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What's Wrong with the Tap? Examining Perceptions of Tap and Bottled Water at Western Michigan University

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A study from Purdue University originally executed by Amber Saylor, Linda Stalker Prokopy, and Shannon Amberg

Replicated by Lindsey Makos

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Abstract

Distrust in tap water seems to be increasing in the United States with a consonant increase in single-use bottled water. As a result, I was intrigued to explore the behaviors and opinions of Western Michigan University (WMU) students in Kalamazoo, MI towards bottled water. Specifically, I initiated a study to examine student's perceptions and use of tap water and bottled water. To study water consumption habits on WMU's campus, I replicated a Purdue University study from 2011. In addition, because of the high profile of the Flint Water Crisis, particularly in Michigan, I added a section that focuses on the Flint Water Crisis. A random sample of students was invited to participate in an anonymous online survey. The survey examined current behaviors related to water consumption, perceived advantages and disadvantages of drinking tap water versus bottled water, and questions pertaining to the Flint Water Crisis. 399 surveys were completed with a mean respondent age of 19. This study revealed that, on average, students are consuming more tap water than bottled water. This study also revealed that respondents who were directly affected by the Flint Water Crisis, or knew someone who was, are less likely to trust the safety and quality of their tap water versus someone without experience of the event. Moreover, the more knowledgeable respondents were of the event, the less likely they were to trust the safety and quality of their tap water. Important implications for WMU to consider include the continuation of encouraging the usage of reusable water bottles, and ensuring clean, filtered water across campus.

Introduction

In 2011, researchers at Purdue University undertook a study to understand the environmental impacts of single-use bottled water (hereafter to be referred to as bottled water) and to examine the drinking water habits at Purdue University. Much of the interest for the original study was driven by negligent attitudes and actions that people have towards bottled water. The primary argument in this study was, "Over the past decade in the United States, public trust in tap water has declined while consumption of bottled water has more than doubled, to a yearly average of almost 30 gallons per person" (Gleick and Cooley 2009). Additionally, according to the results from Purdue, the students, staff, and faculty were no exception to this statement. There were various contributing factors as to why Purdue's campus was consuming more bottled water including the accessibility and convenience of bottled water. The Purdue study attempted to understand the perceptions and use of tap water and bottled water as well as educate and inform the university of the environmental impacts of bottled water via a social marketing campaign.

This study attempts to accomplish similar goals, but in the context of Western Michigan University (WMU) in 2018. This study was conducted to contribute to previous data measuring the perceptions and use of tap water and bottled water on college campuses. Ideally, this data will eventually be used to address issues caused by an increase in distrust of public tap water and an increase of bottled water in the United States. A section about the Flint Water Crisis, which was not in the original Purdue study, was added to examine its impact on public trust of tap water and use of bottled water. Since this study was conducted in Michigan, it was appropriate to see if this event had

any impact on bottled water consumption. Interestingly, when asked how the Flint Water Crisis affected respondent's preference of bottled water versus tap water, the majority said it did not affect their preference. Nevertheless, the results from this study show that on average, WMU students drink more tap water than bottled water. Results from my study differ from the original study, but the new data that has been collected contributes to understanding the perceptions and use of tap water and bottled water on college campuses.

Research Objectives

By conducting this study, I wished to gain insights on the following issues: the perceptions of bottled water versus tap water of WMU students; the amount of water students were drinking overall; whether students were drinking more bottled water or tap water; what advantages and disadvantages students perceived for drinking tap water versus bottled water; whether gender had an effect on drinking bottled water versus tap water; and how the Flint Water Crisis may have impacted the behaviors and attitudes of students' water consumption habits. To gather this data, a quantitative approach was used via an online survey. Together, this data offers insights on the behaviors, attitudes, and consumption habits of water at WMU.

