0.013$) and total cues to action ($\beta=0.31, t=3.64, p<0.001$) significantly predicted 9.30% of variance in knowledge scores ($R=0.31, F(2,145)=7.46, p=0.001$), the addition of the interaction between the two variables was not significant. Total cues to action ($\beta=0.26, t=2.91, p=0.004$) alone is significant for accounting for 6.6% of variance in knowledge scores ($R=0.26, F(2,145)=5.11, p=0.007$), the addition of depression and its interaction with cues to action was not significant.

Perceived Severity:

The centered variables of stress and total severity accounted for 10.7% of total variability in knowledge scores, which was significant, $R=0.33, F(2,135)=8.08, p<0.001$. The coefficients table showed that total severity was the only variable significantly accounting for variation in knowledge scores ($\beta=0.34, t(4.01), p<0.001$). An additional regression was run using anxiety, total severity, and their interaction (in a separate block) to investigate if the anxiety and severity alone were significant contributors to variance in total knowledge. The first model with only the anxiety and severity variables accounted for 11.7% of total variance in knowledge scores and it

was a significant model, $R=0.342$, $F(2,138)=9.17$, $p<0.001$, however, only severity was a significant contributor to this model ($\beta=0.33$, $t=4.09$, $p<0.001$). For the second model (where the interaction variable was added), the amount of variance accounted for increased to 12.3%, which was still significant, $R=.35$, $F(3,137)=6.43$, $p<0.001$. While the interaction was not significant, severity ($\beta=0.333$, $t=4.13$, $p<0.001$) and anxiety ($\beta= -0.17$, $t=-1.99$, $p=0.048$) were significant predictors. A regression model including total perceived severity scores ($\beta=0.33$, $t=3.97$, $p<0.001$) and depression scores ($\beta= -0.17$, $t=-2.10$, $p=0.038$) was significant ($R= 0.34$, $F(2,136)=8.65$, $p<0.001$) in accounting for 11.3% of total variability in knowledge scores. The addition of the interaction was not significant.

Perceived Susceptibility:

The variables of total stress ($\beta=0.34$, $t=3.51$, $p=0.001$) and total susceptibility scores ($\beta= -0.01$, $t= -0.12$, $p=0.91$) accounted for 11.4% of total variability in knowledge scores in the sample; this is a significant amount, $R=0.34$, $F(2,98)=6.29$, $p=0.003$. When the interaction of stress and total susceptibility was added to the model, 15.5% of total variability of knowledge scores were accounted for, which is also significant ($R=0.39$, $F(3,97)=5.95$, $p=0.001$). According to the coefficients tables, total susceptibility ($\beta=0.36$, $t=3.72$, $p<0.001$) and the interaction between stress and total susceptibility ($\beta=0.21$, $t=2.19$, $p=0.031$) were found to be the significant predictors. Perceived susceptibility ($\beta=0.41$, $t=4.62$, $p<0.001$) and the interaction between anxiety and total perceived susceptibility ($\beta=0.22$, $t=2.52$, $p=0.013$) were a significant contributors to a significant model ($R= 0.49$, $F(3,99)=10.59$, $p<0.001$) that accounted for 24.3% of total variance in knowledge scores. A model with total susceptibility ($\beta=0.41$, $t=4.32$, $p<0.001$) and the interaction between susceptibility and depression scores ($\beta=0.19$, $t=2.00$, $p=0.048$) was significant ($R=0.42$, $F(3,98)=7.03$, $p<0.001$) in accounting for 17.7% of total variation in knowledge scores.

Parental Status

Parental status, whether a participant had a child or not, for the entire sample did not significantly account for total variability in stress ($F(1,185)=2.94, p=0.088$), anxiety ($F(1,187)=2.32, p=0.129$), or depression ($F(1,185)=1.64, p=0.202$). Although the differences between parents in depression ($M=6.84$), anxiety ($M=7.03$), and stress ($M=9.25$) scores and non-parents ($M=6.27, M=4.75, M=4.82$ respectively) was not significant, parents did consistently have higher scores in these categories. Exactly 24% of the parents who resided in Flint had stress scores that fell into the mild through severe ranges. While 21.7% had depression scores that would put them in the mild to extremely severe ranges. Lastly, 64.2% of parent residents of Flint had anxiety scores that place them in the mild to extremely severe range. A regression showed that parental status ($\beta=0.30, t=3.81, p<0.001$) significantly accounted for 8.80% of total variance in knowledge scores, $R=0.30, F(1,151)=14.55, p<0.001$. Those who were parents did have significantly higher lead ($M=12.49; F(1,185)= 10.72, p=0.001$), legionnaires' ($M=6.74; F(1,186)= 7.75, p=0.006$), water filter ($M=6.03; F(1,187)= 4.83, p=0.023$), and total knowledge scores ($M=25.52; F(1,151)= 14.55, p<0.001$).

Parents also had significantly higher cues to action ($M=6.69; F(1,197)= 42.55, p<0.001$), perceived susceptibility ($M=7.11; F(1,144)=26.91, p<0.001$), and perceived severity ($M=9.88; F(1,183)=10.52, p=0.001$) compared to non-parents. Also, parents reported significantly lower barriers to action ($M= -1.79; F(1,156)= 5.56, p=0.020$) than non-parents ($M= -5.47$). A regression showed that parental status ($\beta=0.25, t=3.21, p=0.002$) significantly accounted for 6.1% of total variance in total severity scores, $R=0.25, F(1,160)=10.33, p=0.002$. Parental status ($\beta=0.18, t=2.11, p=0.036$) also accounted for 3.2% of total variance in barriers to action scores ($R= 0.18,$

$F(1,135)=4.47, p=0.036$). Parental status ($\beta=0.41, t=5.03, p<0.001$) also significantly accounted for 16.8% of total variance in perceived susceptibility scores ($R=0.41, F(1,125)=25.33, p<0.001$). Lastly, parental status ($\beta=0.47, t=7.03, p<0.001$) accounted for 22.1% of total variance in cues to action scores ($R=0.47, F(1,174)=49.46, p<0.001$).

