Tapping Out Bottled Water:

An Assessment of Drinking Water Choices at UCLA

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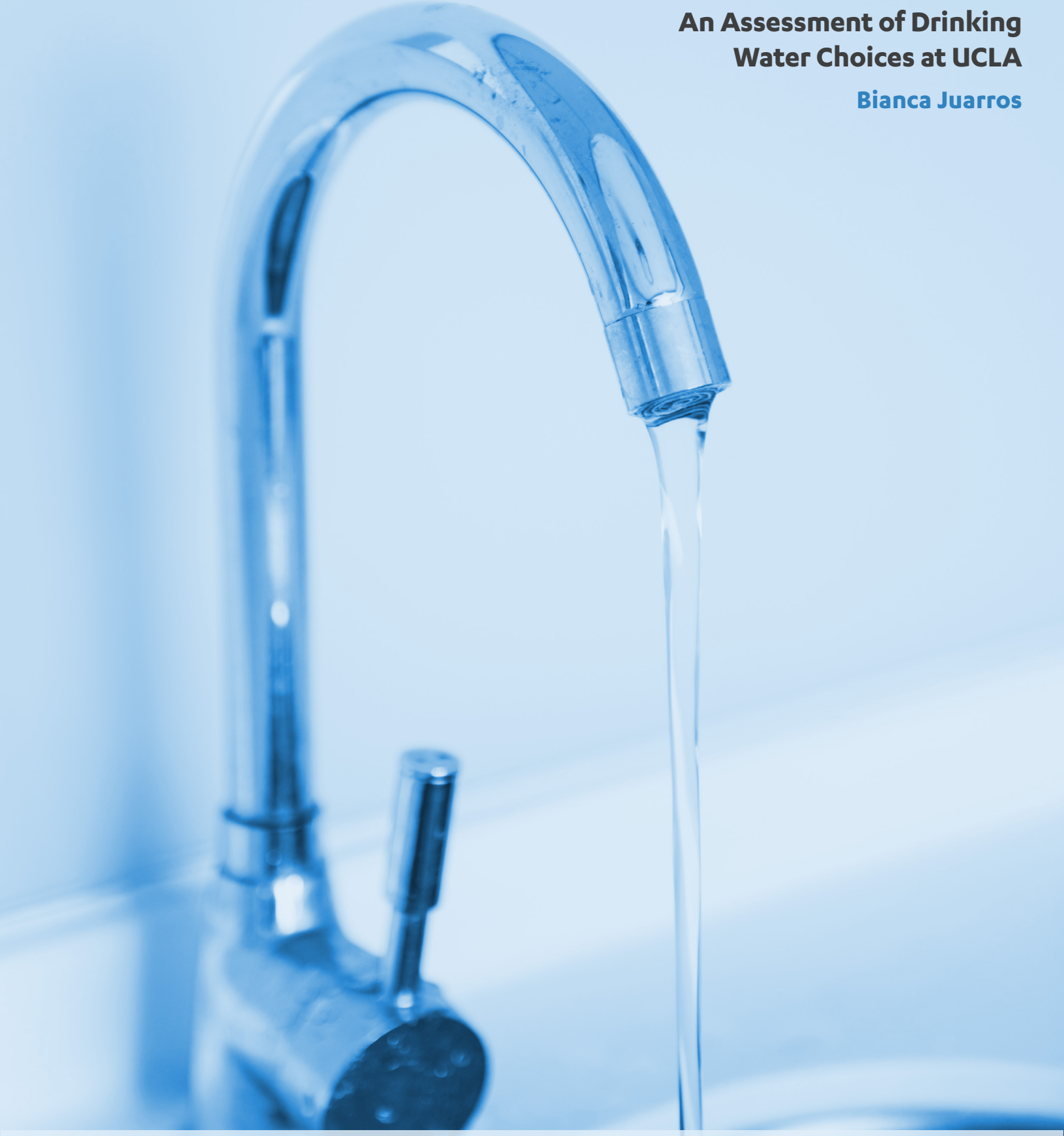

UCLA Luskin Center for Innovation

UCLA Sustainability

Disclaimer:

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Table of Contents

I. Executive Summary

Plastic pollution has become one of the most critical environmental crises in the world. The over-consumption of water bottles can have negative impacts on the environment, household financial implications, and public health. Thus, it is imperative that society move away from the use of plastic water bottles. In order to do so, it is necessary to understand how tap water is viewed to facilitate a shift away from overarching negative attitudes toward it. Studies show that tap water is subject to stricter water quality testing, is less expensive, and poses less of a threat to the environment (*Take Back the Tap*, 2013; Saylor et al, 2011). Still, there are a variety of reasons why people choose to drink bottled water as opposed to drinking tap water from the public water supply. Some include organoleptic perceptions—especially taste—while others include risk perception related to water quality (de França Doria et al, 2009). This negative perception can arise from recent news media reports on contaminated water systems, one's previous experience, and the marketing efforts of bottled water brands (Parag and Roberts, 2009; Doria, 2006). Race, income, education level, and gender have also been found to affect drinking water perception and choice (Onufrak et al, 2012; Saylor et al, 2011).

As UCLA strives to reach its goal of producing zero waste by the year 2020, it is crucial that the campus take steps to transition away from plastic water bottles toward tap water sources for drinking purposes. Doing so may offer the campus as a whole an opportunity to not only reduce its ecological footprint and increase access to clean drinking water, but also save money in the long-run. However, there are several financial, conceptual, and infrastructural barriers the campus faces. By assessing the current consumption levels of bottled water—both individual and large, delivered containers—on campus, understanding the factors that lead to drinking water perception and choice, and investigating the infrastructural and financial barriers to implementing alternatives, this research hopes to foster cost-effective and generalizable recommendations to assist UCLA and other college campuses in becoming more sustainable places to work and study.

To support this goal, this report examines the following primary research questions: Why and how is bottled water currently used on campus? How can the campus transition away from bottled water use toward tap/dispensed water?

To answer these questions, this report uses the following data and methods:

- Annual departmental expenditure data, separated by academic departments and non-academic offices
- The financial statements of the UCLA Store
- Stakeholder response data collected from select offices on campus, key contacts, and an informal survey of the campus community
- An online survey about drinking water perception and choice on campus
- Demographic data for UCLA

An analysis of the Literature Review and data collected generates six key findings:

- Finding #1: These data, which are incomplete, indicate the campus community spends nearly $1,000,000 each year to avoid drinking from the tap and instead use bottled water or bulk, delivered water bottle containers.
- Finding #2: Students primarily drink tap water from dispensers and fill-up fountains, while staff primarily drink from bulk, delivered water bottle containers (i.e. Sparkletts).
- Finding #3: The top two reasons respondents cited for not drinking the tap water on campus were "Health Concerns" and "I don't like the taste."
- Finding #4: The campus population has an inaccurate perception of tap and bottled water in terms of safety and health risks; this is especially true for female respondents.
- Finding #5: The top two reasons staff indicated for purchasing individual bottles of water or bulk, delivered water bottle containers are for convenience and visitors.
- Finding #6: Buildings to consider for interventions on campus include Young Hall, Haines Hall, Franz Hall, Kaplan Hall (formerly Humanities Building), Bunche Hall, Moore Hall, Powell Library Building, Center for the Health Sciences, Young Research Library, and Campbell Hall.

The six key findings from this research inform five primary recommendations:

- Recommendation #1: Implement large interventions, such as hydration stations and gooseneck fountains on existing sinks, especially in the 10 campus buildings specially identified for consideration.
- Recommendation #2: Promote small interventions, such as the use of filtered water pitchers and fixtures that attach directly to the faucet, especially for use in academic departments and non-academic offices.

- Recommendation #3: Generate funds for non-academic offices and academic departments to install gooseneck faucets and hydration stations, through the Healthy Campus Initiative (or other funding sources), a small fee on water bottle purchases, or voluntary staff donations and participation.
- Recommendation #4: Increase educational outreach to educate the campus community about the actual risks involved in drinking tap water in order to address the inaccurate perception of drinking water choices and subsequently promote the use of tap water for drinking purposes.
- Recommendation #5: Conduct further research, such as analyzing expenditure data for brands other than Nestlé on campus, collecting more survey responses (especially from faculty and visitors), and conducting a blind taste test of bottled water and tap water to understand if opinions about tap water are genuine or influenced by other factors.

Transitioning away from bottled water and large, delivered water bottle containers on campus is an achievable, feasible goal considering the amount of progress and momentum this topic has gained in recent years. UCLA has the exciting opportunity to play an important role in affecting local change that will benefit the greater global community in a tangible way for centuries to come.

II. Introduction

A. Overview

Plastic pollution has become one of the most critical environmental crises in the world. In fact, of the 9.2 billion tons of plastic products produced since its invention, over 6.3 billion tons were discarded as waste (Parker, 2018). Society's reliance on plastic water bottles has increased steadily in recent years (Doria, 2006). While water bottle use continues to increase on an international scale, the United States comprises "the largest consumer market for bottled water in the world" (Hu et al, 2011, p. 565). In fact, Food and Water Watch reports that "per capita bottled water consumption in the United States has increased nearly 20-fold" (*Take Back the Tap*, 2013, p. 3) over the last 30 years, and "as of 2011, the average American drank 29 gallons of bottled water each year" (*Take Back the Tap*, 2013, p. 3). As of 2001, the international market for bottled water was estimated at nearly 22 billion dollars (Ferrier, 2001). Furthermore, as Hu et al (2011) notes, studies have suggested that the cost of the water bottle market goes beyond strictly financial considerations and has potential short- and long-term social and environmental costs that society still has yet to fully comprehend. Plastic can take over 450 years to biodegrade, perpetuating its long-term and large-scale accumulation and thus posing environmental and human health risks (Parker, 2018). As such, it is imperative that society consume fewer plastic items, such as water bottles. Doing so would not only positively impact the environment, but might also save money and improve health outcomes in the long-term.

As explained further in the Literature Review, one of the major discussions about this topic concerns the use of bottled water and tap water for drinking purposes, specifically in terms of perception and choice (Doria, 2006). Some argue that bottled water is healthier and safer than tap water for a variety of reasons (*Drinking Water Research Foundation…*, 1999). However, tap water is subject to stricter water quality testing, is less expensive, and poses less of a threat to the environment (*Take Back the Tap*, 2013; Saylor et al, 2011). In order to reduce worldwide dependence on water bottles, local authoritative entities such as cities and universities must play leadership roles in making incremental changes on smaller scales.

UCLA strives to be a zero waste campus by 2020, which means achieving the goal of diverting at least 95% of waste from landfills (*UCLA Zero Waste Plan*, 2012). According to a leading commercial and residential waste hauler, Waste Management, zero waste is "a philosophy of eliminating the generation of materials that have no viable or economic option for end-of-use management" (Nwaogu, 2018, par. 4). Thus, it is crucial that the

campus take steps to transition away from plastic water bottles toward tap water sources for drinking purposes. However, there are several financial, conceptual, and infrastructural barriers to doing so. This report will examine these factors in order to offer UCLA's Office of Sustainability critical information about where the campus currently stands on this topic and how it can move toward a more environmentally sustainable future. Little research has been dedicated to assessing tap and bottled water on college campuses, so this report aims to contribute to this burgeoning body of literature.

B. UCLA's Role

As UCLA strives to reach its goal of zero waste by the year 2020, it is imperative that the campus reassess its current dependence on single-use water bottles and large, delivered water bottle containers. Right now, the campus uses water bottles in a variety of capacities, including events (large and small), daily office consumption, emergency supplies, and daily student boxed lunches; oftentimes there are also inadequate refuse systems (means of collecting and sorting waste) or lack of education surrounding proper disposal (UCLA Office of Sustainability, personal communications, 2018). A partial transition from "single-use" water bottles to water from public resources across several parts of campus may offer the campus as a whole an opportunity to not only reduce its ecological footprint and increase access to clean drinking water, but also save money in the long-run. While there are many types of water bottles used on campus, the main focus of this project will be the bulk, delivered water bottle containers (i.e. Sparkletts or Arrowhead) used primarily by larger entities on campus, such as academic departments and non-academic offices, in addition to some single-use water bottle data collection.

UCLA's Office of Sustainability is the primary entity on campus charged with implementing environmentally-sustainable initiatives on campus, including those related to increasing biodiversity, promoting "green" modes of transportation, procuring environmentally-preferable goods and services, and diverting waste from landfills via composting and recycling (UCLA Sustainability, n.d.). As such, UCLA's Office of Sustainability has an interest in reducing the amount of water bottles used on campus. With a student and faculty population of around 50,000 and a total population of around 80,000, UCLA has the capability to make a real impact on reducing plastic pollution (About UCLA, 2018). In order to reduce worldwide dependence on water bottles, incremental change on a local level is key. This report aims to assist UCLA's Office of Sustainability by providing baseline information in terms of current water bottle use on campus, summarizing current campus perception toward tap and bottled water, and making a compelling case for transitioning

from bottled water sources to tap water interventions from a financial cost-saving standpoint.

