

# UC Riverside

## UCR Honors Capstones 2020-2021

### Title

Understanding Perceptions and Behaviors Related to Clean Water Access and Sugar-Sweetened Beverage Consumption on a University Campus

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UNDERSTANDING PERCEPTIONS AND BEHAVIORS RELATED TO CLEAN WATER  
ACCESS AND SUGAR-SWEETENED BEVERAGE CONSUMPTION ON A UNIVERSITY  
CAMPUS

By

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A capstone project submitted for Graduation with University Honors

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## **Abstract**

The UCR Healthy Campus launched the Healthy Beverage Initiative (HBI) Project to improve the access of clean tap water for UCR students as a better alternative to sugar-sweetened beverages (SSBs). The project also aims to create a healthier environment for students by providing healthy beverage zones on campus. The overall goal of the HBI project is to develop healthy beverage zones on campus by increasing clean tap water access locations and reducing the consumption of SSBs on campus to promote the overall health and well-being of the UCR community. Water hydrations will be available on selected areas on campus with scarce clean tap water access. These locations will include areas that have high foot traffic. The long-term goal of the HBI Project is to continue to improve the clean tap water access on campus and reduce the sales consumption of SSBs.

The goal of my research is to gain an understanding of the perception and behaviors regarding accessible clean water in a campus community. Through the pre-survey data that the HBI team collected, I was able to gain insights on the importance of accessible water access and factors that affect the overall health and well-being of a campus community. Through these findings, I was able to get a deeper understanding of the importance of having clean water access to communities around the world.

## **Acknowledgements**

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## **Introduction**

UCR is committed to providing a healthy environment for students, faculty, and staff. One of the ways UCR approaches this is through UCR Healthy Campus initiatives to improve the health and well-being of the campus community. UCR Healthy Campus launched the Healthy Beverage Initiative (HBI) Project to improve the access of clean tap water for UCR students as a better alternative to sugar-sweetened beverages (SSBs).

SSBs are beverages that contain “added caloric sweeteners such as sucrose, high-fructose corn syrup or fruit-juice concentrates” such as carbonated soft drinks, fruit drinks, sports drinks, energy drinks, and vitamin water drinks (Hu & Malik, 2010). Consumption of SSBs can lead to excessive sugar intake and weight gain (Hu & Malik, 2010). High SSBs consumption can also lead to obesity and other preventable diseases. It is also the main source of sugar intake in the American diet (American Heart Association, 2018). With the continuous growth prevalence in obesity, this issue calls for preventative measures and healthier alternatives to SSBs to promote a healthy lifestyle among the UCR campus community.

## **Problem Statement**

Inspired by the success of UC San Francisco's HBI program in 2015, the UC system created the UC system-wide Healthy Beverage Initiative (HBI)(UCnet, 2019). Through the HBI program, UCSF successfully removed all sugar-sweetened beverages (SSBs) sales from their vending machines on campus. The overall results of implementing the HBI have been significantly positive (Tokar, 2019). Participants who reduced their consumption of SSBs had positive health effects. Participants had less belly fat, and almost 70% saw a decrease in their waist size (Tokar, 2019). With the significant changes that led to a healthier campus

environment, UC launched the UC system-wide Healthy Beverage Initiative (HBI) to improve the health and well-being of the UC campus community.

### **Problems Specific to UCR**

The University of California, Riverside (UCR), located in Riverside County, is part of the desert region in California (Municipal Management Association of Southern California, n.d.). Since the university sits in a desert, there is a need to ensure that the campus community has access to water to prevent dehydration. Furthermore, HBI must address the overall perception that water on campus is dirty and of poor quality. In 2011, Riverside County was proclaimed as one of the US cities with the worst drinking water (McIntyre, 2011). This negative perception of the drinking water affects the campus community as they may find alternatives, such as SSBs, as their beverage choice when they are thirsty. Another issue specific to UCR is regarding SSBs consumption and obesity rates. In 2019, Riverside County had an obesity rate of 28.6%, which is worse and higher than other counties in California (Strategic Health Alliance Pursuing Equity Riverside County [SHAPE], 2021). Concurrently, the percentage of adults who drink SSBs is 11.5%, which is also worse and higher compared to the other counties in California (SHAPE, 2020). This is important because obesity and SSBs consumption have a big impact on the overall health and well-being of the campus community.