Current Dataset versus Previous Data

An ANOVA was run to compare the differences between the 3 groups from the current study and the dataset from the original study. With each dataset in its entirety, there were no significant differences on DASS-21 scores or knowledge scores. Knowledge scores for this comparison have a maximum score of 26, because the previous dataset only had the 17 lead questions and 9 Legionnaires' related questions.

New Flint Residents versus Original Flint Residents:

A series of ANOVAs were run to examine the differences in knowledge and DASS-21 scores between recently collected (new) Flint residents and Flint residents from the dataset collected from 2014-2016 (original). For knowledge, new Flint residents had an average score of 19.24 (SD=3.33) and the original Flint residents had an average score of 18.51 (SD=2.83); this was not a significant difference, $F(1,162)=1.509, p=0.221$. There were also no significant differences found between the two groups of residents for stress ($F(1,166)=0.066, p=0.798$), anxiety ($F(1,166)=0.039, p=0.843$), and depression ($F(1,165)=0.159, p=0.691$). It is worth noting that the original Flint residents had slightly higher stress (M=10.71, SD=10.92) and depression scores (M=8.28, SD=9.71) than the new Flint residents (M=10.17, SD=11.33 and M=7.50, SD=11.04 respectively). The new Flint residents did have a slightly higher anxiety score (M=8.12, SD=9.43) than original residents (M=7.76, SD=9.35).

New Commuters to Flint versus Original Commuters to Flint:

Of the new participants recruited from Flint events, 10 stated that did not live in the city of Flint; the original dataset had 447 total participants that did not live in Flint but worked and/or was a student in Flint. Although, the original group of commuters had higher anxiety ($M=4.35$, $SD=7.49$) and depression ($M=4.60$, $SD=7.59$) scores than the new commuters ($M=3.56$, $SD=5.18$ and $M=2.44$, $SD=4.22$ respectively), an ANOVA showed that the differences were not significant ($F(1,450)=0.222$, $p=0.638$ and $F(1,445)=0.722$, $p=0.396$). Similarly, the differences between average stress scores were not significant ($F(1,450)=0.222$, $p=0.638$), but it was the new commuters ($M=7.11$, $SD=10.11$) that had the higher scores. For total knowledge, the new commuters ($M=20.10$, $SD=2.84$) had significantly higher scores than the original commuter group ($M=17.60$, $SD=2.36$), $F(1,436)=10.82$, $p=0.001$.

Current Control (Milwaukee residents) versus Original Control (Dearborn residents):

A series of ANOVAs were run to compare knowledge and DASS-21 scores of Dearborn recruited participants (previous data) and Milwaukee recruited participants (current study's data). The results showed that Dearborn controls ($M=19.27$, $SD=2.33$) had a significantly higher knowledge score than the more recent Milwaukee controls ($M=17.56$, $SD=2.06$), $F(1,251)=37.16$, $p<0.001$. Milwaukee residents had significantly higher stress scores ($M=5.57$, $SD=8.65$) than Dearborn residents participants ($M=3.19$, $SD=5.57$), $F(1,260)=7.24$, $p=0.008$. It was also found that Milwaukee residents had significantly higher anxiety scores ($M=4.39$, $SD=7.94$) than the original Dearborn control group ($M=1.48$, $SD=3.44$), $F(1,263)=15.64$, $p<0.001$. Lastly, Milwaukee residents also had significantly higher depression scores ($M=4.58$, $SD=7.57$) than the residents from Dearborn ($M=2.23$, $SD=4.28$), $F(1,261)=9.89$, $p=0.002$.

Discussion

The data from this study has shown that Flint residents have had consistently elevated levels of stress, anxiety, and depression in comparison to commuters of Flint and two different control groups (Milwaukee and Dearborn). Although, these levels are considered in the normal or mild categories for DASS-21, it is still concerning that they have been at the higher end of normal (and the lower end of mild for anxiety) for the last 6 years. Additionally, this data showed that Health Belief Model scores played a bigger role in predicting knowledge than was initially expected. Lastly, the results of the current study indicated that parents are experiencing higher DASS-21 scores than non-parents. This is important because this shows which groups of residents may be more negatively affected by the Flint Water Crisis and may need assistance in coping.

An alternative hypothesis for the DASS-21 scores that fall within the normal range from participants within Flint community could be skin-deep resilience, which has been found in upwardly mobile African Americans from disadvantaged backgrounds (Miller, Cohen, Janicki-Deverts, Brody, & Chen, 2016). A part of having skin-deep resilience is maintaining good mental health (Miller et al., 2016). The reason that skin-deep resilience is a potential alternative hypothesis is because many people in the city of Flint come from a disadvantaged background and, based on the results of the current study, there is reason to believe that, on average, Flint residents have good mental health on paper. The downfall of skin-deep resilience is that there are negative health effects for the long-term, which seems like those of chronic stress (Miller et al., 2016). It would need to be explored further to see if this is a viable hypothesis for this community.

A potential confounding variable of this study is the lack of diversity in participants from Flint. Flint is a city that is mostly minorities; therefore, this sample is not exactly an accurate representation of the Flint community. Additionally, all the participants recruited in Milwaukee were (mostly) white, college students, which is not an accurate representation of the city of Milwaukee as a whole. Also, there was not enough participants of each group to compare on every facet of the study; many subsections, such as commuters to Flint had much less than the recommended 30 participants for statistical power. Future researchers should get more participants that are residents and commuters of Flint.