1. This Report

This report will examine the following primary research questions: Why and how is bottled water currently used on campus? How can the campus transition away from bottled water use toward tap/dispensed water?

To answer these questions, this report uses evidence from annual departmental expenditure data for Nestlé water purchases, surveys taken by UCLA staff and students about drinking water choice, conversations with campus administrators and knowledgeable key contacts, and secondary data sources such as demographic data. This report compares annual departmental expenditure data to the cost of implementing small and large interventions such as water refill stations (or, as the Healthy Campus Initiative [personal communications, 2018] calls them, "hydration stations") and water purifiers with the hope of providing evidence of the cost savings departments might experience by transitioning away from water bottle use. This report will also address campus perception of drinking tap water by better understanding staff and student concerns in terms of health, water quality, and other factors such as taste, color, and smell.

Some departments currently use bottled water instead of tap water for drinking purposes because there is no tap water source in their office or they supply water bottles for visitors. Many do not think that drinking tap water poses a risk to their health, yet they tend to agree that bottled water is safer to drink than tap water. By assessing the current consumption levels of bottled water—both individual and large, delivered containers—on campus, understanding the factors that lead to drinking water perception and choice, and investigating the infrastructural and financial barriers to implementing alternatives, this research hopes to foster cost-effective and generalizable recommendations to assist UCLA and other college campuses in becoming more sustainable places to work and study.

The remainder of this report will take the following form. First, it provides an overview of relevant research on the subject of drinking water perception and choice, as well as a justification for this research. It then delves into the details surrounding research design and methodology, including such aspects as data collection and data analysis. Subsequently, this report describes the expenditure, survey, and stakeholder response data collected before drawing meaningful conclusions in the findings. This report concludes with a series of recommendations for large and small interventions, funding

generation for said interventions (especially among staff), educational outreach, and areas in need of further research.

III. Literature Review

A. Alternatives to Tap Water are Problematic

The over-consumption of water bottles is problematic in a variety of ways and can have negative impacts on the environment, household financial implications, and public health.

1. Environment

In terms of environmental impacts, plastic water bottle use is significant in many ways. If not recycled, plastic ends up in landfills or in nature, which can pose a threat to humans as well as plant and animal species. Food and Water Watch reports that "about 77 percent of PET plastic water bottles are not recycled and end up in landfills, as litter or incinerated" (*Take Back the Tap*, 2013, p. 2), thus wreaking havoc on the environment. The impacts of water bottles on the environment persist long after their production and use. In fact, plastic breaks down into small pieces, which can contribute to harmful bioaccumulation of pollutants, causing health concerns for human, animal, and aquatic life (Cho, 2011). This is especially concerning given that the Ocean Conservancy estimates it can take up to 450 years for a plastic bottle to decompose (Cho, 2011). It is interesting, then, to consider the results of a study on water bottle use at Purdue University which revealed that many students believed they could remedy the environmental impacts of water bottles by simply recycling them (Saylor et al, 2011). In fact, the same study indicated that "if the bottles are recycled, a third of respondents believe that the global impact of bottled water is insignificant—24% more than without recycling—and 9.6% believe there is no environmental impact" (Saylor et al, 2011, p. 594). However, as further explained below, this is not the case.

The creation and distribution of bottled water and other alternatives to tap water require large amounts of energy, contributing to greenhouse gas emissions that lead to climate change (Bottled Water and Energy Fact Sheet, 2007). In fact, when considering the energy needs to produce, transport, and consume bottled water, Gleick and Cooley (2009) calculated that bottled water requires about 2,000 times more energy to produce than tap water requires. The Pacific Institute estimated that in 2006 the production of water bottles required approximately 17 million barrels of oil, which a nonrenewable resource, and bottling such water emitted 2.5 million tons of carbon dioxide into the atmosphere (Bottled Water and Energy Fact Sheet, 2007). While about three-quarters of water bottles are manufactured and distributed regionally, about one-quarter are transported longer distances which produces more greenhouse gas emissions than shorter trips produce (Hu et al, 2011).

Furthermore, water bottle production is a water-intensive process that can have detrimental effects on local water supply systems (Hu et al, 2011). For example, "taking too much water can reduce or deplete groundwater reserves and reduce the flow of streams and lakes, causing stress on ecosystems" (Hu et al, 2011, p. 566-567). Additionally, the Pacific Institute also estimated that in 2006, to produce just 1 liter of bottled water required about 3 liters of water (Bottled Water and Energy Fact Sheet, 2007). From start to finish, the process involved in getting water bottles on store shelves is incredibly energy- and water-intensive.

2. Financial Cost

Furthermore, the costs of bottled water and other alternatives to tap water extend beyond the environment. Water bottles are an expensive alternative to tap water for consumers. The cost associated with bottled water may incorrectly give the impression that it is safer to drink than tap water, however this is not necessarily the case, as explained further in the next section (Saylor et al, 2011). In reality, consumers are paying a premium for "plastic packaging, transportation, and the company's goal of making a profit" (Saylor et al, 2011, p. 597). Consumers of bottled water pay about 10,000 times as much money as they would on tap water; this estimate boils down to a per gallon cost of about $10 for bottled water, which is much higher than the per gallon cost of gasoline (Arnold and Larsen, 2006). Thus, households that choose to drink bottled water likely see higher overall expenditures, which "compounds gaps in affordability and broader service accessibility for the disadvantaged" (Pierce and Gonzalez, 2017, p. 1-2). In fact, Javidi and Pierce (2018) estimated this annual, combined expenditure, exclusively for those who mistrust their tap water, is $5.65 billion. The high cost of alternatives to tap water pose equity and affordability issues that may prevent some from accessing drinking water (Hu et al, 2011). Overall, the financial cost of bottled water can create a barrier to access that is largely unnecessary.

3. Health

Alternatives to tap water also pose public health concerns. Doria (2006) summarizes the long-held water quality debate surrounding tap water. Doria (2006) first draws on Olson (1999) to assert, "Some pointed out that tap water is controlled by more rigorous standards and is more frequently analysed than bottled water" (p. 271). Doria (2006) then draws on the *Drinking Water Research Foundation*… (1999) to conversely note, "Others argue that bottled water is submitted to more advanced treatments and/or is less exposed to contamination during distribution, being a safer alternative" (p. 271). While there may be some rational concern surrounding municipal tap water quality at times, studies have shown that there is no reason to believe that bottled water is definitively safer (Hu et al,

2011). In fact, tap water is subject to stronger regulatory oversight than bottled water (*Take Back the Tap*, 2013). The U.S. Environmental Protection Agency (EPA) regulates tap water, while the U.S. Food and Drug Administration (FDA) regulates bottled water distributed between states; however, only the states themselves have regulatory power over bottled water that is produced and distributed within state boundaries (Postman, 2016). Under federal standards, municipal tap water is tested for around 100 contaminants which, if found, must be at lower levels than those outlined in the Safe Drinking Water Act (Skipton and Albrecht, 2010). However, it is important to note that since the FDA is not in charge of the intrastate regulation of bottled water, approximately 60 to 70 percent of bottled water within a given state is not subject to federal regulatory standards on drinking water quality (*Take Back the Tap*, 2013). While state-level regulations have been put in place to oversee bottled water quality within the state, they often differ state by state, creating a situation in which bottled water regulations nationally are "less consistent and comprehensive than those for tap water" (*Take Back the Tap*, 2013, p. 8). Lastly, in terms of large, delivered water containers like office coolers, the buildup of bacteria on the dispensers poses health concerns worth noting as well (Lévesque et al, 1994). Specifically, Lévesque et al (1994) found that 36% of residential water dispensers and 28% of workplace water dispensers "were contaminated by a least one coliform or indicator bacterium and/or at least one pathogenic bacterium" (p. 1174), suggesting that even this alternative to the tap poses health risks. Thus, the belief that the quality of water from bottles is higher or safer than water from the tap is a fallacy largely attributed to the misunderstood fact that bottled water is indeed less regulated than tap water and comes with its own set of special concerns.

Other major health concerns associated with tap water alternatives are the risks associated with chronic sugar intake; households that choose not to drink tap water will often purchase bottled options to fulfill their needs and oftentimes sugary drinks become the primary substitute (Javidi and Pierce, 2018). Furthermore, Patel and Hampton (2011) contend that, in a school environment, "Children and adolescents are not consuming enough water, instead opting for sugar-sweetened beverages (sodas, sports and energy drinks, milks, coffees, and fruit-flavored drinks with added sugars), 100% fruit juice, and other beverages" (p. 1370), which can cause a multitude of health concerns. For example, sugary drinks can lead to a variety of serious health conditions, such as obesity, diabetes, tooth decay, and heart disease, according to the Center for Science in the Public Interest (Sugary Drinks, n.d.). On the other hand, drinking water can improve health outcomes for children and adolescents, including "improved weight status, reduced dental caries, and improved cognition" (Patel and Hampton, 2011, p. 1370). In fact, even after taking into

account race/ethnicity and poverty level, Babey et al (2009) reports that "adults who drink soda occasionally...are 15% more likely to be overweight or obese" (p. 1) than those who do not drink soda at all, while "adults who drink one or more sodas per day are 27% more likely to be overweight or obese" (p. 1) when compared to the same group. As such, when consumers perceive tap water as a risk to their health, the actual long-term health outcomes from consuming alternatives can be far worse.

B. Attributes that Affect Perception and Choice

There are a variety of reasons why people choose to drink bottled water as opposed to drinking tap water from the public water supply. Some include organoleptic perceptions—especially taste—while others include risk perception related to water quality (de França Doria et al, 2009). Strategic marketing efforts are also key to developing drinking water perceptions and choice (Doria, 2006). Even though studies show that about half of all bottled water is actually just tap water, many people still opt to pay for and consume bottled water (*Take Back the Tap*, 2013). The following sections provide an overview of the reasoning behind this phenomenon.

1. Organoleptic Attributes

A leading factor in people's decisions to consume bottled water over tap water is due to the presence of organoleptic attributes. According to Merriam-Webster Dictionary, the term "organoleptic" is defined as "being, affecting, or relating to qualities (such as taste, color, odor, and feel) of a substance (such as a food or drug) that stimulate the sense organs" (Organoleptic, 2018). De França Doria et al (2009) notes that the flavor of water, while "purely aesthetic" (p. 5462), actually "has a strong impact on the perception of water quality and other variables" (p. 5462) because it is one of the only determinants that consumers perceive for themselves directly (De França Doria et al, 2009). However, other surveys have suggested that "water health and safety were more important factors than looks and taste" (Merkel et al, 2011, p. 199) in determining water perception and choice. Organoleptic attributes were also found to play a major role in water perception and choice for undergraduate students at Purdue University, particularly in terms of determining safety and quality (Saylor et al, 2011). All in all, organoleptic attributes play a vital role in one's perception and ultimate choice of drinking water.

2. Premise Plumbing

Another concern regarding tap water quality stems from contaminants found in the premise plumbing, that is, "the point from the service connection line to the public

distribution system and extending through schools, hospitals, businesses and private buildings" (Reynolds, 2007, par. 3). After municipal water exits a treatment facility, it travels through a series of pipes that make up the distribution system before it enters premise plumbing and is dispensed as tap water for consumption (Reynolds, 2007). As such, water that may have been contaminated in the distribution system or premise plumbing does not typically signal a health-related violation because testing at the tap is typically only performed by systems for lead and copper (Pierce and Lai, 2019). Yet, premise plumbing can have a significant influence on the taste, odor, and overall quality of tap water (Lee et al, 2013). For example, pipes made from copper are subject to corrosion which can not only contribute to a "bitter or metallic taste or odor" (Lee et al, 2013, p. E239), but also can cause severe intestinal issues (Lee et al, 2013). Additionally, cross-linked polyethylene pipes may contribute to a "chemical or solvent taste or odor" (Lee et al, 2013, p. E239) and contribute to the growth of bacteria (Lee et al, 2013). Further, "water in premise plumbing has longer residence times, variable and lower flow conditions, higher temperatures and increased stagnation" (Reynolds, 2007, par. 5), which can lead to proliferation of disease-bearing, potentially fatal microbes, such as *Legionella* and *Naegleria*, entering the tap (Reynolds, 2007). While there are ways to reduce the risk of perpetuation of harmful bacteria in premise plumbing—such as ultraviolet light disinfection and chlorine—more research in this area can be done (*Draft - Technologies for Legionella Control*…, 2015). Unsatisfactory organoleptic features as well as the fear of bacterial infections and other health concerns from tap water contamination found in premise plumbing warrants concern and ultimately may dissuade widespread tap water consumption.