Research Design & Methods

In order to assess the perceptions of tap water versus bottled water at WMU, the online survey software Qualtrics was used. Within this software, survey questions, format, and delivery can be developed and executed. The survey was anonymous so that students could answer honestly about their water preferences without having to worry

that their answers would be linked back to them. Questions in the survey pertained to the current behaviors and attitudes of WMU students, the perceived advantages and disadvantages to drinking tap water versus bottled water, and how the Flint Water Crisis may have affected respondent's perceptions. The questions relating to the current behaviors, attitudes, and the advantages and disadvantages to drinking tap water versus bottled water were replicated from the original study. The original study's answers from the survey questions were used to develop a social marketing campaign for promoting tap water. The survey for my study was sent out via email by three professors, one marketing professor and two environmental studies professors. In addition to inviting respondents via email, the survey was posted on my personal Facebook page. A hyperlink was included in the emails and Facebook posts. The invitation for WMU students to participate anonymously at the beginning of the survey stated, "If you are a WMU student please take a few minutes of your time to complete this survey. Your feedback is greatly appreciated".

After the survey deadline, the data collected was downloaded and analyzed using IBM SPSS Statistic software. Various tests were performed including T-tests and correlations to observe relationships between different variables. One of the T-tests that were performed examined the differences in means between male and female participants and their preferences to tap water versus bottled water. A second T-test compared current behaviors and attitudes with whether or not respondents were directly affected or knew someone directly affected by the Flint Water Crisis. The correlation that was conducted assessed current behaviors and attitudes, and compared these results to how knowledgeable respondents were about the Flint Water Crisis.

Qualtrics Survey

To gain a better understanding of the perceptions of tap water versus bottled water an online survey was created through Qualtrics. The survey questions were taken from the original study to keep all variables constant and to eventually conduct a similar social marketing campaign promoting tap water. In addition to the survey questions used in the original study, a section about the Flint Water Crisis was added to examine whether or not this event has affected respondent's preference and/or perceptions of tap water. The survey had a total of 59 questions and took approximately 10 minutes to complete. The survey was open for three weeks to attain a high response rate. A total of 399 students responded, which provided an adequate sample size to observe various significant differences.

IBM SPSS Statistic Software

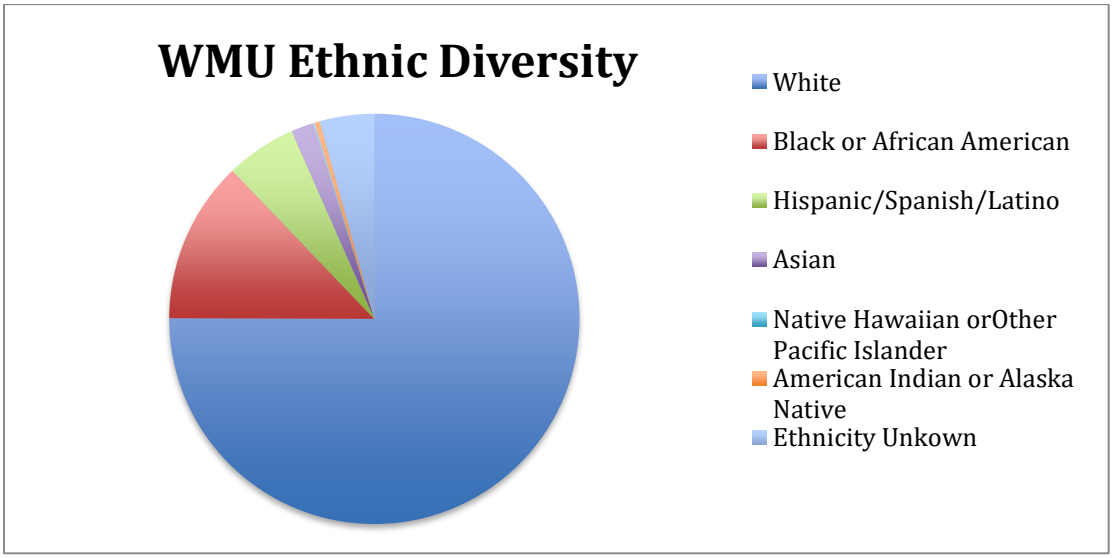
The software, IBM SPSS Statistic Software, which stands for Statistical Package for Social Science, is a commonly used program for analyzing survey results. The software allows researchers to perform various tests in order to find significant differences within the data. A high number of significant differences mean that you are at least 95% confident that the odds of the results are by chance is less than .05. As stated previously, T-tests and correlations were used to extract the most relevant information in addition to descriptive statistics, which measure means and percentages of a dataset.