If this study were to be replicated, it is believed that, based on the current data, this study should have a more targeted approach. The only stipulation that needed to be met to participate in this study was that participants were over the age of 18. Based on the data obtained from this study, it may be more beneficial to require participants to be parents or to be expecting a child. Although there was only one pregnant participant in this study, their scores for DASS-21 (30 or more for each subsection) were all in the severe or extremely severe range; this makes it seem that pregnant individuals (or their partners) may be experiencing extreme emotional effects of the Flint Water Crisis. However, since there was only one pregnant participant, this needs to be investigated further before any conclusions can be drawn. Another reason that this study should target parents is because of the previously referred to statistic about the increasing number of special needs students in Flint; this may lead to parents becoming more emotionally impacted by the water crisis.

Additionally, it may be helpful to obtain cortisol, a biological sign of stress, levels from participants. Cortisol levels are an accurate indicator of stress and would be more accurate than self-report of stress. Also, there is the cortisol awakening response where cortisol levels tend to

be higher in people experiencing, or anticipating, a more stressful day than their average day. It has been found that greater cortisol following an acute stress test has been found in those with lower incomes, a relationship that is significantly mediated by blood lead levels (Gump, 2009). Lastly, I would also add more questions based on the use of plastic water bottles. After talking to participants in person (after they completed the survey), it was discovered that one of the biggest worries of several participants was potential health effects of relying solely on plastic water bottles for the long-term. For future research, it would be important to evaluate this concern.

Overall, the results of this study indicate that Flint residents do have elevated stress, anxiety, and depression scores in comparison to non-residents who have been to Flint and participants who have never been to Flint. Even though the average scores of these Flint residents mostly fell in the normal range of the DASS-21 scoring, it is important to note that there are several participants whose scores were higher than the normal range. Indicating that, although they may be a minority, there are some residents of Flint that need mental health assistance. Another important takeaway from this data is that some HBM subsets are significant predictors for knowledge scores. Additionally, parental status is a significant predictor for some HBM behaviors as well. These data indicate that mental health interventions may still be needed by some residents in Flint, Michigan to ensure that all residents are recovering from the water crisis. Even though, in this sample, those with mild or higher DASS-21 scores are the minority, that may not be the case for the entire population of Flint. The only way to know the mental health status of those who have suffered through the water crisis is to survey as many Flint residents as possible. It is important to implement a more widespread evaluation that can help identify residents who are struggling with depression, anxiety, or stress and ensure they get the help they need.

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Table 1
Demographics of Current Study by Group

Variable	Milwaukee residents (n=131)		Residents of Flint (n=37)		Commuters to Flint (n=10)	
	n	%	n	%	n	%
Age (mean)	21.3	SD=3.4	54.	SD=15.9		
	1	3	7	0	60.5	3
Gender						
Male	22	17.60%	13	36.10%	3	30.00%
Female	102	81.60%	23	63.90%	7	70.00%
Non-binary	1	0.80%	0	0.00%	0	0.00%
Race/Ethnicity						
White/Caucasian	85	68.00%	16	43.20%	7	70.00%
Black/African-American	9	7.20%	18	48.60%	2	20.00%
Asian/Asian-American	7	5.60%	0	0.00%	0	0.00%
Middle Eastern	3	2.40%	0	0.00%	0	0.00%
Mixed/Multiple Races	4	3.20%	1	2.70%	1	10.00%
Hispanic/Latinx	16	12.80%	0	0.00%	0	0.00%
American Indian/Alaska Native	0	0.00%	1	2.70%	0	0.00%
Other	1	0.80%	1	2.70%	0	0.00%
How many children do you have?						
None	119	95.20%	10	27.00%	3	30.00%
One	3	2.40%	3	8.10%	2	20.00%
Two	2	1.60%	9	24.30%	3	30.00%
Three	1	0.80%	6	16.20%	1	10.00%
Four or more	0	0.00%	9	24.30%	1	10.00%
Have you heard of the Flint Water Crisis?						
Yes	97	77.60%	35	94.60%	10	100.00%
I'm not sure	7	5.60%	0	0.00%	0	0.00%
No	21	16.80%	2	5.40%	0	0.00%
Have you ever been to Flint?						
Yes	14	11.20%	36	100.00%	10	100.00%
No	111	88.80%	0	0.00%	0	0.00%
Have you used unfiltered Flint water since the water crisis began?						
Yes	3	21.40%	22	61.10%	6	60.00%
No	7	50.00%	13	36.10%	2	20.00%
I'm not sure	4	28.60%	1	2.80%	2	20.00%
Do you have a water filter at home?						
Yes	85	68.00%	33	89.20%	5	50.00%
No	40	32.00%	4	10.80%	5	50.00%

Table 2:
 Knowledge and DASS-21 Scores by
 Group

Variable	Milwaukee Residents		Residents of Flint		Commuters to Flint	
	m	SD	m	SD	m	SD
Knowledge						
Lead	11.44	1.67	12.45	2.64	12.6	2.07
Legionnaires'	6.08	1.18	6.73	1.28	7.5	1.08
Water Filter	5.5	1.39	6.03	1.7	5.8	1.99
Total (with water filter score)	23.09	2.71	25.04	4.4	25.9	3.54
Total (without water filter score)	17.57	2.06	19.24	3.33	20.1	2.85
DASS-21						
Depression	4.58	7.57	7.5	11.04	2.44	4.22
Anxiety	4.39	7.94	8.12	9.43	3.56	5.17
Stress	5.57	8.65	10.17	11.33	7.11	10.11