3. Public Awareness and the Media

Another key factor in determining drinking water perception and choice is one's own lived experiences (Doria, 2006). Namely, "issues of trust and remembrance of past problems" (Doria, 2006, p. 273) can have a significant and persistent effect on how one perceives drinking water in their community (Doria, 2006). Further, increased risk perception can be attributed to, inter alia, public awareness of water contamination events, the regularity at which these events occur, and the capability of authorities to adequately resolve prior issues (Anadu and Harding, 2000). For example, the well-known and ongoing water contamination event in Flint, Michigan—in which an emergency manager switched the water source for the community to the highly polluted Flint River—sparked nationwide outrage over water contamination issues broadly as well as brought attention to the disparate impacts communities of color face in this regard (Switzer and Teodoro, 2017). Flint had a notable effect on local and national tap water perception. A poll of 400 residents

in Flint revealed that "70% of residents don't trust government assurances that filtered water is safe to drink" (Egan, 2016, par. 1). Since Flint, on a national scale, a Gallup poll revealed that 63% of Americans "worry a great deal about pollution of drinking water" (McCarthy, 2017, par. 1), which contributes to the conclusion that "Americans are more concerned about water pollution than they have been since 2001" (McCarthy, 2017, par. 2). More locally, when the Los Angeles neighborhood of Watts experienced discolored tap water in 2016, the Los Angeles Unified School District distributed bottled water as a safety measure, and at least one school continued to do so even after the Department of Water and Power deemed the water safe again, providing further evidence of the influence of water contamination events on the perception of tap water quality (MacBride, 2016).

The media also plays a significant role in determining public opinion on drinking water, as it largely focuses on "trust-destroying" (Parag and Roberts, 2009, p. 629) events that are alarming and profitable, while the disproportionate amount of good news may be seen as less interesting or less credible (Parag and Roberts, 2009). Thus, the combination of personal experiences and media coverage of water contamination events have notable influences on public perception and choice.

4. Marketing

Another major determinant of drinking water perception and choice stems from the impact of marketing. Bottled water manufacturers have "generated demand for bottled water through marketing" (*Take Back the Tap*, 2013, p. 3), long touting their products as the healthier or classier alternative to tap water (Doria, 2006). For example, Perrier has been marketed as a "status symbol" (Doria, 2006, p. 274) while Dasani has been branded as a "lifestyle drink" (Doria, 2006, p. 274). When consumers opt to purchase bottled water, it may not be for practical reasons at all, but rather the illusion that they exude superiority in one form or another. This perception is borne from advertisements and packaging designed to portray the image of purity, often featuring "pristine glaciers and crystal-clear mountain springs" (Postman, 2016, par. 3) on the label and on multimedia platforms. This positive public perception of bottled water compared to the tap comes as no surprise considering that bottled water manufacturers have consistently spent millions of dollars per year on advertisements strategically designed to mislead and mystify the public to promote their brands (Ives, 2004).

C. Demographic Attributes

Several other factors play a role in determining drinking water perception and choice, including race and ethnicity, income, education level, and gender.

1. Race and Ethnicity

Race and ethnicity have been found to have a correlation with perception of drinking water (Javidi and Pierce, 2018). Onufrak et al (2012) found that the non-white population tended to have lower trust in the safety of tap water than the white population, opting for bottled water at higher rates. Further, studies have shown that, "while the propensity of negative tap water perception in Hispanic versus African American households is greater, avoidance of the tap altogether is higher in African American communities relative to Hispanic communities" (Javidi and Pierce, 2018, p. 6106). As such, studies have also shown that water bottle purchases are more prevalent amongst Hispanic, African American, and even Asian populations (Doria, 2006). Further, Pierce and Gonzalez (2017) showed that, while they are correlated, foreign-born nativity is a stronger predictor than race and ethnicity alone. While perception of drinking water choice is likely the result of a variety of factors, it is important to recognize that race and ethnicity have a unique effect.

2. Income

Further, income has an effect on drinking water choice in most studies. Onufrak et al (2012) found that lower income populations tended to mistrust tap water and opt to consume bottled water more so than higher income groups. In the same vein, studies have shown that higher income households tended to have more trust in their water quality (Pierce and Gonzalez, 2017). This might be a result of the disproportionate amount of water contamination events impacting lower-income groups than higher-income groups. In fact, Switzer and Teodoro (2017) found that not only is it more common for Safe Drinking Water Act health violations to occur among communities of color, but also "it is in the poorest of communities that race and ethnicity seem to matter most in determining drinking water quality" (Switzer and Teodoro, 2017, p. 45), suggesting that income level within communities of color is a significant determinant of water quality that may impact perception (Switzer and Teodoro, 2017). Others, however, have determined that household income may not have as strong a correlation with perception and choice as other factors that are associated with income (Javidi and Pierce, 2018).

3. Education

Education level may also affect drinking water perception and choice. Onufrak et al (2012) found that those with less education tended to have a preference for bottled water and a lack of trust for tap water. Along the same lines, a study by the Medical College of Wisconsin and the University of Wisconsin revealed that parents with higher levels of educational attainment were less likely to buy bottled water for their households (*Take Back the Tap*, 2013). Other studies further demonstrate the correlation between

educational attainment and drinking water choice, as Javidi and Pierce (2018) report that "the odds of high school graduates perceiving their tap water as safe are 50% higher than non-high school graduates" (p. 6107). Further, Merkel et al (2011) found an interesting correlation between education level and water bottle use, suggesting that a lack of water bottle use among more highly educated populations may be due to environmental concerns relating to the use of plastic water bottles. Interestingly, however, Hu et al (2011) determined in their study that "education level was not a significant predictor for bottled water use" (p. 572). It is understandable that with higher levels of education may come more understanding surrounding tap water quality and environmental concern over water bottle use than those with lower levels of educational achievement.

4. Gender

There is generally a strong correlation with gender and risk perception, which is consistent with the studies of drinking water choices. Field studies have shown that women tend to be more risk averse in general than men (Eckel and Grossman, 2008). Consistent with this finding, Finucane et al (2010) surveyed both men and women about the perceived risk involved in different hazards and ultimately found that the men tended to perceive less risk than women did. In terms of drinking water specifically, results of a study at Purdue University showed "women were much more likely than men to be concerned about environmental health risks" (Saylor et al, 2011, p. 593), and subsequently drank more bottled water than men in the same study (Saylor et al, 2011). In another study on small water supply systems in Oregon, researchers also found that women tended to have higher risk perceptions of tap water than men (Anadu and Harding, 2000).

D. Drinking Water Choice on University Campuses

Current literature in the field of drinking water perception and choice suggest many explanations for water choice—the key elements of which have been outlined in this Literature Review. Pierce and Gonzalez (2017) point out that "studies on water perception in the US context...have almost exclusively focused on subsets of the population" (p. 2). However, there are still noticeable gaps in areas of emerging interest, particularly those that focus on drinking water perception and choice on college campuses, the residents of which tend to be much more educated and environmentally-motivated than the general population.

While there have been some studies on drinking water perception and choice on college campuses in recent years, they largely have a regional focus due to the fixed location of the campus of study; few, if any, have focused on California. For example, Saylor et al

(2011) focuses on Purdue University in Indiana and, in addition to adding to the existing knowledge of the reasons for choosing tap or bottled water, finds that water bottle use is most prevalent among women and undergraduate students and offers some recommendations for increasing tap water consumption on campus. Qian (2018) focuses on three universities in Asia—National University of Singapore, Hong Kong University, and Macau University—and finds that bottled water is still used in some instances despite the fact that the study population consisted of highly educated students and tap water sources were relatively easy to access. Additionally, Qian (2018) noted that social norms and influence of peers had impacts on drinking water choice among university students. Levêque and Burns (2018) further the conversation surrounding drinking water perception and choice on college campuses by focusing on a research university in West Virginia—a state that has had issues with water quality in the past—finding that "perceived health risks, organoleptic perceptions, and environmental concern" (p. 836) were notable reasons for respondents of the survey in their perception of drinking water choices (Levêque and Burns, 2018). Considering that bottled water use is still commonplace on university campuses for a variety of reasons, Saylor et al (2011) suggests, inter alia, that campuses consider implementing complete bans of water bottles. However, as Berman and Johnson (2015) found in their study at the University of Vermont, an all-out ban of bottled water had the unexpected result of increased consumption of sugary drinks which, in turn, did not lower the amount of plastic bottles the campus produced as waste, and lead to greater health concerns. How, then, can campuses across the United States successfully transition away from consumption of bottled water to tap water?

To answer this question, it is first important to understand that the Los Angeles Department of Water and Power (LADWP) serves the entire UCLA campus through a large and complex water system that connects to miles of campus pipes, linking hundreds of campus buildings—each with their own premise plumbing (Utility Distribution, 2019). It is the responsibility of UCLA Facilities Management, not LADWP, to adequately maintain all pipes present on campus (Utility Distribution, 2019). It is this premise plumbing that may lead to negative organoleptic attributes present in tap water on campus as well as a negative perception of tap water among campus community members. As such, it is imperative that the campus take these infrastructural considerations into account when planning for a successful transition away from bottled water toward tap water for drinking purposes at UCLA.

In order to reduce worldwide dependence on water bottles, local authorities such as cities and universities must play leadership roles in making incremental changes on smaller

scales. Little research has been dedicated to assessing tap and bottled water use on college campuses, so this report aims to contribute to this burgeoning body of literature. While much more research needs to be done in order to address this question, the research at UCLA summarized in this report will help contribute to the answer. As UCLA strives to reach its goal of zero waste, it is imperative that the campus reassess its current dependence on single-use water bottles and large, delivered water bottle containers. This report assesses departmental expenditures on water bottles and ties drinking water perception to infrastructure. By assessing the current consumption levels of bottled water—both individual and large, delivered containers—on campus, understanding the factors that lead to drinking water perception and choice, and investigating the infrastructural and financial barriers to implementing alternatives, this report hopes to provide cost-effective and generalizable recommendations to assist UCLA and other college campuses in becoming healthier, more sustainable places to work and study.

IV. Data and Methods

This report examines the following primary research question: Why and how is bottled water currently used on campus, and how can the campus transition away from bottled water use toward tap/dispensed water?

To answer these questions, this report uses evidence from annual departmental expenditure data for water bottle purchases, surveys taken by UCLA staff and students about drinking water choice, conversations with campus administrators and key contacts, and secondary data sources such as demographic data. Departmental purchasing data for single-use and large, delivered water bottle containers is critical for understanding the financial cost these water bottles have on individual departments on an annual basis. These data also have the highest likelihood of providing the most compelling argument for transitioning away from water bottles toward tap water: the financial bottom line. Receiving student responses in terms of how much money they spend on drinking water will also provide a glimpse at the amount of money students could save by switching to tap water if more opportunities to do so existed. The survey provides the best method of making inferences about a large study population by gathering data from a substantial sample of individuals on campus. Further, surveys allow for the measurement of general attitudes and perceptions about water, while also capturing basic demographic data and other quantitative data associated with drinking water choice. Additionally, data gathered through conversations with knowledgeable stakeholders provide an internal perspective on some of the issues involved in transitioning away from plastic water bottles and containers toward tap and dispensed water—particularly in terms of infrastructural barriers. Further, insight gleaned from a few different staff contacts offers anecdotal context that supplements the rest of the data. Lastly, basic demographic data—such as affiliation with UCLA—provide a baseline to understand if survey responses represent the actual staff and student populations on campus.

A. Financial Data

The UCLA Office of Sustainability (personal communication, November 6, 2018) acquired departmental data on water bottle and container purchases from UCLA Campus Purchasing ("Shred and Water Spend Data," 2018). These data include how much money approximately 300 academic departments or non-academic offices on campus spent on Nestlé Waters North America products in the 2017-2018 year, including products such as 5-gallon water bottle containers, cups, mini-coolers, and smaller sizes of water bottles ("Shred and Water Spend Data," 2018; UCLA Office of Sustainability, personal

communication, November 6, 2018). To compare the differences in water bottle usage between academic departments and non-academic offices, these groups were separated based on the title given in the data from UCLA Campus Purchasing ("Shred and Water Spend Data," 2018). For example, "Musicology" and "Economics" were classified as academic departments, whereas "Center for World Languages" and "Office of VP Information Technology" were classified as non-academic offices. The mean, median, and range were then calculated for each of the two groups.