### **Purpose**

The purpose of this research is to recognize the main themes in water access points usage, UCR campus community belief and awareness regarding water on campus, and student purchasing behaviors. It will provide a better understanding of how to improve the health and overall well-being of the UCR campus community. This research will help develop feasible

recommendations to increase water usage and promote a healthier alternative to SSBs in the UCR environment.

## **Significance**

### **Obesity is a Problem among US adults**

Obesity is a common and serious disease among US adults. The World Health Organization defined obesity as an “abnormal or excessive fat accumulation that presents a risk to health” (WHO, n.d. ). A person with a body mass index (BMI) over 30 is considered obese. In the US, the prevalence of obesity was 42.4% in 2017-2018 (Centers for Disease Control and Prevention [CDC], 2021a). Obesity poses a problem in the US. Over the years, the number of people who are considered obese is continuously growing in the US. The prevalence of obesity in the US increased from 1999-2000 through 2017-2018 (Hales et al., 2018). Figure 1 depicts the self-reported adult obesity prevalence in the US by state and territory in 2019 released by the Centers for Disease Control and Prevention (CDC, 2021b). While California’s obesity prevalence of 26.2% is not high compared to other states, there is a potential avenue to decrease it through preventative measures (CDC, 2021b).



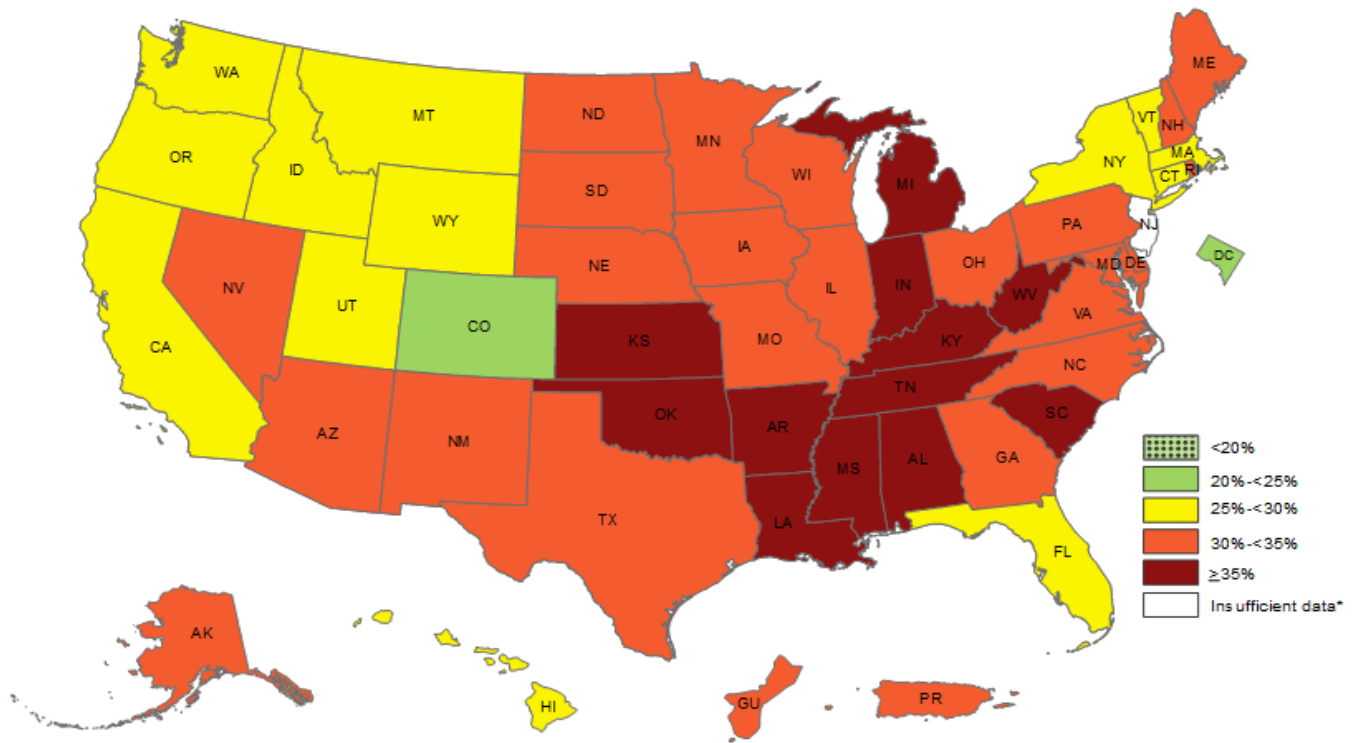


Figure 1. *CDC 2019 Adult Obesity Prevalence Map.*

### **Health consequences of Obesity**

Obesity has many health complications. Obesity increases the probability of hypertension, type 2 diabetes, coronary heart diseases (CHD), stroke, gallbladder diseases, respiratory problems, and certain types of cancer (U.S. Department of Health and Human Services, 2013). Recent studies from England and Mexico also provided new information regarding obesity as a risk factor for adverse COVID-19 outcomes. In a study led by the University of Oxford, published in *The Lancet Diabetes & Endocrinology*, researchers stated that “people with excess weight, even without other comorbidities, are at substantially increased risk

of admission to hospital and ICU and death due to COVID-19” (Gao et al., 2021). Obesity is a modifiable risk factor that negatively impacts the severity of COVID-19. In the study published in *Epidemiology & Infection*, led by Instituto Nacional de Ciencias Medicas y Nutricion and the Instituto Nacional de Cardiologia Ignacio Chavez, researchers in Mexico City also studied the role of obesity for poor outcomes in patients with COVID-19. Research shows that obesity alone increased the mortality risk in patients who tested positive for COVID-19. Mostly if it with diseases such as hypertension. It also has a big impact on short-term mortality and critical illness in Mexican patients with COVID-19 (Vera-Zertuche et al., 2021). The adverse health consequences from obesity can be life-threatening and have lifetime complications.