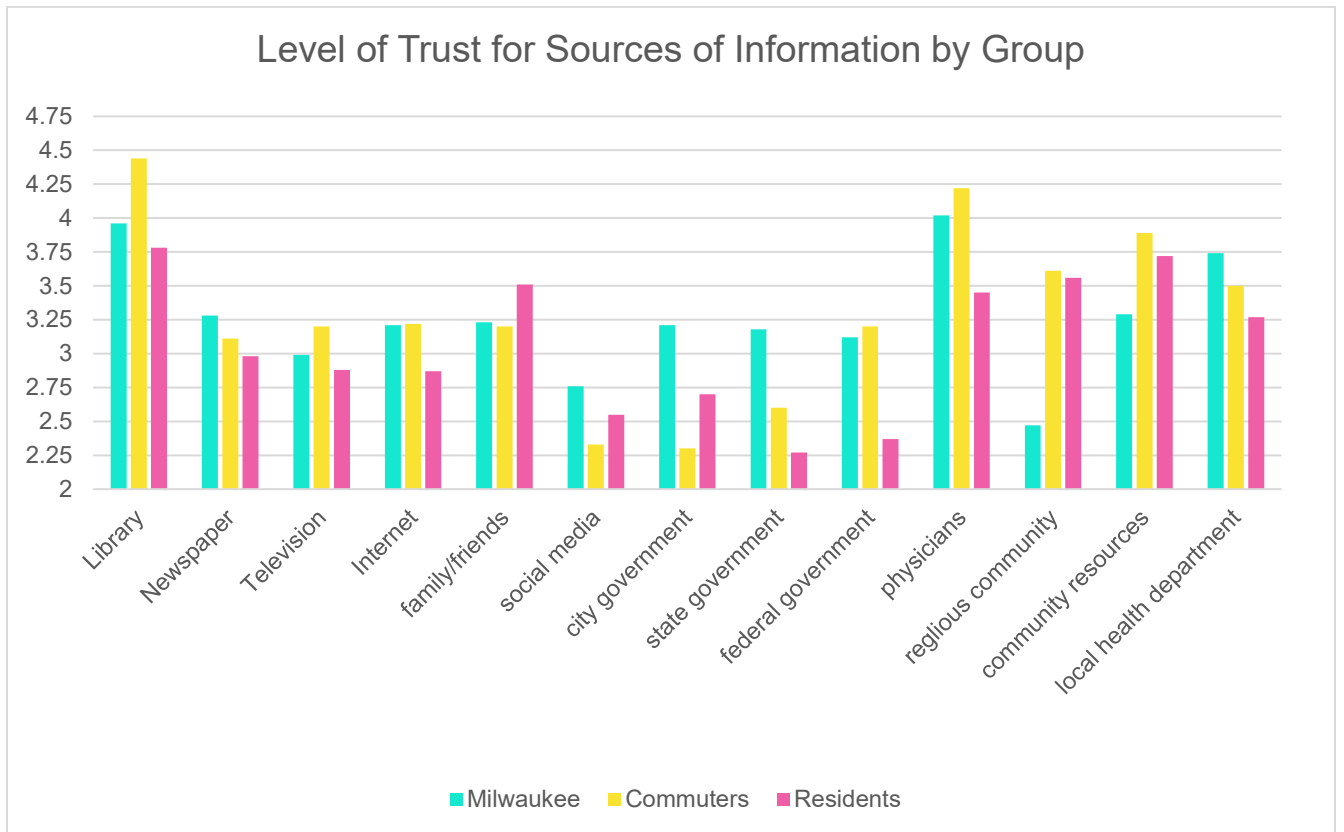
Table 3
 Frequency of DASS-21 Categories by Group

DASS-21	Milwaukee		Flint Residents		Commuters to Flint		Total	
	n	%	n	%	n	%	n	%
Stress								
Normal	103	84.40%	25	71.40%	7	77.80%	135	81.30%
Mild	7	5.70%	4	11.40%	0	0%	11	6.60%
Moderate	4	3.20%	1	2.90%	1	11.10%	6	3.60%
Severe	7	5.70%	3	8.60%	1	11.10%	11	6.60%
Extremely Severe	1	0.80%	2	5.70%	0	0%	3	1.80%
Anxiety								
Normal	98	79.00%	17	50.00%	8	88.90%	123	73.70%
Mild	4	3.20%	8	23.50%	0	0%	12	7.20%
Moderate	6	4.80%	3	8.80%	0	0%	9	5.40%
Severe	8	6.50%	2	5.90%	1	11.10%	11	6.60%
Extremely Severe	8	6.50%	4	11.80%	0	0%	12	7.20%
Depression								
Normal	100	80.60%	25	78.10%	8	88.90%	133	80.60%
Mild	5	4.00%	1	3.10%	1	11.10%	7	4.20%
Moderate	11	8.90%	1	3.10%	0	0%	12	7.30%
Severe	5	4.00%	1	3.10%	0	0%	6	3.60%
Extremely Severe	3	2.4	4	12.50%	0	0%	7	4.20%

Table 4:
Health Belief Model (HBM) Section Scores by
Group

	Milwaukee Residents		Residents of Flint		Commuters to Flint	
	m	SD	m	SD	m	SD
Health Belief Model						
Perceived Severity	8.35	2.46	10.12	3.24	9.5	3.6
Perceived Susceptibility	4.89	1.95	7.09	2.57	7.4	2.7
Benefits to Action	2.22	1.25	2.05	1.61	2.1	0.74
Cues to Action	2.68	2.96	8.5	3.1	4.2	2.82
Barriers to Action	-5.93	7.4	-0.97	12.32	-6.4	1.52
Self-Efficacy	4.77	2.62	2.78	3.56	4.67	2.06