There are several water vendors on campus, but this research only includes data for one large vendor on campus, Nestlé. While the UCLA Office of Sustainability (personal communications, 2018) reported that delivery trucks for Arrowhead have been seen delivering various types of water bottles on campus, Nestlé and Arrowhead are the same company (Jaeger, 2015). It is important to note that these data do not represent all of the water bottle purchases at UCLA; there might still be missing data from other water vendors, the Coca-Cola contract UCLA holds for the dining and residence halls (among other campus entities), and additional water bottle purchases through the student governing body ASUCLA—all of which are largely not incorporated in these data (UCLA Office of Sustainability, personal communications, 2018; Office of Media Relations, 2013). However, the departmental Nestlé water bottle purchasing data incorporated in this report represents a good portion of the overall water bottle consumption at UCLA and associated financial costs to departments on campus.

This report also analyzes the financial statements of ASUCLA for the 2016-2017 year in order to gauge what proportion of total sales comprises water bottle purchases at the UCLA Store; monthly financial statements are available publicly online and there is a line item specifically for UCLA Store Actual Gross Income (ASUCLA Financials 2016-2017, 2019; ASUCLA Financials 2017-2018, 2019). To find the total Actual Gross Income for the 2016-2017 year, the Actual Gross Income for each month in that year was totaled. An article in the *Daily Bruin* reported the amount of total sales the UCLA Store had from water bottles alone in the 2016-2017 year (Wenceslao, 2017). The percentage of total sales at the UCLA Store that water bottles comprise was found by dividing the amount of money made from water bottle sales by the total Actual Gross Income for the year. Using the method described above, the Actual Gross Income for the 2017-2018 year was calculated. To calculate the amount of money taken in from water bottle sales in this year, the same percentage as the 2016-2017 year was applied, which then found the estimated amount of water bottle sales from the UCLA Store in the 2017-2018 year. Understanding how much money the UCLA Store makes on water bottles will help inform how other entities on

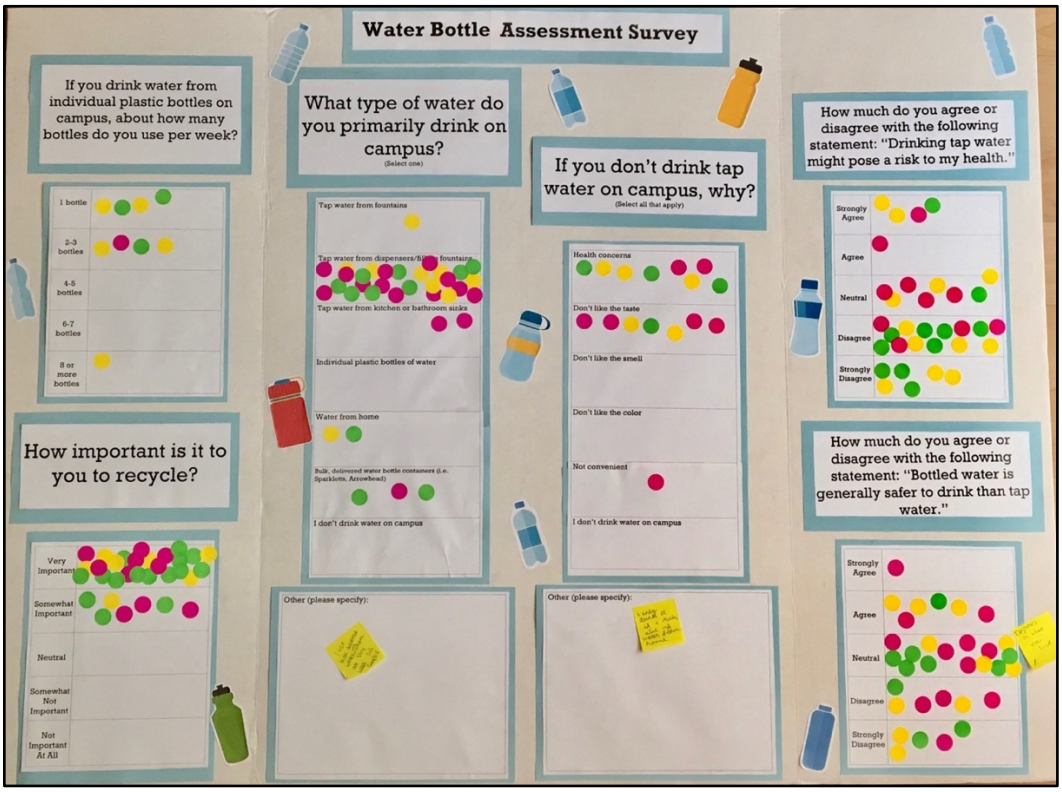
campus also profit from water bottle sales. Thus, this information proves useful in making a case for alternative ways this money could be spent.

B. Stakeholder Response Data

In order to provide additional context for the cost and survey data, select offices on campus were contacted to more fully assess their bottled water use. This information is helpful in framing a largely data-driven argument in a way that takes into consideration some of the circumstances departments and offices on campus face in terms of pursuing viable alternatives to bottled water.

Additionally, an informal poster survey was conducted during Waste Awareness Week on campus during Week 2 (mid-January 2019) in which a select subset of the survey questions was selected and placed on a poster board for the UCLA community to answer by placing a sticker in the box that best represented their answer. Based on this even, there seems to be a general lack of concern regarding the safety of tap water on campus, a motivation toward environmental sustainability in terms of recycling, and an interest in using hydration stations or other kinds of dispensed tap water on campus. This suggests that UCLA students and staff may be interested in installing more hydration stations and transitioning away from plastic water bottles and containers for drinking water purposes. However, there may be some bias in the poster survey results as it was set up at a zero waste event; the results were more environmentally- and health-informed than the general campus survey because of the self-selection effect. Figure 1 details the results. This poster provides supplemental data in a visually-appealing way. Participating in Waste Awareness Week also furthered the conversation on campus in terms of tap and bottled water perception and choice.

Figure 1



Of the very few individuals who indicated that they drink water from individual plastic water bottles on campus, most said they drink one to three bottles per week. All survey respondents indicated that recycling is "Very Important" or "Somewhat Important" to them. However, these results may be biased because all answers were visible and participants may have felt uncomfortable placing their answer choice sticker in another answer category. The vast majority of participants indicated that the type of water they primarily drink on campus is tap water from dispensers or fill-up fountains, while no one indicated they drink from individual plastic bottles of water. This result is curious, though, as there were respondents in the previous question about how many individual water bottles they drink each week. This result may have been swayed or influenced by other visible answers as well. It seems most participants in this poster survey drink tap water on campus in some capacity, but for the few that do not drink tap water on campus, the most popular reasons cited included "Health concerns" and "I don't like the taste." This is consistent with the online survey results and the existing literature on this subject. Most respondents said that they "Disagree" with the statement, "Drinking tap water might pose a risk to my health." Most respondents indicated that they are "Neutral" in terms of the statement, "Bottled water is generally safer to drink than tap water," followed by a similar amount of responses among "Agree," "Disagree," and "Strongly Disagree."

C. Survey Data

1. Development

The survey[1] was developed over the course of three months in consultation with the UCLA Office of Sustainability and Dr. Gregory Pierce within the Luskin School of Public Affairs. The survey was hosted on SurveyMonkey, a reputable and efficient online survey and data management platform. All survey respondents, regardless of their affiliation with the campus, were asked the same series of preliminary questions followed by more specific questions based on their affiliation later. The survey included 15 questions asked of all survey respondents, then bifurcated depending on the how the participant responded to the fifteenth question asking about their affiliation with UCLA. If the participant indicated that they were an "Undergraduate Student," "Graduate Student," or "Other" then they were taken to the final question in the survey. If the participant indicated that they were "Staff" then they were taken to a brief series of questions about their department's water bottle purchasing choices and their drinking water choices within their office. If the participant indicated that they were "Faculty" then they were taken to a brief series of questions about their drinking water choices within their office. After these brief series of questions, those who indicated they were "Staff" or "Faculty" were then taken to the final question of the survey. Most of the questions had a set series of multiple choice answers, and some included an "other" choice where respondents could provide a write-in answer. The very last question was open-ended, asking if respondents had any additional thoughts to share. The optional, anonymous survey was anticipated to take participants 5 to 7 minutes to complete.

2. Distribution

The survey was sent to multiple people to review and pre-test before distribution via a "test collector" function in SurveyMonkey. Additionally, the survey was tested several times in the "test collector" with various responses to ensure that the logic of the questions was accurate based on the different combination of answers respondents may choose. The survey was distributed to undergraduate students, graduate students, and departmental staff members. It was also originally intended to reach faculty, however research goals shifted to focus on students and staff only. The reasoning behind this decision was that these two groups would have the most impact on water bottle use on campus, given that they represent a large population at UCLA and have the most purchasing power.

[1] Study Title: "Drinking Water Consumption Choices on Campus." IRB Study Number: 18-001845. For more information about the IRB exemption or to view the survey, please see the Appendix.

To reach undergraduate students, a recruitment email[2] with the survey was sent in mid-January 2019 via email to the Sustainability Leadership Council, a group of 123 undergraduate student leaders of environmental sustainability organizations at UCLA (Graduate Students Association - SRC, personal communication, February 4, 2019). This group of undergraduates was selected to receive the survey because they are tied to the UCLA Office of Sustainability and were therefore an easy group to access in the beginning stages of survey distribution. These undergraduate leaders were encouraged to distribute the survey to their respective members. It can be inferred that 36 undergraduates took this survey as a result of the email sent to the Sustainability Leadership Council. It should be noted that there might be a bias in these responses toward environmentally sustainable practices because this group of students is involved in sustainability organizations on campus.

To reach graduate students, the same recruitment email with the survey was sent via email as a part of the Graduate Students Association (GSA) weekly newsletter during Week 4, Week 5, and Week 6 of Winter Quarter (late January to mid-February of 2019). This email was sent to 7,312 graduate students during Week 4, and 7,308 graduate students during Weeks 5 and 6 (Graduate Students Association - Communications, personal communications, January 31, 2019; February 7, 2019; February 13, 2019). It can be inferred that 97 of the graduate student responses came from these emails.

To reach a larger number of undergraduate and graduate students at UCLA, the recruitment email with the survey was sent via email to 5,277 students at UCLA through the Registrar Service Request process; of the 5,277 students, 1,183 were randomly-selected graduate students and 4,094 were randomly-selected undergraduate students—both groups included students from any year and any major (UCLA Student Affairs IT, personal communication, February 20, 2019). It can be inferred that 337 undergraduate and 110 graduate student responses came from this email through the Registrar.

In total, there were 373 undergraduate student responses and 207 graduate student responses out of a campus total of 30,873 undergraduate students and 14,074 graduate students (UCLA, 2018). These results represent all complete responses completed by February 27, 2019. However, more responses were collected after this date for potential use in future research.

[2] To view the recruitment email sent to undergraduate and graduate students, please see the Appendix.

To reach staff members from the academic departments and non-academic offices included in the Nestlé purchasing data, each department and office was researched online to determine the best primary and secondary points of contact for each. Then, an individualized recruitment email[3] was sent in mid-January 2019 to 226 primary staff members (who are likely in charge of purchasing for their respective department or office) representing 251 departments and offices on campus. Examples of staff titles included "Management Service Officers," "Administrative Assistants," and "Chief Financial Officers," among others. Emails sent to each of the 226 primary staff members may have had secondary and tertiary staff members copied in the email to ensure that it reached the correct staff member for each department or office. About a week and a half after the first email was sent, a reminder email was sent to all staff members who did not voluntarily email back confirming that they took the survey the first time. Between both the initial email and the reminder email, if a primary contact email address bounced back, then the best effort was made to research the next best point of contact. Additionally, between both the initial email and the reminder email, if a staff member responded with the contact information of the correct person, then that new contact was sent the survey recruitment email.

In total, there were 117 staff responses. This is a substantial number of responses given the aforementioned process. However, future research on this topic should acquire additional vendor data and reach out to even more applicable staff members.

Most of the data was organized in SurveyMonkey using its built-in analyzation features, such as cross-tabulations and filtered responses (to glean respondent data on specific groups, such as gender identity and affiliation with UCLA). "Other" write-in responses were summarized for their main points or interesting insights. Only completed surveys were included in the analysis; all the surveys that were started but not finished were deemed incomplete and therefore not included in the analysis.

[3] To view the recruitment email sent to staff, please see the Appendix.