### **SSBs are Major Contributors to Obesity**

Overconsumption of SSBs is one of the key drivers contributing to obesity. It is well known that there is a correlation between SSBs intake and obesity. There have been numerous studies and research regarding the association between SSBs consumption and unhealthy outcomes. The higher consumption of SSBs, the higher body weight that can result in obesity. The American Heart Association (AHA) recommends no more than 100 calories per day of sugar intake for women and 150 calories for men (Johnson et al., 2009). That is about six teaspoons of sugar for women and nine teaspoons for men (AHA, 2018). SSBs already go over the recommended sugar consumption. A 12 oz Coca-Cola can already have 39g of sugar and 140 calories (Coca-Cola Company, n.d.). The intake of one 12 oz soda is already over the recommended sugar intake. At the same time, there has been consistent evidence that high SSBs consumption is positively associated with the risk of people being obese (Vartanian et al., 2011).

A high body fat percentage results in a high BMI. Overconsumption of SSBs will continue to have adverse health consequences.

### **Methodology Approach**

The UCR HBI Project collected both quantitative and qualitative data. Data collection was through several methods: baseline campus mapping, campus-wide survey, focus groups, and observations. For this research project, I will focus on the data that was collected through the pre-test survey.

### **Pre-test survey Description**

The pre-test survey was administered campus-wide through Qualtrics in Fall 2019. The survey will help assess and gain information on the UCR campus community's drinking habits, perception of the water at UCR, usage of the water fountains and hydrations stations, and their overall awareness of these water access. A total of 661 students participated in the pre-survey that concluded on October 30, 2019. Respondents' names and email addresses are collected in the survey to contact them to take the post-test survey in Spring 2020. Those who did not consent to have their names and email addresses to be collected were not able to participate in the survey. The post-survey is to assess the impact of the HBI intervention. Respondents also have the option to join the drawing for a \$50 Barnes and Noble Giftcard for taking part in both the pre-test survey and post-survey.