Figure 1:



Appendix:
Flint Water Study Survey

Start of Block: Consent Form

Q100 **Consent to Participate in a Research Study Flint Water Study** _ You are invited to participate in a research study about your knowledge of the Flint Water Crisis and your reactions to it. If you agree to be part of the research study, you will be asked to answer a series of demographic questions about yourself, questions about water safety, and questions about your reaction to the water crisis. Benefits of the research are to help us understand what people know about the Flint water and their reactions to the situation. Risks and discomforts are minimal, if any. There is no compensation for completion of this survey. Participating in this study is completely voluntary. Even if you decide to participate now, you may change your mind and stop at any time. You may choose not to answer any survey question for any reason. If you have questions about this research study, you may contact Lindsey Hieber at lhieber@uwm.edu. The University of Wisconsin-Milwaukee Institutional Review Board has determined that this study is exempt from IRB oversight.

I agree to participate in the study.

- Yes (5)
- No (6)

Skip To: End of Survey If Consent to Participate in a Research Study Flint Water Study You are invited to participate in... = No

End of Block: Consent Form

Start of Block: Default Question Block

Q23 This survey is an attempt to determine what members of the Milwaukee, Wisconsin university community understand about the effects of lead in drinking water and their reactions to the Flint water situation. Your participation in this study will hopefully help us to understand the effects of such events and help those who need it. This survey will consist of some demographic questions, a few short questionnaires, and some follow-up questions about the reactions you may have had. In total, this survey should take you about 20 minutes to finish. You may end taking the survey at any time, but your full participation would be most appreciated. To begin, are you 18 or older?

- Yes (1)
- No (2)

Skip To: End of Survey If This survey is an attempt to determine what members of the Milwaukee, Wisconsin university commun... = No

Q24 Current age. Please put numerically, for example just type 22 if you are 22 years old.

Q89 What is your five digit zip code for your residence (For example 48502)?

Q93 With which gender do you identify?

Male (1)

Female (2)

Non-binary (3)

Prefer not to say (4)

Other, please specify (5) _____

Q74 Which best describes your Race/Ethnicity?

- White or European-American (15)
 - Black or African-American (16)
 - Hispanic/Latinx (24)
 - American Indian or Alaska Native (17)
 - Asian or Asian-American (18)
 - Native Hawaiian or Pacific Islander (19)
 - Middle Eastern or North African (21)
 - Mixed/multiple race (23)
 - Other, please specify (20) _____
-



Q26 What is your current domestic status?

- Single, never married (1)
 - Married without children (2)
 - Married with children (3)
 - Divorced (4)
 - Separated (5)
 - Widowed (6)
 - Living w/ partner (7)
-

Q75 How many children do you have?

- One (1)
- Two (2)
- Three (3)
- Four or more (4)
- None (5)

Skip To: Q74 If How many children do you have? = None

Q76 How many of your children are under the age of six?

- One (1)
 - Two (2)
 - Three (3)
 - Four or more (4)
 - None (5)
-

Q74 Are you or your partner currently pregnant/expecting?

- Yes (5)
 - No (6)
-

Page Break

Q105 Have you heard of the Flint Water Crisis before this survey?

- Yes (1)
 - No (3)
 - I'm not sure (2)
-

Q83 Which best describes your status at the university?

- University of Wisconsin-Milwaukee student (7)
- University of Wisconsin-Milwaukee staff member (8)
- University of Wisconsin-Milwaukee faculty member (9)
- Not affiliated with a university (10)

Skip To: Q102 If Which best describes your status at the university? = Not affiliated with a university

Skip To: Q102 If Which best describes your status at the university? = University of Wisconsin-Milwaukee staff member

Skip To: Q102 If Which best describes your status at the university? = University of Wisconsin-Milwaukee faculty member

Q76 What is your class standing now?

- Freshman (1)
 - Sophomore (2)
 - Junior (3)
 - Senior (4)
 - More that four years at college (5)
 - Graduate student (6)
 - Non candidate for a degree (7)
-

Q102 Have you ever been to Flint, Michigan?

- Yes (5)
- No (6)

Skip To: Q97 If Have you ever been to Flint, Michigan? = No

Q84 Have you ever (or do you currently) lived in Flint, Michigan or an area that uses Flint water? (If you pay the City of Flint for your water, your residence uses Flint water.)

- Yes (1)
- No (2)

Skip To: Q94 If Have you ever (or do you currently) lived in Flint, Michigan or an area that uses Flint water? (l... = No

Q140 Did you feel like leaving/moving out of Flint because of the Flint Water Crisis?

- Yes (1)
 - No (3)
-

Q141 How long have you lived/did you live in Flint?

- 0-2 years (1)
 - 3-5 years (2)
 - 6-10 years (3)
 - Over 10 years (4)
-

Q106 To the best of your knowledge, have the water service pipes in the ground outside of your home been investigated and/or replaced?

- Yes (1)
 - No (3)
 - I'm not sure (2)
-

Q107 To the best of your knowledge, have the water pipes inside of your home been investigated and/or replaced?

- Yes (1)
 - No (2)
 - I'm not sure (3)
-

Page Break

Q94 To your knowledge, have you used Flint water WITHOUT a water filter in the past 5 years (since the Water Crisis began)?

- Yes (1)
- No (2)
- I'm not sure (3)

Skip To: Q97 If To your knowledge, have you used Flint water WITHOUT a water filter in the past 5 years (since th... = No

Q104 To your knowledge, have you used Flint water WITH a water filter in the past 5 years (since the water crisis began)?