V. Findings and Analysis

By examining Nestlé purchasing data from academic departments and non-academic offices at UCLA, reviewing ASUCLA financial reports, incorporating stakeholder responses, and interpreting online survey responses, this section of the report shows how and why campus residents currently use water bottles and large, delivered water bottle containers. The findings of this study help determine how the campus can best transition away from bottled water use toward tap water, thus facilitating UCLA in becoming a more sustainable campus.

A. Financial Data

By understanding how much money the campus community currently spends on avoiding tap water and instead choosing to purchase bottled water and large, delivered water bottle containers, this report sheds light on the amount of money the campus community might be able to save by shifting, in part or wholly, to greater reliance on the tap.

1. Finding #1

These data alone indicate the campus community spends nearly $1,000,000 each year to avoid drinking from the tap and instead use bottled water or large, delivered water bottle containers. It is estimated that the campus community spends about $1,000,000 each year (specifically, $942,407.36 based on the UCLA Store sales, department and office purchasing data from Nestlé, and staff and student survey responses described in this section) to not use the tap and instead use bottled water or large, delivered water bottle containers. Much more is spent on avoiding the tap if water bottle sales from other campus stores, water filtration systems (filtered pitchers, for example), and brands other than Nestlé are considered.

2. UCLA Store

Tables 1 and 2 in the Appendix outline the monthly gross income for the UCLA Store—a student store on campus run by ASUCLA that sells a myriad of products, from books, to clothing, to electronics, to food and drinks, and more—for the 2016-17 year and 2017-18 year respectively (UCLA Store, 2019). By understanding water bottle sales at the UCLA Store as an example case, we can better understand what water bottle sales across all campus stores might look like and, in turn, better understand the financial implications of switching to tap water, instead of simply environmental ones.

Table 3: Summary of UCLA Store Water Bottle Sales

Annual sales from water bottles at UCLA Store in 2016-17	$339,000[4]
% of total annual gross income from water bottles at UCLA Store in 2016-17	0.7547%
Annual sales from water bottles at UCLA Store in 2017-18 (calculated)	$339,675

Considering that the UCLA Store is just one of several campus operations run by ASUCLA, it can be inferred that the organization as a whole has a much higher amount of annual sales from water bottle sales alone than what is reflected in Table 3. On the other hand, there may be evidence that bottled water sales are declining on campus. Wenceslao (2017) also reports that "the UCLA Store sold 7,200 fewer plastic water bottle units in the past fiscal year, going from 169,200 units during the 2015-2016 school year to 162,000 units during the 2016-2017 school year" (par. 10), further indicating a gradual shift in preferences for the campus community away from bottled water.

If the UCLA Store and other ASUCLA-owned stores on campus considered reducing the amount of water bottles they sell and instead invested in hydration stations, patrons of this store (and other stores on campus) could save money in the long-run by using refillable water bottles at these hydration stations instead of buying individual bottles of water.

The estimation of water bottle purchases on campus can also be used to assess the revenue raised from a small fee on bottled water which is in turn dedicated to installing hydration stations in key locations on campus. Taxing bottled water to support tap water access is an idea gaining in popularity. For instance, the State Water Resources Control Board's recent draft water affordability plan suggests a tax on bottled water as a partial means of revenue for affordability support (*Options for Implementation...,* 2019).

While the UCLA Store sells many sizes of water bottles at various prices, at the time of this writing, a standard 16.9 ounce Arrowhead water bottle sells for $1.35. The calculated gross annual sales from water bottles from the UCLA Store in 2017-18 amount to $339,675 (Table 3). If we assume that all $339,675 in water bottle sales came from 16.9 ounce Arrowhead water bottles, then the approximate number of water bottles sold in one year is 251,611. If bottled water sales remained steady and each of these water bottles sold had an additional fee attached to the selling price (for example, 5% or $0.0675), then the proposed fee could generate $16,983.74 for the installation of hydration stations. Instead of campus community members spending money on individual water bottles year-round,

[4] (Wenceslao, 2017)

ASUCLA could install hydration stations with the money generated by the fee. Futhermore, this would reduce the amount of plastic ASUCLA contributes to the waste stream, help the campus commuity save money in the long-run, and further the overarching sustainability goals of the campus. However, if ASUCLA prioritizes the revenue that water bottles generate instead, then it is not surprising that the organization might be reluctant to transition away from plastic water bottles and install hydration stations.

3. Academic Departments and Non-Academic Offices

Academic departments and non-academic offices at UCLA purchase a substantial amount of large, delivered water bottle containers. This not only causes environmental issues in terms of plastic use, but also poses logistical issues in terms of delivery-related traffic on campus, storage space, delivery processes, and financial burdens (UCLA Office of Sustainability, personal communications, 2018). Specifically, this section analyzes the purchasing data for Nestlé water bottle products across 311 academic departments and non-academic offices on campus to determine how much money these entities spend on alternatives to tap water in one year. Table 4 shows the specific amounts, for comparison. Figure 4 (in the Survey Results section) shows how much money survey respondents spend on water each week.

Table 4: 2017-18 Annual Expenditures for Nestlé Water Bottle Products[5]

	Academic Departments	Non-Academic Offices	All Departments and Offices
Number	115	196	311
Mean	$1,973.11	$1,905.54	$1,930.52
Median	$880.05	$735.18	$763.95
Range	$26.58 to $15,934.10	- $16.81 to $49,793.45	- $16.81 to $49,793.45
Total	$226,907.13	$373,485.23	$600,392.36
% of Total Expend.	($226,907.13 / $600,392.36) 37.79%	($373,485.23 / $600,392.36) 62.20%	
% of Total Depts/ Offices	(115 / 311) 36.97%	(196 / 311) 63.02%	

These data indicate that academic departments and non-academic offices spend a combined total of $600,392.36 on Nestlé water products in a single year ($226,907.13 for academic departments and $373,485.23 for non-academic offices). It does not appear that the norm for non-academic offices is to have a high expenditure for water bottles. There may only be a few outliers within the non-academic offices category that spend a much higher amount since the median for this category is lower than the median for academic departments, yet the means for both are nearly the same. The percentage of total expenditures for both academic departments and non-academic offices is roughly proportional to the percentage of total departments and offices each represents in this dataset. It should be noted that this dataset only includes 2017-2018 expenditure data for Nestlé water purchases alone, and does not incorporate all departments or offices on campus, or other water suppliers.

[5] ("Shred and Water Spend Data," 2018)

B. Stakeholder Response Data and Analysis

1. Academic Departments and Non-Academic Offices

In order to provide additional context for the financial and survey data, four offices on campus were consulted to better understand their bottled water use; two of these offices replied with insightful comments. These offices were contacted at the request of UCLA Office of Sustainability (personal communications, 2018). A representative from the UCLA Undergraduate Admission office said that while they do not offer water bottles for their guests, they do subscribe to delivery service for 5-gallon water bottle containers for staff members to refill their reusable water bottles; however, this office occasionally provides individual water bottles for VIP guests or interviewees (UCLA Undergraduate Admission, personal communication, November 9, 2018). Further, they indicated that it would be easier to use cups and carafes in lieu of individual water bottles, however their office does not have a sink (UCLA Undergraduate Admission, personal communication, November 9, 2018). This story provides evidence for some of the infrastructural barriers that exist on campus that perpetuate the use of water bottles and containers, which might not reflect in the other financial or survey data.

Further, the UCLA Office of Sustainability (personal communications, 2018) indicated that individual frozen water bottles are used as ice packs for student sack lunches at some of the restaurants and cafés on campus; the frozen water bottle keeps food in the sack lunch cold and by the time students are ready to eat them, the water bottle has melted back into drinking water for students to consume. For reference, of the 1,300 transactions one café on campus processes on any given Monday through Friday, about 150 of these are sack lunches with water bottles (UCLA Dining Services, personal communication, November 14, 2018). While this is a novel idea that serves a dual purpose, there may be an opportunity to transition away from the use of water bottles for these sack lunches and instead use reusable ice packs or freeze a different part of the lunch.

Additionally, the UCLA Office of Sustainability (personal communications, 2018) understood that Coca-Cola, due to their contract with UCLA, donates water bottles for various events on campus. Scoping this potential additional use of bottled water merits further research.

C. Survey Data

The online survey produced interesting results that not only inform how the campus currently uses water bottles and large, delivered water bottle containers, but also help to

frame how to best transition away from these drinking water options toward tap and dispensed water sources.

1. Descriptive Statistics

Table 5 and Figures 2 and 3 provide descriptive statistics for survey respondents, which provide context for the survey results and the findings.

Table 5: Survey Respondents by Affiliation with UCLA

	Total Respondents	Total Population at UCLA	Percent Represented
Undergraduate Student	373	30,873[6]	1.21%
Graduate Student	207	14,074[7]	1.47%
Staff	117	20,507[8]	0.57%
Total	706[9]	65,454	3.25%

[6] (UCLA, 2018)
[7] (UCLA, 2018)
[8] Represents "Professional and support staff" who "provide administrative, professional, technical, and operational support through independent judgment, analytical skill, and professional or technical expertise, or are responsible for providing clerical, administrative, technical, service, and maintenance support for university departments, programs, and fields of study" (Non-Academic Staff Demographics, 2016-17, 2019, par. 4).
[9] 2 respondents skipped the question about how they are affiliated with UCLA. Additionally, 3 respondents said they affiliated as Faculty and 4 said they affiliated as Other. While these responses were included in the report analysis, they are too small to include in this table.