### Pre-test survey Questions

The pre-test survey includes questions about their usage of water stations on campus, how often they use them, and their perceptions of the cleanliness and quality of the water to drink. Table 1 shows the list of questions along with the available choices participants can choose. The pre-test survey asked participants if they have any issues that they have encountered that prevent them from using the water fountains or hydration stations. Opinions of the respondent's regarding their ideal locations for water access points on campus were also considered. The decision-making and behavior about beverage choice are also in the pre-test survey.

Questions Asked
Q2 The UCR campus has a number of access points to refill a water bottle with tap water, pictured here. Have you ever used a water fountain with gooseneck spigot or water refill station (also known as a “hydration station”) on campus?
Q3 How frequently do you use water fountains on campus?
Q4 How frequently do you use hydration stations on campus?
Q5 Thinking about the tap water on campus, to what extent do you agree that the water is safe to drink?
Q6 Which of the following issues, if any, have kept you from using a water fountain or hydration station on campus in the past? Select all that apply.

Q7 In which area of campus do you spend the most time?
Q8 Thinking about [Q7/ChoiceGroup/SelectedChoices], in which of the following locations have you noticed a water fountain or hydration station? Select all that apply.
Q9 Would you like to see more clean water access points on campus?
Q10 Where would you like to see additional clean water access points? Select all that apply.
Q11 Do you purchase meals or beverages from on-campus vendors (e.g., dining halls, vending machines, kiosks)?
Q12 Thinking about the times that you purchase meals or beverages from on-campus vendors, what factors do you consider when selecting a beverage? Select all that apply.

Table 1. *Survey Questions for the HBI Project.*

### **Post Survey Constrains**

Due to the COVID-19 constraints, the HBI Project has been postponed. A post-survey will be conducted after the implementation of the hydrations systems once it is safe to return to campus. The post-survey will help the HBI Team learn about adding more water access to the UCR campus community and whether the sales of SSBs decreased as the water access locations have increased. The post-survey will also give insight into the UCR campus community’s perception and awareness about the water on campus.

### **Analysis/Results**

#### **Need more clean water access on campus**

One of the key findings on the pre-test survey is the necessity of having more water resources, such as the hydration stations, on campus. Among the respondents, 62% use hydration

stations more than once per week, and 44% use water fountains more than once a week. The campus community does utilize the water foundations and hydration stations, but there is a need to have more accessible locations on campus.

The campus community has difficulty in finding clean water fountains and water hydration to use. The main reason as to why is because the location is not convenient. As seen on Figure 2, there are several issues that kept respondents from utilizing the water fountains and hydration stations on campus. The biggest factor is location. Due to the limited areas where water is accessible, students are not using these water stations. 39.9% of the respondents' responded that both water access locations are not conveniently located. It has kept them from using the water fountains or hydration stations.