Results

A total of 399 respondents completed the survey over a three-week period. More females (68.07%) than males (30.61%) responded to the survey. Out of the respondents,

(88.39%) identified as White/Caucasian, (1.85%) identified as African American or Black, (2.90%) identified as Hispanic/Spanish/Latino, (2.64%) identified as Asian, (0.26%) identified as Native Hawaiian or Pacific Islander, (0.53%) identified as American Indian or Alaska Native, (1.06%) identified as Middle Eastern or North African, and (2.37%) identified as Other. Compared to WMU's overall ethnic diversity, this spread is fairly representative (Graph 1).

Graph 1: WMU Ethnic Diversity Spread



The mean age of respondents was 19 and the majority of respondents were juniors or seniors: freshmen (24.21%), sophomores (20%), juniors (27.37%), and seniors (27.37%). A set of questions from the original survey about drinking water risks was not included in the analysis because there were no significant differences found and the questions were extremely similar to Tables 1 and 2.

Current Behaviors

The current behaviors analyzed included: how much bottled water and tap water respondents were consuming on average; what did males and females prefer more; and which gender was consuming more bottled water. On average, respondents consumed 2.53 bottles of water in a week on a range of 0-50 bottles. Approximately 84.53% of respondents said that they used a reusable water bottle in the last week. Additionally, when respondents were asked to estimate the percent of water they had consumed that came from the tap that week, the mean was 66.77%. Results also showed that compared to males, females tended to prefer and trust bottled water more than tap water. Lastly, females tended to consume more bottled water than males. Overall, these results show that on average, WMU students drink more tap water than bottled water.

Perceived Advantages and Disadvantages of Drinking Tap Water

A T-test was conducted to test for significant differences between males and females of the perceived advantages and disadvantages of drinking tap water. Results of the T-test performed for advantages revealed significant differences between males and females for 3 out of 16 potential advantages of drinking tap water. Females were significantly more likely to be heavier users than males. Advantages to drinking tap water that resulted in the largest significant differences for females were: agreement that bottled water is much more expensive than tap water ($t=1.669$); agreement that by using tap water respondents are contributing less plastic to landfills ($t=-2.716$); and respondents feel guilty throwing away plastic bottles after only using them once ($t=-2.523$)

The T-test performed on the statements related to the disadvantages of drinking tap water revealed 5 out of 14 perceived disadvantages. The T-test was conducted based

on differences in means between male and female users, female again users being heavier users than males. Disadvantages to drinking tap water that created the largest significant differences were that females believed: that there aren't enough convenient places to refill a reusable water bottle on campus (t=-.944); that Western's tap water is unsafe to drink (t=-3.159); they could get sick from germs growing in a reusable water bottle if I don't keep it clean (t=-1.765); female users worry about using a reusable water bottle since it could transfer harmful chemicals (such as BPA) into the water (t=-1.694); and that they do not trust the Western administration to provide accurate and timely information about the safety of tap water on campus (t=-1.881). Results from Table 1 and Table 2 reveal that respondents perceived more disadvantages of tap water compared to advantages. However, 3 out of 5 significant differences pertaining to the disadvantages of tap water referred to issues with WMU providing healthy, safe tap water.

Table 1 Differences in agreement of advantages between male and female users of tap water (strongly disagree - strongly agree: 1 - 5)	Full Sample	Male Users	Female Users	T-value
Bottled water is much more expensive than tap water	5.99	5.82	6.11	1.669**
I don't have to go to the store to purchase bottled water regularly	5.31	5.16	5.41	-1.31
I am contributing less plastic to landfills	5.57	5.25	5.74	-2.716*
I can reduce my consumption of oil used to make plastic	5.65	5.62	5.65	-0.249
I am reducing my personal contribution to global climate change	5.4	5.24	5.47	-1.455
I am helping to make our campus more sustainable	5.41	5.26	5.46	-1.345
Bottled water is often the same or similar to tap water	4.19	4.34	4.15	0.95
Reusable water bottles are easy to refill throughout the day	5.76	5.69	5.82	-0.943
Municipal tap water is more regulated, and therefore safer to drink than bottled water	3.69	3.41	3.55	-0.898
I feel guilty throwing away plastic bottles after only using them once	5.87	5.57	6.01	-2.523*
I can filter tap water myself to make it safer to drink	5.46	5.37	5.52	-0.844
A reusable water bottle is convenient because I can always have it with me	5.85	5.56	5.99	-3.039
Recycling single-use bottles takes too much time and/or effort	3.23	3.03	3.33	-1.446
I worry about drinking bottled water because the plastic can transfer harmful chemicals to the water inside	3.9	3.5	4.06	-2.748
Municipal tap water has the benefits of added fluoride, while bottled water does not	4.21	4.04	4.3	-1.65
By using a reusable water bottle, I motivate others to do the same	4.72	4.71	4.71	0.012
*P<.05; **P<.01				