Figure 2: Survey Respondents by Affiliation with UCLA

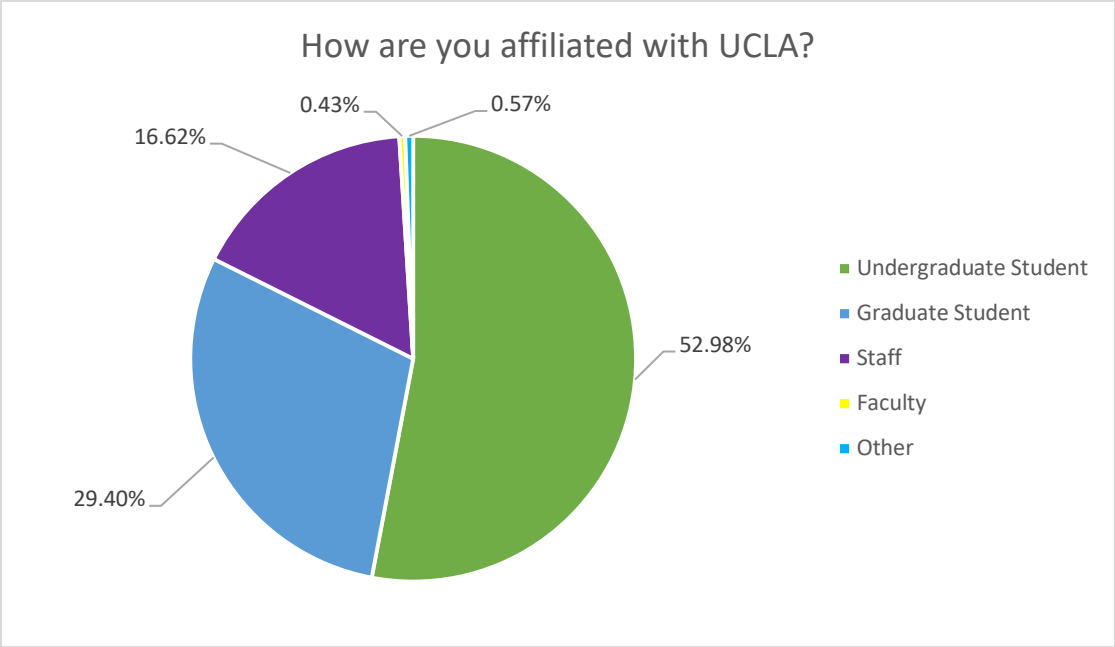
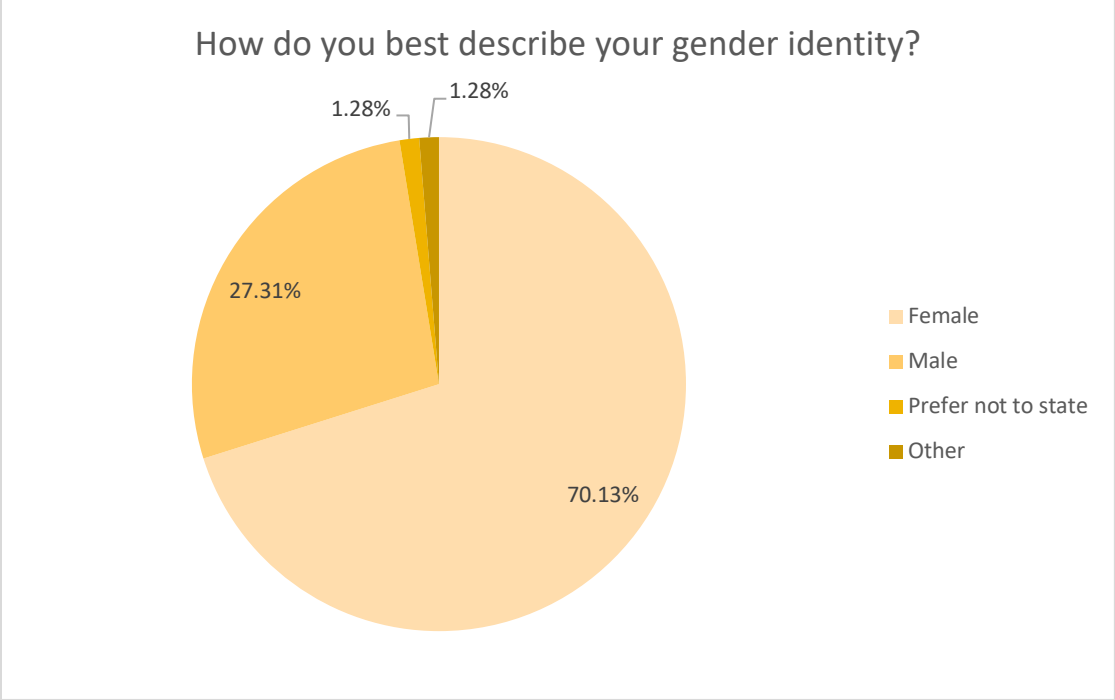
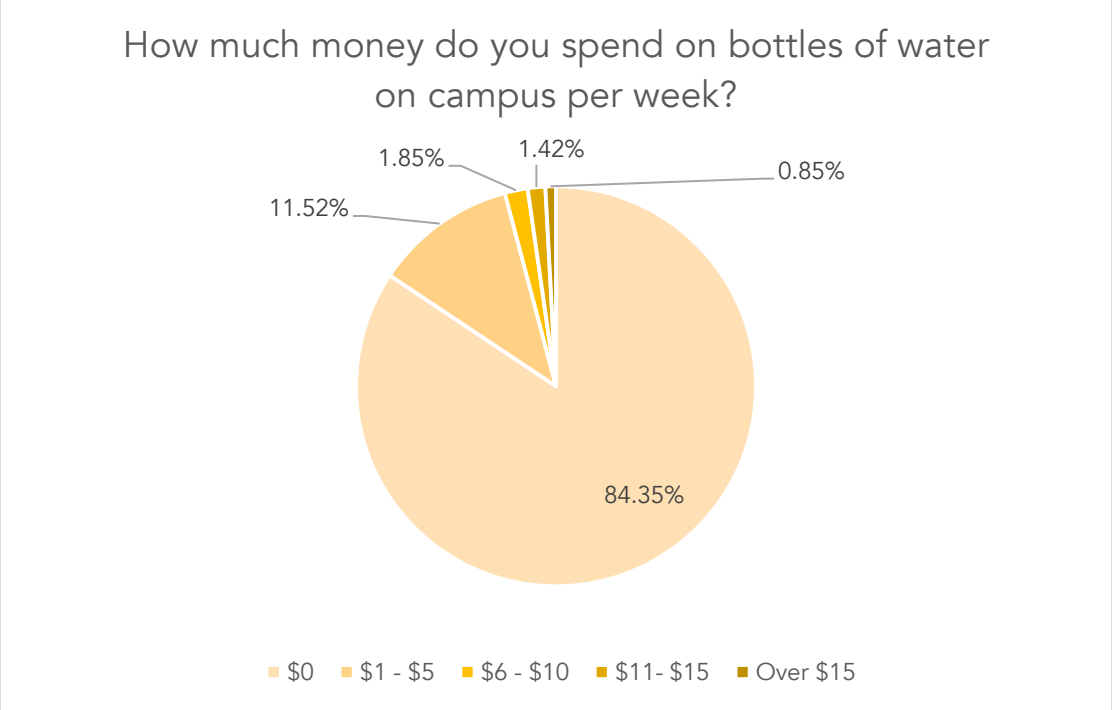


Figure 3: Survey Respondents by Gender Identity



2. Survey Results

Figure 4



Per Figure 4, while the vast majority of survey respondents indicated that they do not spend any money on water bottles each week, there are still some that do. Approximately 12% of survey respondents indicated that they spend $1 to $5 per week on water bottles, which can add up to $260 per year that these individuals spend on alternatives to tap water. Additionally, about 2% of survey respondents indicated that they spend $6 to $10 per week on water bottles, which can add up to $520 per year that these individuals spend on alternatives to tap water. Nearly 1.5% of survey respondents indicated that they spend $11 to $15 per week on water bottles, which can add up to $780 per year that these individuals spend on alternatives to tap water. Lastly, just under 1% of survey respondents indicated that they spend over $15 per week on water bottles, which can add up to well over $780. Based on this information, it is estimated that about 15% of the campus community can spend a total of about $2,340 combined on water bottles each year. The campus community has an opportunity to save a substantial amount of money each year by switching to tap water instead of bottled water.

Based on the financial data presented in this report, it is estimated that the campus community spends about $1,000,000 each year (specifically, $942,407.36, which is based on the UCLA Store sales, department and office purchasing data from Nestlé, and staff and

student survey responses all listed previously in this report) to not use the tap and instead use bottled water or large, delivered water bottle containers. Much more is spent on avoiding the tap if water bottle sales from other campus stores, water filtration systems (filtered pitchers, for example), and brands other than Nestlé are considered.

3. Open Comments

There were 227 open comments left at the end of the survey. Many of them expressed support for sustainability efforts at UCLA and excitement that this research was being conducted. Others favored eliminating plastic bottles on campus altogether, while at least one respondent expressed strong support for bottled water on campus. Many comments expressed support for increasing the amount of hydration stations on campus, especially as attachments to existing drinking water fountains. Additionally, there were a few comments expressing support for FloWater stations and sparkling water dispensers. One concern that arose a couple times in the comments was that students who have reusable water bottles do not have a place to adequatley wash them since the sinks in the residence halls are often too shallow. Others indicated that they wish there were a map of hydration stations on campus because they do not know where they can fill up their reusable water bottles. There were a few comments specifically aimed at Franz Hall and the CHS building; specifically, survey respondents were concerned about water quality and potential contamination. Lastly, one comment stated: "My department used to get large bottles of Sparkletts or Arrowhead water but stopped several years ago once a water fountain was equipped to fill pitchers and reusable water bottles." This is exactly the kind of intervention that other departments and offices might be able to implement to transition from bottled to tap water use. Additional research can relate these comments back to survey responses.

D. Cost of Interventions (from Key Campus Contacts and General Research)

There are many different alternatives to bottled water that pose viable pathways for greater tap water reliance at UCLA. See Table 6 for an overview and the following discussion for more details.

Table 6

Large Interventions	Cost	Pros	Cons
Gooseneck faucets	$1,500 (hardware and installation)[10]	Easy to fill bottle; relatively inexpensive; no infrastructure changes in piping.[11]	Requires an existing sink; may be prone to vandalism and breaking; rapid deterioration; longer wait times at sink.[12]
Hydration stations (FloWater)	$4,000 - $6,000 (hardware and installation) and $100/month (maintenance)[13]	Attractive; purified water; automatic.	Reliability issues; expensive initially; requires electric and water source.[14]
Hydration stations (Elkay)	$1,700 - $2,000 (hardware) and marginal costs for maintenance[15]	Attractive; purified water; automatic.	Expensive initially; requires electric and water source.[16]

One of these options the UCLA Office of Sustainability (personal communications, 2018) is considering is the installation of gooseneck faucets on kitchen sinks, the design of which can make it easier for individuals to refill their reusable water bottles. One cost estimate for gooseneck faucet hardware and installation is quoted at $1,500 (Healthy Campus Initiative, personal communication, November 19, 2018). This intervention would not include additional piping or infrastructure changes, as it is simply a fixture that can be installed on an existing sink. Gooseneck faucets on sinks can offer an opportunity to easily fill up reusable water bottles without spending as much money as hydration stations that automatically dispense water. However, the UCLA Office of Sustainability (personal communications, 2018) described some concerns that these types of faucets are particularly vulnerable to vandalism and breaking, which could potentially lead to flooding.

[10] (Healthy Campus Initiative, personal communication, November 19, 2018)
[11] (UCLA Office of Sustainability, personal communications, 2018)
[12] (UCLA Office of Sustainability, personal communications, 2018)
[13] (Healthy Campus Initiative, personal communication, November 28, 2018)
[14] (UCLA Office of Sustainability, personal communications, 2018)
[15] (Elkay Manufacturing, 2017; How to Replace…, n.d.)
[16] (UCLA Office of Sustainability, personal communications, 2018)

However, representatives from the Office of Sustainability at Princeton University have not heard of any instances of vandalism or breaking in their experience (Savage and Nicolaison, personal communication, March 12, 2019). Additionally, gooseneck faucets are only viable options for offices where there is an existing sink and will only be useful if the sink is in a convenient location. Furthermore, since gooseneck faucets are attached to existing sinks (which are used in a variety of ways, such as dishwashing and hand washing), increased use of one sink might cause there to be wait times and might contribute to more rapid depreciation. Considering the limitations of gooseneck faucets, these are not silver bullet solutions to tap water access issues; however, under the correct circumstances, gooseneck faucets offer a possible solution.

Another alternative is to install automatic filtered water dispensers, or hydration stations. In an attempt to phase out delivered water bottle containers in offices, at least one school on campus has implemented filtered water dispensers through a company called FloWater; these dispensers cost anywhere from $4,000 to $6,000 to install and an additional $100 per month to lease (Healthy Campus Initiative, personal communication, November 28, 2018). However, in some first-hand experience with FloWater machines, water fails to dispense after multiple tries, leading to questions about reliability. Another example is a built-in filtered water dispenser such as those provided by Elkay. The Elkay water dispensers are a combination of a traditional drinking water fountain (which dispenses a stream of water in an upward direction for direct consumption, by pushing on a handle or button) and a hands-free feature to automatically dispense water in a downward direction (in order to fill up a container, such as a reusable water bottle) with the use of a motion sensor. A single Elkay drinking water dispenser can range from around $1,700 to $2,000, with marginal added costs for annual filter replacement (Elkay Manufacturing, 2017; How to Replace…, n.d.). In terms of infrastructural barriers, these kinds of water dispensing stations require access to both electrical outlets and water pipelines—a combination of necessities that may not be feasible in any given desirable location for a hydration station (UCLA Office of Sustainability, personal communications, 2018). These kinds of hydration stations might provide students and staff peace of mind in terms of water quality considering their sleek appearances and filtration capabilities. While the installation of hydration stations is a good option, they do require a high initial investment, the appropriate infrastructural conditions, and regular maintenance.

Based on this information from key contacts, it is clear that it is less expensive for academic departments and non-academic offices to continue purchasing bottled water and large, delivered water bottle containers for the time being, as the annual median expenditures

are $880.05 and $735.18 respectively (Table 4), whereas the cost to install a gooseneck faucet is $1,500 and a FloWater or Elkay hydration station is even higher (Healthy Campus Initiative, personal communication, November 19, 2018, November 28, 2018; Elkay Manufacturing, 2017). Using the median figure in this case is more accurate and beneficial than using the mean because, as previously explained, it appears that there are a few outliers that are swaying the results and raising the mean expenditure. However, based on the median expenditures for both categories, it appears that it would take about two years of not purchasing water bottles and large, delivered water bottle containers from Nestlé in order for the installation of a gooseneck faucet to pay off. This typical cash flow issue begs the question of how departments and buildings can be incentivized to make long-term investments with short-term yearly budgets.

Assuming expenditures remain constant over the years, and assuming that one gooseneck faucet can replace the need for water bottle and container usage in any given department or office included in these data, academic departments can see a savings of $2,900.25 over five years and $7,300.50 over ten years; non-academic offices can see a savings of $2,175.90 over five years and $5,851.80 over ten years, as seen in Table 7.

Table 7: Cost Savings from Installation of a Gooseneck Faucet

	Cost savings over 5 years	Cost Savings over 10 years
Academic Departments	$2,900.25	$7,300.50
Non-Academic Offices	$2,175.90	$5,851.80

These kinds of cost savings present exciting opportunities for departments and offices on campus to not only save money but also contribute to UCLA's overall sustainability efforts. The funds saved could be used in a variety of ways, including improving student services and increasing departmental resources. Additionally, departments and offices can consider using these funds to install more gooseneck faucets or hydration stations in their workspaces. However, this scenario only applies if offices already have a sink in a convenient location or adequate electrical and water sources. All in all, the long-term financial benefits for transitioning away from water bottles and containers is evident, and the environmental impact could be substantial.