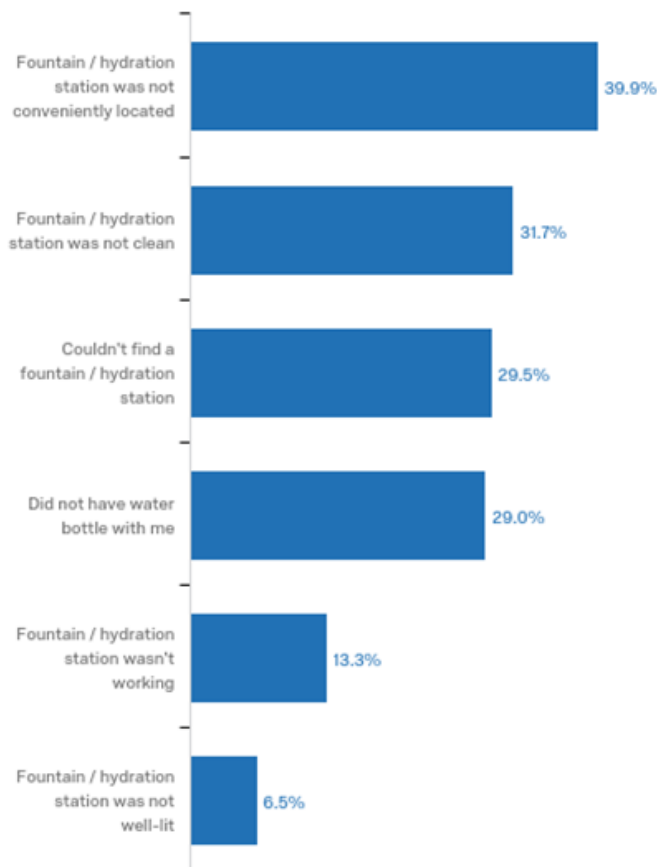
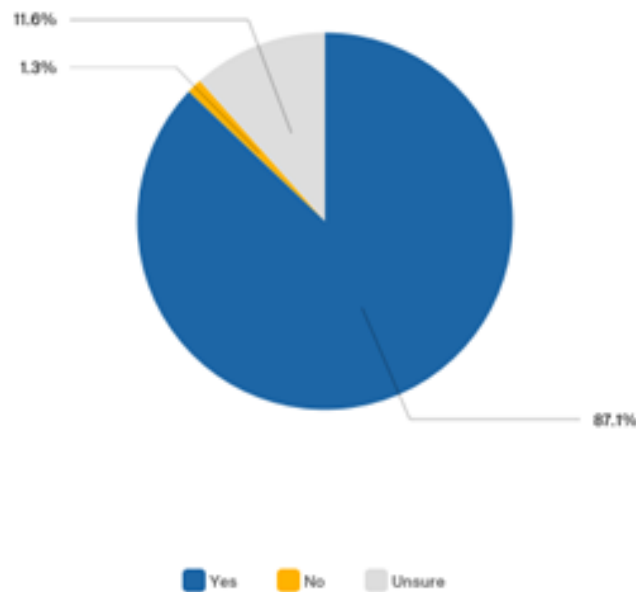


Figure 2. Frequency of Issues Preventing Respondents From Using the Water Locations

Additionally, many respondents were not able to find a water fountain or hydration station. As seen on Figure 3, there is a strong interest in having more clean water stations on campus. Providing more clean water stations has a positive impact on the campus community. There were several respondents as well that commented that hydrations stations have long lines that prevented them from using them. Similarly some respondents do not have reusable water bottles with them that hindered them from utilizing the water fountains and hydration stations. There are also areas on campus that do not have a water fountain or hydration station accessible to them. The places on campus with high foot traffic lack accessibility to water fountains and water hydrations.



*Figure 3.* Interest in More Water Locations

## UCR campus community's perception of university water is not clean and of poor quality

One of the main issues that respondents have encountered when using water fountains or hydrations stations is cleanliness. As seen on Figure 4, participants' opinion regarding the cleanliness of water on campus is somewhat divided. While 53% of the respondents somewhat or strongly agreed that the water on campus is safe, whether it is the water fountains or hydration stations, many have voiced their opinions and experiences on the cleanliness of the water access locations.