Table 2 Differences in agreement of disadvantages of tap water between males and females (strongly disagree - strongly agree: 1-5)	Full Sample	Male Users	Female Users	T-value
Bottled water is safer to drink than municipal tap water	3.25	3.19	3.28	-0.667
I don't trust our local government to ensure the safety and quality of tap water	3.18	2.91	3.25	-2.646
I don't have access to filtered tap water on campus	1.82	1.81	1.79	0.165
There aren't enough convenient places to refill a reusable water bottle on campus	2.54	2.44	2.59	-.944*
Reusable water bottles are easy to lose or forget at home	2.97	3.05	2.95	0.71
Bottled water is more convenient because it is available in many places on campus	2.88	2.81	2.93	-0.901
I feel that tap water on Western's campus is unsafe to drink	2.49	2.17	2.62	-3.159**
I don't like the taste of tap water as much as bottled water	2.99	2.76	3.03	1.705
Cleaning a reusable water bottle requires too much time and effort	2.29	2.34	2.26	0.645
I feel that tap water in general is unsafe to drink	2.29	2.1	2.35	-1.902
I could get sick from germs growing in a reusable water bottle if I don't keep it clean	3.53	3.37	3.62	-1.765*
Reusable water bottles are too big to fit in a car cup holder	2.56	2.49	2.54	-0.346
I worry about using a reusable water bottle since it could transfer harmful chemicals (such as BPA) into the water	2.14	1.99	2.21	-1.694*
I don't trust the Western Administration for accurate and timely information about the safety of tap water on campus	2.42	2.23	2.47	-1.881**
*P<.05; **P<.01				

Flint Water Crisis

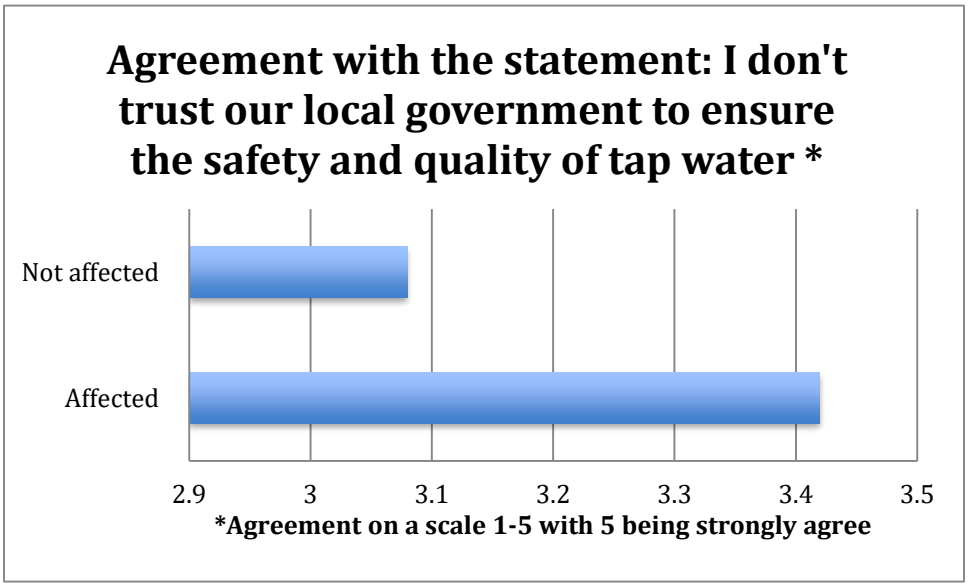
In April 2014, city officials in Flint, Michigan decided to switch from the city of Detroit, Michigan's water supply and create an independent pipeline to deliver water directly from Lake Huron. This decision was made in an attempt to offset the city's $25 million deficit (CNN Library). While the pipeline was being built city officials among other decision makers, decided to use the Flint River as the city's primary water source. Almost immediately after the switch, severe health problems began to occur. These

health problems resulted from not properly treating the water, which contained high levels of E. Coli and lead. Approximately 1,700 residents were impacted by the crisis and continue to be impacted today (CNN Library).