- Yes (1)
 - No (3)
 - I'm not sure (2)
-

Q97 How comfortable are you, or would be with drinking water out of the University of Michigan-Flint's public water fountains?

- Very comfortable (4)
 - Comfortable, but have concerns (6)
 - Somewhat comfortable, but with concerns (7)
 - Somewhat uncomfortable, have serious concerns (8)
 - Very uncomfortable (9)
-

Q96 How comfortable would you be using the University of Michigan-Flint's recreation center for bathing purposes?

- Very comfortable (4)
 - Comfortable, but have concerns (5)
 - Somewhat comfortable, but with concerns (6)
 - Somewhat uncomfortable, have serious concerns (7)
 - Very uncomfortable (8)
-

Page Break

Q110 Do you have a water filter at home?

- Yes (23)
- No (24)

Skip To: Q111 If Do you have a water filter at home? = No

Q117 As of today, do you feel the water in YOUR home is safe to use WITH a filter?

- Yes (4)
 - No (5)
-

Q111 How comfortable are you with drinking water out of your tap at home?

- Very comfortable, no concerns at all (24)
 - Comfortable, but have concerns (25)
 - Somewhat comfortable, but with serious concerns (26)
 - Somewhat uncomfortable, have serious concerns (27)
 - Very uncomfortable (28)
-

Q95 How often did you use tap water before you became of the water situation in Flint?

- A great deal (23)
 - A lot (24)
 - A moderate amount (25)
 - A little (26)
 - None at all (27)
-

Q112 How often do you use tap water in your home since you became aware of the Flint water situation?

- Much more often (39)
 - Somewhat more often (40)
 - About the same (41)
 - Somewhat less often (42)
 - Much less often (43)
-

Q131 Do you currently use the water in your home for bathing purposes?

Yes (23)

No (24)

Q113 Do you currently use bottled water for drinking, cooking, bathing, brushing your teeth, or for other purposes?

Yes (5)

No (6)

Skip To: Q129 If Do you currently use bottled water for drinking, cooking, bathing, brushing your teeth, or for ot... = No

Q114 What do you use bottled water for? Please select all the options that apply.

Drinking (1)

Cooking (2)

Bathing/Showering (3)

Brushing teeth (9)

Washing hands (4)

Washing food (5)

Cleaning counters/floors/other surfaces (6)

Washing face (7)

Other, please specify (8)

Q153 Are you worried about relying solely on filtered tap water if there's no longer bottled water supplied?

Yes (4)

No (5)

Q129 Getting sufficient bottled water is

Extremely easy (18)

Somewhat easy (19)

Neither easy nor difficult (20)

Somewhat difficult (21)

Extremely difficult (22)

Page Break

Q133 From which of the following sources of information have you learned about the Flint wa-
ter?

Check ALL that apply.

- library (1)
- newspaper (2)
- television (3)
- internet search (4)
- family or friends (5)
- social media (6)
- city government (7)
- state government (8)
- federal government (9)
- physicians (10)
- religious community (11)
- community resources (12)
- local health department (13)
- none; haven't heard about situation with Flint Water. (14)

*Skip To: Q80 If From which of the following sources of information have you learned about the Flint wa-
ter? Check... = none; haven't heard about situation with Flint Water.*

Q132 Please rate the following sources of information for Flint water based on how much you trust them.

	Don't trust them at all (3)	Have very little trust in them (4)	Have a moderate amount of trust in them (6)	Trust them a lot (7)	Completely trust them (8)
library (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
newspaper (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
television (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
internet search (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
family or friends (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
social media (6)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
city government (7)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
state government (8)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
federal government (9)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
physicians (10)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
religious community (11)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
community resources (12)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
local health department (13)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Page Break

Q80

The following questions ask about your knowledge on the safety of using Flint water.

Lead can cause damage to the brain, red blood cells, and kidneys.

- True (4)
- False (5)

Q81 Adults absorb lead faster than children.

- True (4)
- False (5)

Q82 Water dissolves the same amount of lead regardless of temperature.

- True (5)
- False (6)

Q83 Human skin can absorb lead in water.

- True (5)
 - False (6)
-

Q84 Bathing and showering should still be considered safe for children and adults, even if the water contains high amounts of lead.

- True (4)
 - False (5)
-

Page Break

Q85 Even small amounts of lead can harm kids' health.

- True (4)
 - False (5)
-

Q86 For children, there are no long-term problems associated with lead poisoning.

- True (4)
 - False (5)
-

Q87 If children drink water with lead in it, up to 50% of it can be kept in their bodies.

- True (4)
 - False (5)
-

Q154

To protect people from lead in the water, only cold water should be used through water filters.

- True (1)
 - False (2)
-

Q89 It is safe to use unfiltered tap water containing lead to wash my hands and dishes.

- True (4)
 - False (5)
-

Q90 Foods with a lot of calcium, iron, and vitamin C can help keep lead from being stored in a child's body.

- True (4)
 - False (5)
-

Page Break

Q91 Fruits can be washed safely with unfiltered water that may have lead in it.

- True (4)
 - False (5)
-

Q92 Children suffering from lead poisoning often fail to present outward symptoms.

- True (4)
 - False (5)
-

Q93 Exposure to lead to can cause learning disorders.

- True (4)
 - False (5)
-

Q90 Exposure to lead may cause Attention Deficit Hyperactivity Disorder (ADHD).

- True (1)
 - False (2)
-

Q91 Exposure to lead has been know to reduce IQ.

- True (1)
 - False (2)
-

Q94 Pregnant women exposed to lead cannot pass lead onto their fetus.