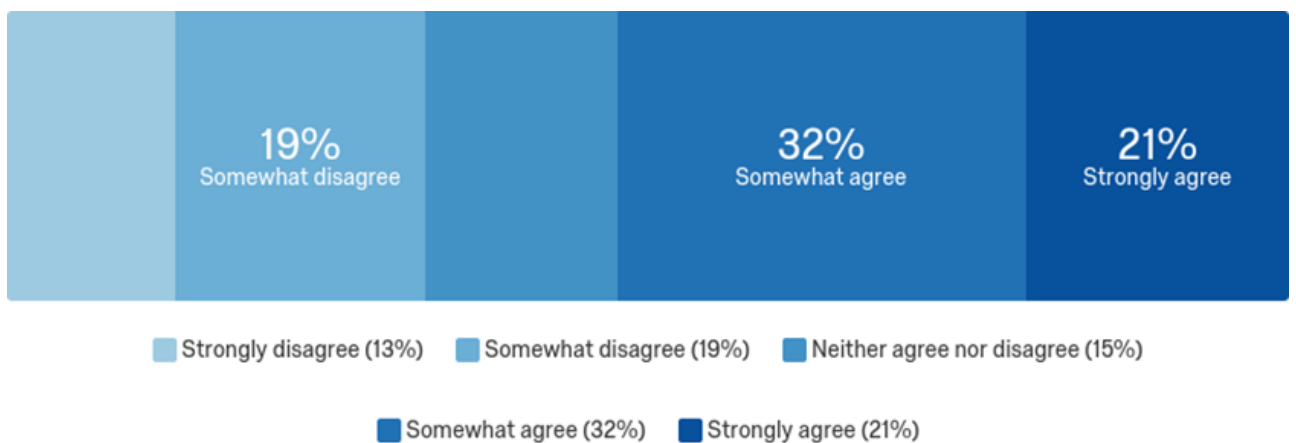


Figure 4. Agreement on the cleanliness of water on campus

Many students stated the issues they have encountered when using the water fountains and hydration stations. Most of their experiences have not been great. Cleanliness is the biggest issue. Some that contributed to their experiences were taste or flavor, temperature of the water, long lines, and the filters on the hydration stations.

Some of the student's issues and testimonies are:

“Sometimes the orange light was on and I informed the HUB desk, still took a week...” (student)

“The water station had a yellow light instead of green light.” (student)

“I rarely use these sources for drinking water. I am concerned about the quality.” (student)



“I am not convinced this water is filtered to the level I feel is safe.” (student)

“I reuse a gallon bottle. Over the months, it has become crusty from calcium buildup. This leads me to believe the water filter might not be filtering as much as it should.” (student)

Many were concerned that the water filters in the hydration stations were changed or cleaned regularly. The hydration stations that have a green light means that water is 100% filtered, yellow light means that it is still filtered but should be changed soon, while orange means that it should be changed immediately (Moriarty & Pinkowski, 2019). Many think that orange lights already means that the water from the hydration stations are filtered. Prior knowledge regarding filter status is vague. With hydration stations that often have orange lights, many students distrust the cleanliness and the quality of water they are going to drink.

### **Consumer behavior and habit on beverage choice**

To promote a healthier campus environment, student consumer behavior is evaluated to understand the factors affecting student purchasing behavior when selecting a beverage to drink. Out of the 610 respondents, 89% of them purchase beverages or meals on campus. The campus community can buy meals and drinks from on-campus vendors such as the dining halls, vending machines, and kiosks around campus. Many factors contributed to the respondents purchasing behavior when buying meals or beverages on campus. As seen on Figure 5, the top factors included price, taste/flavor, health reasons, and other beverage characteristics. However, price is the factor that influences them the most. Price is the main factor that 64.3% of respondents consider when making a purchasing decision. A price increase on the SSBs is a promising factor

for the community to provide a healthy beverage environment for students ( Blake et al., 2018).  
Increasing the price may be a potential solution to reduce the sales of SSBs at UCR.