Given the high profile of the Flint Water Crisis, it seemed relevant to add a section in this study to determine whether or not it has affected WMU students' perceptions of tap water. The statements and questions used in the survey related to the Flint Water Crisis are as follows: I know someone directly affected by the Flint Water Crisis (Yes 20.47%; No 79.53%); I have been directly affected by the Flint Water Crisis (Yes 2.62%; No 97.38%); how knowledgeable do you consider yourself to be in regards to the Flint Water Crisis? (Not knowledgeable at all (7.14%); Slightly Knowledgeable (34.39%); Moderately Knowledgeable (44.18%); Very Knowledgeable (11.64%); Extremely Knowledgeable (2.65%), and how has the Flint Water Crisis affected your preference of bottled water versus tap water? The last question was open ended and had various answers, but the overall consensus seemed to be that the event did not affect their preferences of bottled water versus tap water.

To analyze these results further, another T-test was conducted to determine if there was any significant differences between whether respondents were directly affected or knew someone directly affected by the Flint Water Crisis and compared this to their current behaviors and attitudes of their drinking water preferences. There was only one significant difference, but it is extremely informative (Graph 2). The results showed that respondents who were directly affected or knew someone directly affected did not trust the government to ensure safety of tap water.

Graph 2: Comparison of Students Directly Affected by the Flint Water Crisis vs. Students not directly affected



A correlation was created to examine the relationship between how knowledgeable respondents were of the Flint Water Crisis and what their drinking water preferences were. Again, only one significant difference was found, but it is extremely informative. The results show that the more knowledgeable respondents were of the Flint Water Crisis, the higher the probability was that they did not trust the government to ensure safety and quality of tap water ($r=.129$, $p=.012$). The significant differences in the T-test and correlation reveal that the respondents who were directly affected, know someone directly affected, or were moderately knowledgeable of the Flint Water Crisis do not trust the government to ensure the safety and quality of tap water.

Results from the open-ended question, "How has the Flint Water Crisis affected your preference of bottled water versus tap water?" had various answers, but the overall

answer seemed that the crisis did not have any effect on their preference. Approximately 40% of respondents had answers such as: “It hasn’t affected my preference”, “Not at all”, “Only slightly”. Other responses varied and did not have an overall pattern.

Discussion

The results from this study show that on average, WMU students drink more tap water than bottled water. However, the amount of bottled water students are using is quite high. The average number of bottled water students consumed in a week was 2.53. At WMU, there are approximately 24,000 students so at 2.53 bottles per week, it could be estimated that students are using 60,720 bottles per week. Additionally, respondents said that only 66.77% of their water came from the tap. Even though the results show that WMU students are drinking more tap water than bottled water, students are drinking a significant amount of bottled water.

From my results, I have gained insights on understanding the perceptions WMU students have toward tap water and bottled water. However, more research should be conducted at WMU in order to get an even further understanding of these perceptions. In addition to further research, a social marketing campaign encouraging tap water consumption should be developed. The authors of the original Purdue study, from which this study replicated, took what they found from their survey data and developed a social marketing campaign to educate and inform Purdue’s community about the benefits of drinking tap water. A campaign such as this would be extremely beneficial to WMU since most of the respondents perceived more disadvantages in drinking tap water on campus. However, researching the safety and quality of tap water on campus would be

essential in order to promote these qualities of tap water on campus. If executed properly, this campaign could have an extremely positive effect on the consumption of tap water on and off campus.

The Flint Water Crisis results revealed that the event did not have a significant impact on respondent's preference or perceptions of tap water and bottled water, which was unexpected. I included the Flint Water Crisis in this study to see whether or not the event had any impact on the increase of distrust in public tap and the increase in bottled water consumption. Also, because the crisis happened in the same state as WMU, I thought it would be more likely for respondent's perceptions to be altered.