- True (4)
 - False (5)
-

Page Break

Q81 Legionnaires' disease is caused by a type of bacteria called *Legionella*.

- True (1)
 - False (2)
-

Q79 *Legionella* grows best in cold water.

- True (1)
 - False (2)
-

Q80 You can get Legionnaires' disease from drinking contaminated water.

- True (1)
 - False (2)
-

Q82 You can get Legionnaires' from breathing mist or vapor (small droplets of water) from a contaminated source.

- True (4)
 - False (5)
-

Q83 Individuals who have a weakened immune system (from diseases like cancer or diabetes) are at risk for getting Legionnaires' disease.

- True (4)
 - False (5)
-

Q84 Legionnaires' is mostly spread from person-to-person.

- True (4)
 - False (5)
-

Q85 You need to add a filter to eliminate *Legionella* in your drinking water.

- True (4)
 - False (5)
-

Q86 There are no symptoms that occur because of Legionnaire's disease.

True (4)

False (5)

Q87 Legionnaires' disease can cause death.

True (4)

False (5)

Page Break

Q145 It is safe to brush your teeth using unfiltered water.

True (17)

False (18)

Q146 Aerator screens in all faucets should be cleaned weekly.

True (4)

False (5)

Q147 Every morning, water faucets should be flushed for 5 minutes.

True (4)

False (5)

Q148 Faucets should be flushed with the water filter turned on.

- True (4)
 - False (5)
-

Q149 Water filters on faucets can be turned on and off.

- True (4)
 - False (5)
-

Q150 Your hot water heater tank does NOT need to be flushed regularly.

- True (4)
 - False (5)
-

Q151 It is recommended that pregnant women, women who are breastfeeding, and all children under the age of 6 should use bottled water ONLY.

- True (4)
 - False (5)
-

Q152 Boiling water removes lead.

- True (4)
 - False (5)
-

Page Break

Q128 How do you respond to the statement "The lead in the Flint drinking water is a severe health threat."?

- Strongly agree (4)
 - Agree (5)
 - Neither agree nor disagree (6)
 - Disagree (7)
 - Strongly disagree (8)
-

Q101 How concerned are you about being exposed to water with lead in it? Select the BEST answer.

- Very concerned (1)
 - Somewhat concerned (2)
 - Neutral (5)
 - Not too concerned (3)
 - Not at all concerned (4)
-

Q127 To what extent do you think you have been exposed to drinking water with lead in it?

- A great deal (23)
- A fair amount (24)
- Somewhat (25)
- Very little (26)
- Not at all (27)

Page Break

Q130 Getting a home water filter installed is

- Extremely easy (22)
- Somewhat easy (23)
- Neither easy nor difficult (24)
- Somewhat difficult (25)
- Extremely difficult (26)

Q99 How do you respond to the statement "Having a home water filter installed limits the risks of drinking tap water."?

- Strongly agree (1)
- Agree (2)
- Neither agree nor disagree (3)
- Disagree (4)
- Strongly disagree (5)

Page Break

Q134 How important is it to avoid drinking Flint water?

- Extremely important (11)
 - Very important (12)
 - Moderately important (13)
 - Slightly important (14)
 - Not at all important (15)
-

Q98 How do you respond to the statement "Avoiding drinking Flint water limits health risks."

- Strongly Agree (1)
 - Agree (2)
 - Neither Agree nor Disagree (3)
 - Disagree (4)
 - Strongly Disagree (5)
-

Q107 How much control do you have over avoiding lead in your water?

- Very much (1)
 - Somewhat (2)
 - Neutral (5)
 - Not very much (3)
 - No control at all (4)
-

Page Break

Q119 Do you feel that the water in Flint is currently safe to drink WITHOUT a water filter?

Yes (4)

No (5)

Skip To: Q73 If Do you feel that the water in Flint is currently safe to drink WITHOUT a water filter? = Yes

Q120 Do you feel the water in Flint is currently safe to drink WITH a water filter?

Yes (4)

No (5)

Page Break

Q73 Please read each of the following statements and indicate how much each one applies to you since finding out about the Flint Water situation. 0=Does not apply to me at all (never), 1=applies to me some of the time, 2=applies to be a good part of the time (often), and 3=applies to me most of the time (almost always).

	0 (1)	1 (2)	2 (3)	3 (4)
I found it hard to wind down. (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I was aware of dryness in my mouth. (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I couldn't seem to experience any positive feeling at all. (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I experienced breathing difficulty (ex. excessively rapid breathing, breathlessness without physical activity). (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I found it difficult to work up the initiative to do things. (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I tended to over-react to situations. (6)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I experienced trembling (ex. in the hands). (7)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Page Break

Q74 Please read each of the following statements and indicate how much each one applies to you since finding out about the Flint Water situation. 0=Does not apply to me at all (never), 1=applies to me some of the time, 2=applies to be a good part of the time (often), and 3=applies to me most of the time (almost always).

	0 (1)	1 (2)	2 (3)	3 (4)
I felt that I was using a lot of nervous energy. (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I was worried about situations in which I might panic and make a fool of myself. (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I felt that I had nothing to look forward to. (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I found myself getting agitated. (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I found it difficult to relax. (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I felt downhearted and blue (sad). (6)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I was intolerant of anything that kept me from getting on with what I was doing. (7)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Page Break

Q75 Please read each of the following statements and indicate how much each one applies to you since finding out about the Flint Water situation. 0=Does not apply to me at all (never), 1=applies to me some of the time, 2=applies to be a good part of the time (often), and 3=applies to me most of the time (almost always).