Some smaller interventions that academic departments and non-academic offices can implement include the use of water pitchers and filtration fixtures for sinks, if there is access to a kitchen or sink. Water pitchers can provide an easy way for staff to access water if they are placed in convenient locations throughout the office. While water pitchers can

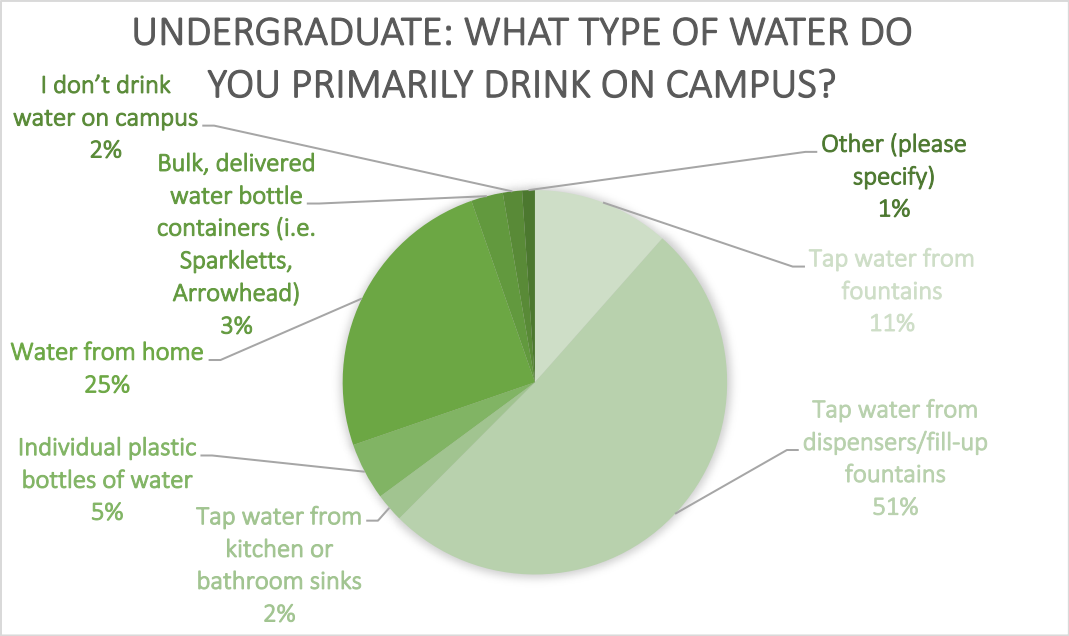
be open on the top, those with lids would likely work best in an office setting to prevent spilling accidents. If an office has access to a refrigerator, water pitchers can also be placed there to provide cold water. Additionally, many water pitchers have filtration systems built into the lids. For example, brands such as PUR and Brita offer a variety of pitchers that range from about $17 to $48 (Water Filter Pitchers…, n.d.; Water Filter Pitchers, 2018). The maintenance involved and the amount of filter replacements needed would depend on the amount of pitchers one office may need and the frequency of use, but the cost is certainly much less than the cost of the larger interventions described above. Additionally, filtration fixtures on sinks can also cost about $15 to $50, which may be a more preferable and convenient alternative to pitchers (Amazon…, 2019).

E. Key Survey Findings

1. Finding #2

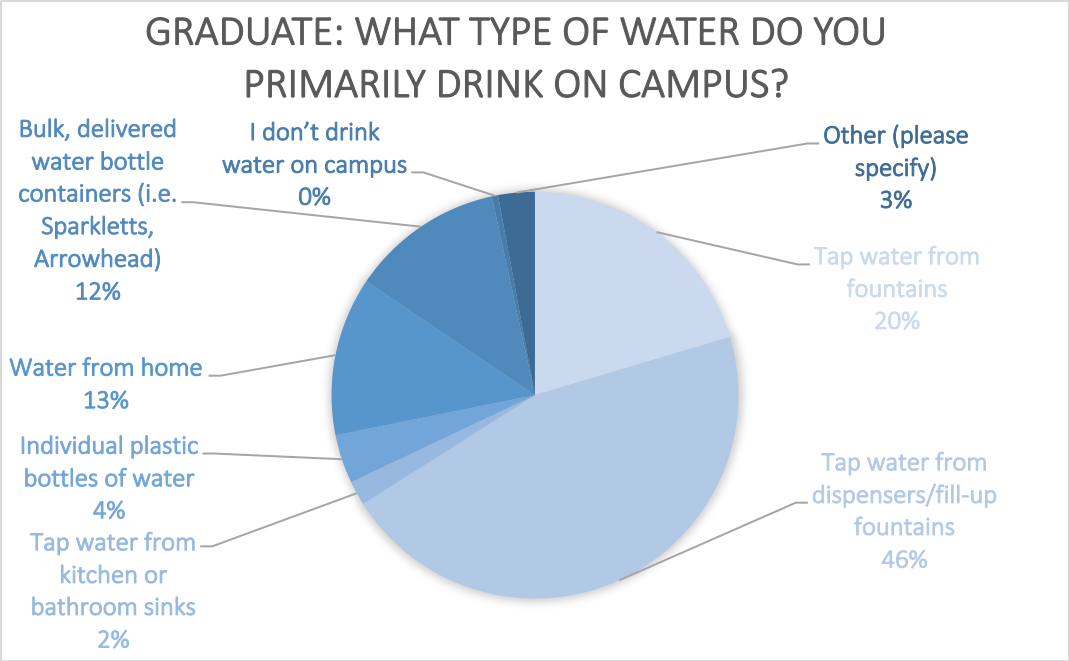
Students primarily drink tap water from dispensers and fill-up fountains, while staff primarily drink from bulk, delivered water bottle containers (i.e. Sparkletts). As described in Figures 5 through 7, "Tap Water from Dispensers/Fill-Up Fountains" was the most popular answer for drinking water choice on campus among undergraduate and graduate students, while "Bulk, delivered water bottle containers (i.e. Sparkletts, Arrowhead)" was overwhelmingly the most popular answer for drinking water choice on campus among staff. This suggests that installing more hydration stations on campus would be useful and valuable for students, and that there is an opportunity among non-academic offices and academic departments to transition away from bulk, delivered water bottle containers toward a more sustainable, cost-effective option. A graph of all other types of water, excluding the type respondents indicated they primarily drink, can be found in the Appendix.

Figure 5: Types of Water Undergraduate Students Primarily Drink on Campus



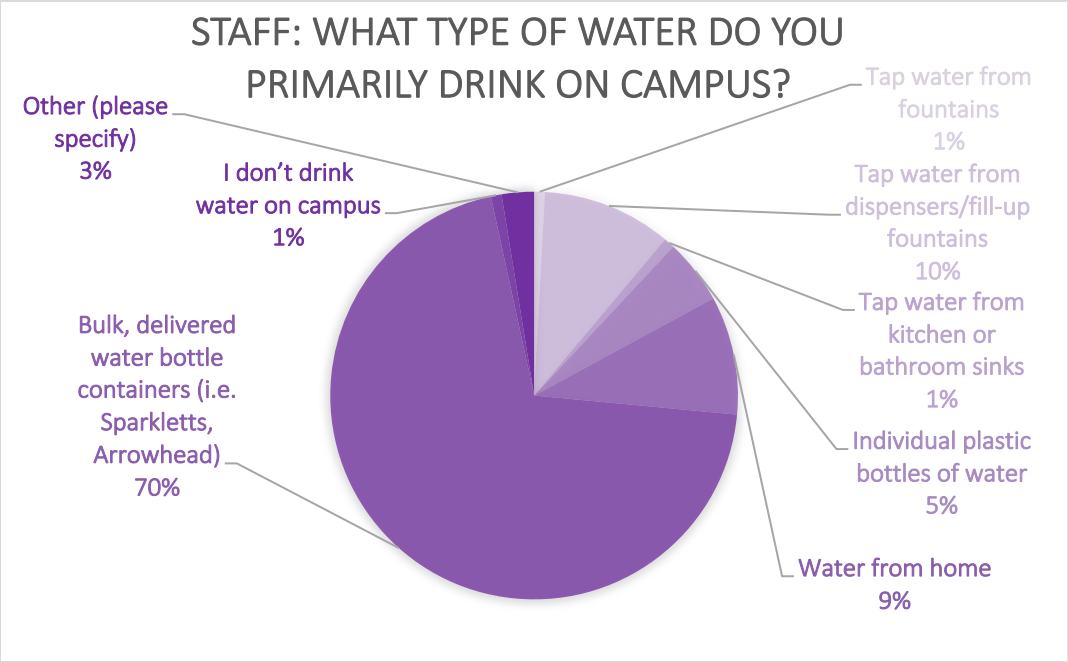
Notable "Other" responses for undergraduate students: FloWater, filtered water and water dispensing machines.

Figure 6: Types of Water Graduate Students Primarily Drink on Campus



Notable "Other" responses for graduate students: Filtered water dispensers, hot water, and tap water filtered through Brita.

Figure 7: Types of Water Staff Primarily Drink on Campus

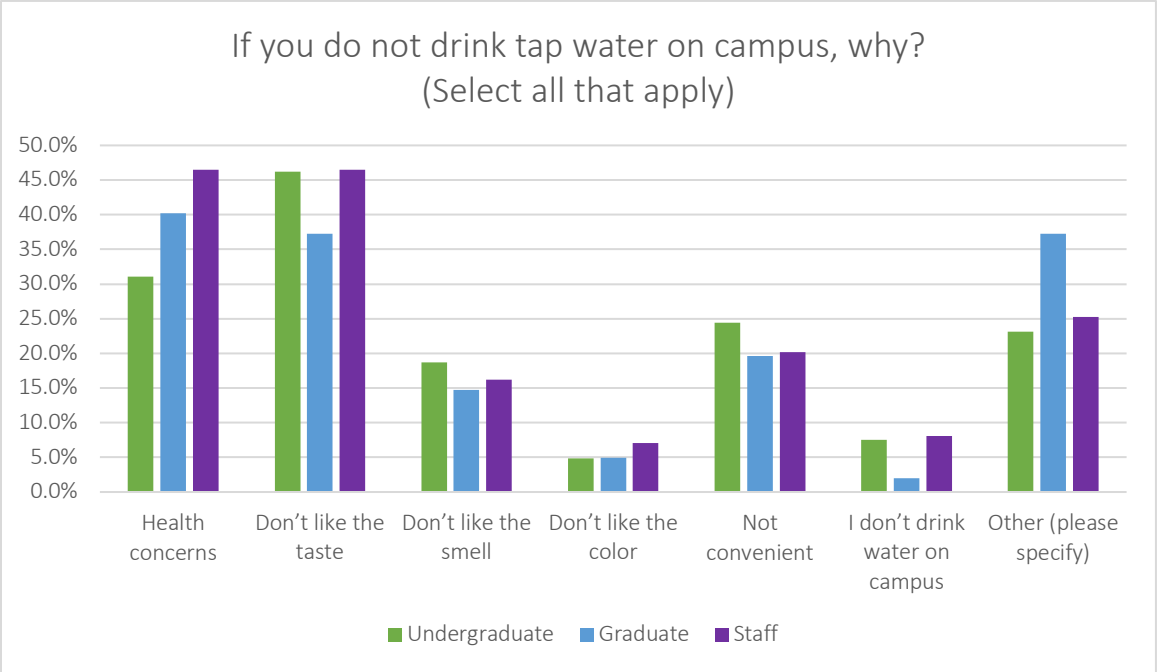


Notable "Other" responses for staff: Sparkling water.

2. Finding #3

The top two reasons respondents cited for not drinking the tap water on campus were "Health Concerns" and "I don't like the taste." As described in Figure 8, for all three groups (undergraduate students, graduate students, and staff), the top two reasons respondents cited for not drinking the tap water on campus were "Health Concerns" and "Don't like the taste." This finding is consistent with the poster survey results and the existing literature on this subject. While there may be some rational concern among those drinking water in old buildings, the plumbing of which may cause organoleptic contamination (discoloration, smell, taste), the general notion that tap water poses widespread health risks is largely unfounded and has no substantiation with respect to the UCLA campus. This suggests that there is an opportunity for education about tap water safety in terms of health. Additionally, these results suggest that there should be further research conducted about the taste of tap water and bottled water to determine if the feelings toward both are genuine or based on a negative perception of tap water.