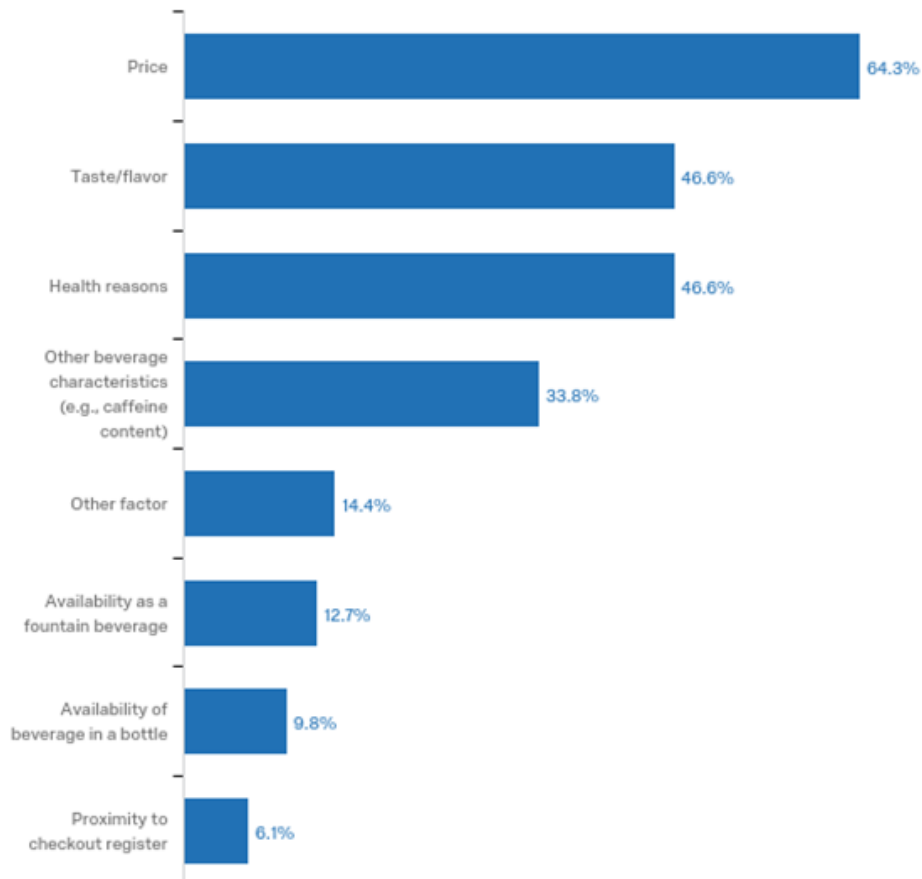


Figure 5. Factors respondents considered when purchasing meals/beverages on campus

## Recommendations

### Cleanliness of the water fountains and hydration stations must be prioritized

A way to help change the campus community’s perception of the cleanliness of the water fountains and hydration stations, consistent cleaning must occur. For the water fountains, the surrounding areas must be clean of debris or trash for students to be more willing to use them. In the hydration stations, its filters must also be clean consistently. It is what students use more often. Educating the campus community about the lights on the hydrations stations can help them

understand how frequently the filters are changed. It can be through signage or posters by the hydration stations regarding filter status. It can also be through the Healthy Campus social accounts, such as an Instagram post. Having clean water fountains and hydration stations can provide a better experience for the campus community.

### **Install more accessible water fountains and hydration stations around campus**

Many areas on campus with high foot traffic do not have access to water. Installing more water fountains and hydration stations in those areas can provide quick access to clean water for the campus community. Popular areas on campus that need accessible clean water access based on the survey, focus groups, and observation groups should be the first to be prioritized. UCR campus is also expanding. The new building must also have water fountains and hydration stations to increase access to water on campus. .

### **SSBs price increase and reduction of availability**

Price changes and reduction of SSBs on campus can help reduce the sales of SSBs. Currently, SSBs have the same price as water bottles in vending machines on campus. Also, some vending machines do not have water, or it is often on the bottom shelves. Since there is no difference in price between SSBs and water bottles, students are more likely to purchase SSBs instead of a healthier alternative. At the same time, there are also many locations on campus where students can purchase SSBs. Reducing the amount of vending machines and places that students can buy SSBs will help increase water consumption as it is more conveniently available on campus.

## **Limitations and Future Work**

### **Limitations**

One limitation of the HBI Project is the sample size. While many respondents answered the pre-test survey, it might not be a good reflection of the perception of the UCR community. Bigger sample size would be better to reflect a better representative of the UCR community population. Another limitation is that the students who have participated in the pre-test survey may not be able to participate in the post-survey. Their opinions might have a better indicator of how much impact the HBI campaigns made on the campus community. Their perceptions are into consideration regarding water usage and cleanliness on campus in determining the possible HBI interventions. Their thoughts after HBI interventions could have provided a better insight into the impact of HBI campaigns

### **Future Work**

As a next step in continuing the study, I would conduct a new pre-test survey and send it to the UCR campus community. It will be hard to administer a post-survey on the students who participated in the initial pre-test survey since some may have graduated already. A new pre-test survey will help gain new insights on the current student drinking behaviors, perception regarding the water stations, and the overall cleanliness of the water at UCR. A new research study that mainly focuses on the UCR campus community's perception of the water on campus starting from their freshman year until the year they graduate may provide a better insight on the impact of HBI campaigns on campus.

With the recent changes due to COVID-19, many students are concerned with their health and safety. Instead of having hydration that students have to be constantly touched when refilling their water, a better alternative is to install hands-free water filling stations, such as the Flowater's Water Refill Station. These would be touchless water stations where students only

need to use their feet when refilling their reusable water bottles. It is a much cleaner and faster way for the UCR campus community to replenish their water bottles.