	0 (1)	1 (2)	2 (3)	3 (4)
I felt I was close to panic. (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I was unable to become enthusiastic about anything. (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I felt I wasn't worth much as a person. (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I felt that I was rather touchy (sensitive). (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I was aware of the action of my heart in the absence of physical activity (ex. sense of heart rate increase, heart missing a beat). (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I felt scared without any good reason. (6)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I felt that life was meaningless. (7)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Page Break

Q108 To what extent do you agree with the statement: "I feel my concerns regarding the Flint Water Crisis have been heard by the government."?

- Strongly agree (1)
 - Agree (3)
 - Neither agree nor disagree (2)
 - Disagree (4)
 - Strongly disagree (14)
-

Q109 To what extent do you agree with the following statement: "I believe that everything possible has been done to correct the water situation in Flint, Michigan."?

- Strongly agree (6)
 - Agree (7)
 - Neither agree nor disagree (9)
 - Disagree (8)
 - Strongly disagree (10)
-

Q115 To what extent do you agree with the statement: "I have enough clean water to supply my needs."?

- Strongly agree (1)
 - Agree (3)
 - Neither agree nor disagree (2)
 - Disagree (4)
 - Agree (5)
-

Q110 To what extent do you agree with the statement: "I often think about my current water quality."?

- Strongly agree (13)
 - Agree (14)
 - Neither agree nor disagree (15)
 - Disagree (16)
 - Strongly disagree (17)
-

Page Break

Q112 To what extent do you agree with the statement: "I feel the Flint Water Crisis has been handled well by decision makers."?

- Strongly agree (46)
 - Agree (47)
 - Neither agree nor disagree (48)
 - Disagree (49)
 - Strongly disagree (50)
-

Page Break

Q131 Do you feel you need mental/behavioral health services because of the Flint Water Crisis?

- Yes (4)
 - No (5)
-

Q118 Do you feel the Flint Water Crisis is over?

- Yes (1)
 - No (2)
-

Q122 Do you fear that the Flint Water Crisis could happen (or has happened) somewhere other than Flint, Michigan?

- Yes (4)
 - No (5)
-

Page Break

Q123 Which emotions do you feel when you think about the water crisis in Flint? Please select the emotion that applies to you. 1=strongly identify with emotion on the LEFT hand side, 2=slightly identify with the emotion on the LEFT hand side, 3=neutral, 4=slightly identify with the emotion on the RIGHT hand side, 5=strongly identify with the emotion on the RIGHT hand side.

	1=strong left	2=slight left	3=Neutral	4=slight right 5=strong right		
	(1)	(2)	(3)	(4)	(5)	
Anger	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	At ease
Disgust	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Pleased
Hopeless	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Hopeful
Fear	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Brave
Sadness	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Happiness
Stress	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Calm
Relief	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Heart-break
Content	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	De-pressed
Helpless	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	In control

Page Break

Q129 Who/what do you blame for the Flint Water Crisis? Please select all that apply.

- Federal government (1)
- State government (Michigan government/Governor) (2)
- Local government/Flint City Counsel (3)
- Local health department (14)
- Flint Emergency Manager (8)
- Media (5)
- Flint Water Treatment Plant (and staff) (6)
- Environmental Protection Agency (EPA) (7)
- Michigan Department of Environmental Quality (MDEQ) (13)
- the residents of Flint (4)
- Detroit Water and Sewerage Department (DWSD)/Detroit's city government (10)
- Poor infrastructure (9)
- No one/nothing (11)
- Other, please specify (12) _____

Page Break

Q135 Have you ever been to an event regarding the Flint Water Crisis? For example, city hall meetings, rallies, protests, fundraisers, water drives, volunteering at a water distribution site, etc..

Yes (4)

No (5)

Skip To: Q127 If Have you ever been to an event regarding the Flint Water Crisis? For example, city hall meetings,... = No

Q134 Have you been to an event in the last 6 months regarding the Flint Water Crisis? For example, city hall meetings, rallies, protests, fundraisers, water drives, volunteering at a water distribution site, etc..

Yes (4)

No (5)

Q127 Do you blame yourself for your actions during the Flint Water Crisis (for example, have you have thought you should've gotten a water filter sooner or that you should've gone to more rallies/fundraisers for Flint)?

Yes (1)

No (3)

Sometimes (2)

Q136 To what extent do you agree with the statement: "I feel Flint has recovered from the water crisis."?

- Strongly agree (1)
 - Agree (3)
 - Neither agree nor disagree (2)
 - Disagree (4)
 - Strongly disagree (5)
-

Q138 Do you feel you have recovered from the water crisis?

- Yes (1)
 - No (3)
-

Page Break

Q80 Thank you very much for your participation in our research. We certainly appreciate your time and input.

Your willingness to answer these types of questions is deeply appreciated. Your participation could help to contribute to the progress in our understanding of how people are responding to the Flint water situation. **If you are experiencing any distress due to any part of this study and you would like to speak to a counselor about your thoughts, please contact:**

Students: In Milwaukee (Norris Health Center) (414) 229-4716.

If you would like further information about the Flint water, go to the Genesee County Health Department website at <https://gchd.us/residents/water-information/>

Remember that all of the responses from this study will remain entirely confidential, as no identifying information about you has been recorded. In return, we ask you to maintain confidentiality about the details of this experiment since any knowledge of our purpose will bias others' data and thus cannot be used. If you have questions about this research study, you can contact Lindsey Hieber at liieber@umflint.edu or lshieber@uwm.edu. If you have questions about your rights as a research participant, please contact the University of Wisconsin-Milwaukee Institutional Review Board at irbinfo@uwm.edu or 414-229-3182.

Thank you for your time.

End of Block: Default Question Block