However, after conducting a T-test and correlation pertaining to the Flint Water Crisis the significant difference found in both tests was that respondents did not trust the local government to ensure safety and quality of tap water. Therefore, the data shows that respondents who were directly affected or knew someone directly affected by the Flint Water Crisis were less likely to trust the local government to ensure safety and quality of tap water. Furthermore, the more knowledgeable respondents were of the event, they again were less likely to trust the local government to ensure safety and quality of tap water.

Some of the results from this study are incomplete relating to perceptions and preference that WMU students have for tap water and bottled water. However, the results from Table 2 reveal that WMU must do a better job of ensuring the safety and quality of tap water on campus. The WMU administration is not failing in this regard but, ideally, the university will eliminate any skepticism students have about tap water on campus. As stated previously, this could be done through a social marketing campaign for tap water.

Such a campaign would not only educate and inform students about the safety and quality of tap water on campus, but would promote drinking tap water both on and off campus.

Limitations

There were numerous limitations that impaired the accuracy of my study. First, there were many issues pertaining to the demographics. There were more females than males that responded to the survey, which may have lead to biased responses. In terms of ethnic diversity, my survey did not capture a representative sample of WMU's student body. Even a ten percent addition of Black/African American respondents, for example, could potentially significantly changed my results for the Flint Water Crisis since the city's primary ethnic background is Black/African American. I also did not ask what student's majors were. This was an important question to ask in order to get a better understanding of whether or not majors of students had an effect on perceptions of water consumption as well as where my survey was distributed. I asked each respondent for their class standing, but it would have been useful to ask what their majors were as well. Three professors distributed the survey, but one of these is a marketing professor and is known to have received a high number of respondents. Therefore, many of the respondents may have been in the Haworth College of Business, which may have biased the results. A final question that I failed to ask pertaining to demographics was asking where respondents were from. When analyzing the Flint Water Crisis results, this question could have provided significant insights on why the event had so little of an impact on respondents.

Other limitations to the data I collected are more specific. For example, I did not ask questions about filtered water stations on campus. Seeing that many students perceived more disadvantages of drinking tap water on campus provides evidence that there may be issues with the water. Filtered water stations are becoming more commonplace on campus, but there are still buildings without them. If I were to ask questions relating to usage and trust of filtered water stations on campus, I would have gained important insights on which students had access to them, used them, and trusted tap water on campus. Other question sets that I could have included to gain a better understanding of students perceptions were about recycling. The question sets included in my survey were created to see what students were drinking more, but asking questions about how much bottled water was being recycled could have added a useful layer to my study about the effectiveness of recycling on and off campus.

A final limitation in this study again related to the Flint Water Crisis section. When asking the open-ended question of how the Flint Water Crisis had affected preference of bottled water versus tap water, I did not ask students' water preference. Many respondents answered that the event had no effect on their preference, but most did not specify their preference. If respondents' original water preference were bottled water it would make sense that the event did not affect their preference. On the other hand, it would be interesting to know that the event did not have any effect on their preference of drinking tap water.

Conclusion & Recommendations

After completing this research, I have gained a better understanding of the perceptions and use of tap water and bottled water of WMU students. The survey results revealed that on average, WMU students are drinking more tap water than bottled water. Results from the survey also reveal that even though student drink more tap water, students see more disadvantages than advantages to drinking tap water, specifically on campus. Furthermore, the survey results show that the Flint Water Crisis did not have much of an effect on students' preferences of bottled water versus tap water. The results described in Table 1 and Table 2 could be used for a tap water social marketing campaign to educate and inform the campus community in hopes to reduce the use of bottled water.

In addition, further research could be used to strengthen the arguments for the data that has been already collected. Continued research should include questions described in the limitations to get a more complete dataset. This research should also include the entire WMU community, not just undergraduate students. Moreover, future research should be done on a larger scale than single campuses. Conducting this research on a larger scale could provide a more accurate understanding of the perceptions and use of tap water and bottled water and could be used to find solutions to decreasing the consumption of bottled water in the United States.

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