## **Conclusion**

Through this study, we can better understand the behaviors and perceptions of the campus community to have a healthier campus environment. Key findings establish the need for clean water access locations and insight on student behavior regarding beverage choice. The pre-test survey also provided great insights into the water usage and awareness of accessible clean water locations on campus. This can help HBI develop healthy beverage initiatives towards a healthier campus environment at UCR.

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## Appendix

A. Image of a water fountain with gooseneck spigot



B. Water Refill Station/Hydration station



## C. Pre-survey Questions

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### Start of Block: Default Question Block

Q1 UCR is participating in a UC system-wide initiative to improve beverage options on campus. As a part of this, we are seeking to better understand the beverage-related habits and needs of the UCR campus community. Your feedback will be used to inform our efforts to improve options on campus. Responses are anonymous, so please answer all questions honestly. If you have any questions about this survey, please contact \_\_\_\_\_.

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### Page Break

Q2 The UCR campus has a number of access points to refill a water bottle with tap water, pictured here. Have you ever used a water fountain with gooseneck spigot or water refill station (also known as a “hydration station”) on campus?

- Yes, water fountain (1)
  - Yes, hydration station (2)
  - No (3)
- 

### Display This Question:

*If The UCR campus has a number of access points to refill a water bottle with tap water, pictured he... = Yes, water fountain*

Q3 How frequently do you use water fountains on campus?

- Daily (1)
- A few times per week (2)
- A few times per month (3)
- Less than once per month (4)
- Never (5)

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*Display This Question:*

*If The UCR campus has a number of access points to refill a water bottle with tap water, pictured here... = Yes, hydration station*

Q4 How frequently do you use hydration stations on campus?

- Daily (1)
- A few times per week (2)
- A few times per month (3)
- Less than once per month (4)
- Never (5)

Q5 Thinking about the tap water on campus, to what extent do you agree that the water is safe to drink?

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

Q6 Which of the following issues, if any, have kept you from using a water fountain or hydration station on campus in the past? Select all that apply.

- Fountain/station was not clean (1)
- Fountain/station was not well-lit (2)
- Fountain/station was not conveniently located (3)
- Did not have water bottle with me (4)
- Couldn't find a fountain/station (5)
- Fountain/station wasn't working (6)
- Other, please specify: (7) \_\_\_\_\_
- None; I have never experienced an issue that kept me from using an on-campus fountain/station (8)

Q7 In which area of campus do you spend the most time?

- Area 1 (1)
  - Area 2 (2)
  - Area 3 (3)
  - Area 4 (4)
  - Area 5 (5)
  - Area 6 (6)
  - Area 7 (7)
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Q8 Thinking about  $\{Q7/ChoiceGroup/SelectedChoices\}$ , in which of the following locations have you noticed a water fountain or hydration station? Select all that apply.

- Populate list (mixed true/false) based on area. (1)
- Click to write Choice 2 (2)
- Click to write Choice 3 (3)

Q9 Would you like to see more clean water access points on campus?

- Yes (1)
- No (2)
- Unsure (3)

Q10 Where would you like to see additional clean water access points? Select all that apply.

- Area 1, please specify exact locations: (1)

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- Area 2, please specify exact locations: (2)

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- Area 3, please specify exact locations: (3)

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- Area 4, please specify exact locations: (4)

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- Area 5, please specify exact locations: (5)

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- Area 6, please specify exact locations: (6)

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- Area 7, please specify exact locations: (7)

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Q11 Do you purchase meals or beverages from on-campus vendors (e.g., dining halls, vending machines, kiosks)?

- Yes, frequently (1)
  - Yes, rarely (2)
  - No; I don't purchase food or beverages from on-campus vendors (3)
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Q12 Thinking about the times that you purchase meals or beverages from on-campus vendors, what factors do you consider when selecting a beverage? Select all that apply.

- Price (1)
- Proximity to order location or register (2)
- Taste/flavor (3)
- Availability in fountain (4)
- Availability in bottle (5)
- Health (6)
- Other beverage characteristics (e.g., caffeine content) (7)
- Other, please specify: (8) \_\_\_\_\_

End of Block: Default Question Block

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