Figure 8: Reasons for Not Drinking Tap Water on Campus



Top "Other" Responses (undergraduate students, graduate students, staff, and overall trends):

- Undergraduate students: bring water from home, not enough/hard to find hydration stations
- Graduate students: bring water from home, concerns over safety (iron and lead found in some buildings)
- Staff: other alternatives/coolers available, no options/nothing nearby, safety concerns (especially regarding old pipes)
- Across all three groups: concerns with germs/cleanliness of sinks and fountains.

Generally, there appears to be a misunderstanding that dispensed water is different than tap water, and that tap water is less safe.

3. Finding #4

The campus population has an inaccurate perception of tap water and bottled water in terms of safety and health risks; this is especially true for female survey respondents. As described in detail in Tables 8 through 10, about 42% of all survey respondents indicated that they "Agree" or "Strongly Agree" with the statement, "Bottled water is generally safer to drink than tap water." However, this is unsubstantiated and reflects a misunderstanding of the risks of tap water and benefits of bottled water. About 32% of all survey respondents indicated that they "Agree" or "Strongly Agree" with the statement, "Drinking tap water

might pose a risk to my health." However, this is also largely unsubstantiated. Furthermore, consistent with the Literature Review that shows females tend to be more risk-averse than males, female survey respondents indicated more so than males that they believe tap water might pose a risk to their health.

Table 8: Undergraduate Students

	"Drinking tap water might pose a risk to my health."[17]			"Bottled water is generally safer to drink than tap water."[18]		
	Strongly Agree & Agree	Neutral	Disagree & Strongly Disagree	Strongly Agree & Agree	Neutral	Disagree & Strongly Disagree
Total	*105*	*98*	*169*	*163*	*92*	*117*
Female	*80 (30.08%)*	*77 (28.95%)*	*109 (40.98%)*	*114 (42.86%)*	*69 (25.94%)*	*83 (31.2%)*
Male	*23 (23.23%)*	*17 (17.17%)*	*59 (59.59%)*	*44 (44.44%)*	*22 (22.22%)*	*33 (33.33%)*
Prefer not to state	*0 (0%)*	*1 (100%)*	*0 (0%)*	*1 (100%)*	*0 (0%)*	*0 (0%)*
Other	*1 (20%)*	*3 (60%)*	*1 (20%)*	*3 (60%)*	*1 (20%)*	*1 (20%)*

[17] 1 Undergraduate skipped this question. 1 Undergraduate response unaccounted for. Used total of 373.
[18] 1 Undergraduate skipped this question. 1 Undergraduate response unaccounted for. Used total of 373.

Table 9: Graduate Students

	"Drinking tap water might pose a risk to my health."			"Bottled water is generally safer to drink than tap water."		
	Strongly Agree & Agree	Neutral	Disagree & Strongly Disagree	Strongly Agree & Agree	Neutral	Disagree & Strongly Disagree
Total	*61*	*47*	*99*	*70*	*54*	*83*
Female	*42 (32.31%)*	*33 (25.38%)*	*55 (42.31%)*	*48 (36.92%)*	*34 (26.15%)*	*48 (36.92%)*
Male	*16 (22.86%)*	*13 (18.57%)*	*41 (58.57%)*	*19 (27.14%)*	*20 (28.57%)*	*31 (44.29%)*
Prefer not to state	*2 (67.67%)*	*0 (0%)*	*1 (33.33%)*	*3 (100%)*	*0 (0%)*	*0 (0%)*
Other	*1 (25%)*	*1 (25%)*	*2 (50%)*	*0 (0%)*	*0 (0%)*	*4 (100%)*

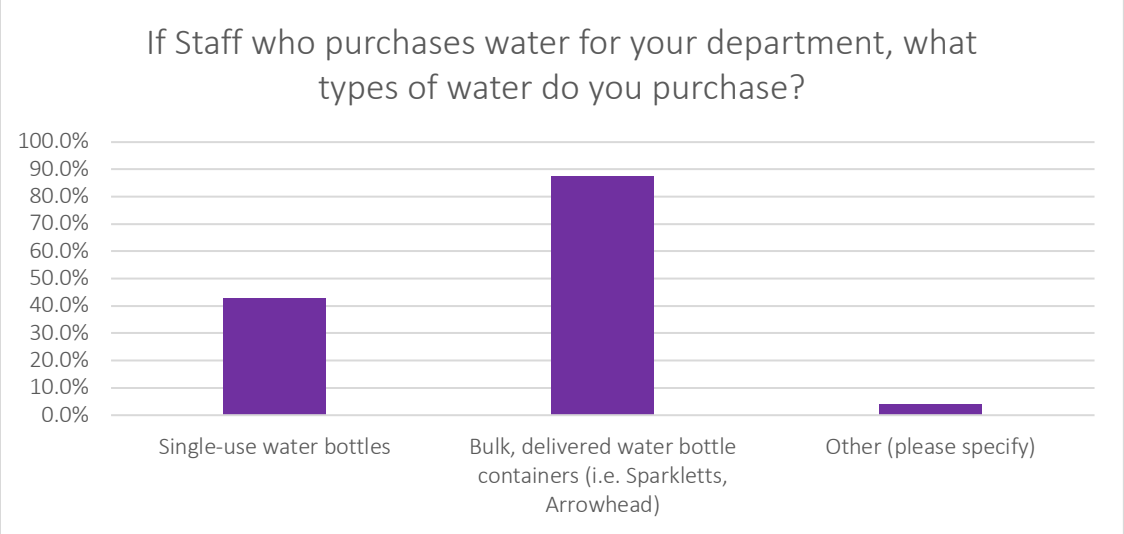
Table 10: Staff

	"Drinking tap water might pose a risk to my health."			"Bottled water is generally safer to drink than tap water."		
	Strongly Agree & Agree	Neutral	Disagree & Strongly Disagree	Strongly Agree & Agree	Neutral	Disagree & Strongly Disagree
Total	*57*	*33*	*27*	*60*	*36*	*21*
Female	*46 (51.11%)*	*24 (26.67%)*	*20 (22.22%)*	*43 (47.78%)*	*28 (31.11%)*	*19 (21.11%)*
Male	*7 (31.82%)*	*8 (36.36%)*	*7 (31.82%)*	*13 (59.09%)*	*8 (36.36%)*	*1 (4.55%)*
Prefer not to state	*4 (80%)*	*1 (20%)*	*0 (0%)*	*4 (80%)*	*0 (0%)*	*1 (20%)*
Other	*0 (0%)*	*0 (0%)*	*0 (0%)*	*0 (0%)*	*0 (0%)*	*0 (0%)*

4. Finding #5

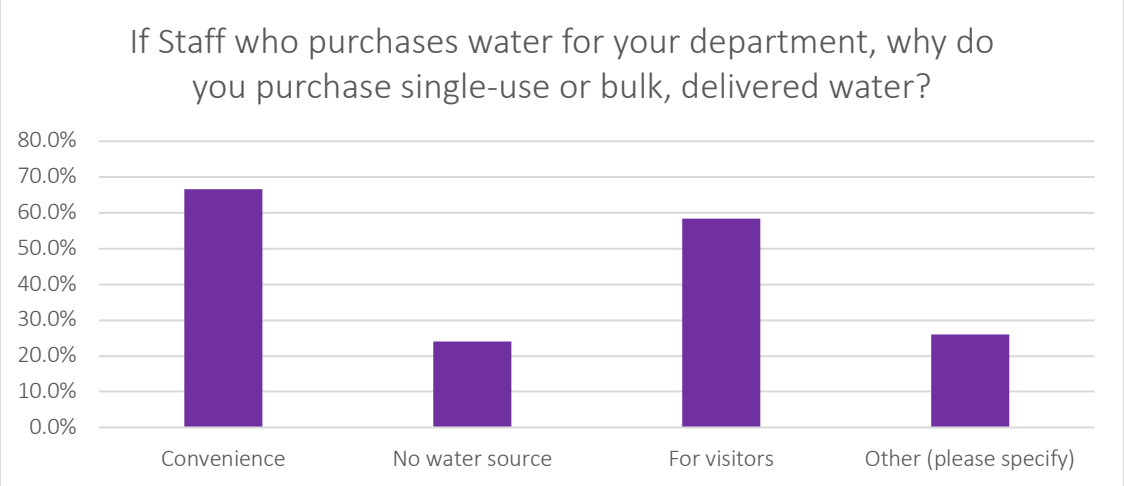
The top two reasons staff gave for why they purchase individual bottles of water or bulk, delivered water bottle containers were for convenience and for visitors. The survey results in Figures 9 and 10 may suggest that if there were more convenient hydration stations in offices and departments that staff could rely less on water bottle containers. Further, perhaps visitors can be offered other options such as complimentary water from pitchers and reusable cups and mugs.

Figure 9: Types of Water Purchased by Staff



Top "Other" response: use bottled water for events only.

Figure 10: Reasons for Staff Purchasing Water Bottles for Departments



Top "Other" responses: for meetings/events, not enough convenient water sources, it is what the department has always done.

5. Finding #6

The survey results suggest that there are at least 10 buildings on campus that should be considered for interventions to increase tap water use for drinking purposes. They include:

- Young Hall
- Haines Hall
- Franz Hall
- Kaplan Hall (formerly Humanities Building)
- Bunche Hall
- Moore Hall
- Powell Library Building
- Center for the Health Sciences
- Young Research Library
- Campbell Hall

These are the 10 buildings in which a significant number ($n \geq 10$) of responses were recorded, and of that number, at least 25% of respondents said they never drink water from this building. Furthermore, these buildings were all built between 1929 and 1964, which may contribute to potential premise plumbing concerns (All Buildings..., 2019). Of the 10 buildings identified for interventions, the average year of construction is about 1944 (All Buildings..., 2019). Of all the buildings in the survey for which there was data included in (All Buildings…, 2019), the average year of construction is 1972 (All Buildings..., 2019). This may indicate a correlation between the age of the building and potential premise plumbing concerns. Please see the Appendix for more details.

VI. Conclusion and Recommendations

In order for UCLA to achieve its goal of zero waste by 2020, it is imperative that the campus transition away from using individual plastic bottles of water and large, delivered water bottle containers. Doing so will not only help the campus become more environmentally sustainable, but also reduce the amount students and staff spend on alternatives to tap water. The data collected through surveys, analysis of campus purchasing data, and conversations with stakeholders contributed to the formulation of key findings that offer insight into the infrastructural, financial, and psychological barriers to increasing tap water consumption on campus. These findings not only reaffirm many of the conclusions found in the existing literature, but also contribute to an emerging body of research surrounding tap water perception and choice on college campuses. This report also informs some tangible recommendations that UCLA and other college campuses can pursue in the future in order to become more sustainable, healthier places to work and study.

The six key findings from this research inform five primary recommendations, some of which are specific to UCLA while others are generalizable to other college campuses and the broader built environment.

A. Recommendation #1: Implement Large Interventions

Considering that the campus community spends nearly $1,000,000 each year on water bottles and containers according to these data alone, there is an opportunity for students and departments to save a substantial amount of money by transitioning to sustainable sources of tap water for drinking purposes, even if they may be more expensive initially. Large interventions can include installing hydration stations, such as FloWater and Elkay water dispensers, as well as installing gooseneck faucets on existing sinks. These types of water dispensers provide people with an easy way to quickly access filtered tap water, which may be more appealing than drinking directly from a sink considering that health and taste were among the main concerns expressed in the campus survey. Further, considering that the most popular answer in terms of primary type of water consumed on campus for both undergraduate and graduate students was tap water from dispensers and fill-up fountains, the installation of more hydration stations would prove valuable and beneficial to students. Efforts to install more hydration stations should focus on where people spend the most time and where a significant number of people never drink the water from the building; based on the survey results, this appears to be in Young Hall, Haines Hall, Franz Hall, Kaplan Hall (formerly Humanities Building), Bunche Hall, Moore Hall, Powell Library Building, Center for the Health Sciences, Young Research Library, and

Campbell Hall. Additionally, measures to address potential premise plumbing issues especially in older buildings on campus might subsequently improve water quality at the source, but these may be structurally invasive and costly.

B. Recommendation #2: Promote Small Interventions

Another way for the campus community to spend less money on bottled water sources is to promote the use of small interventions across campus. Small interventions can include the use of filtered water pitchers and fixtures that attach directly to the faucet. These small interventions may work especially well for academic departments and non-academic offices with existing sinks, especially if each invests in reusable mugs and cups for staff to use instead of disposable ones. Departments and offices can secure funding for small interventions and reusable kitchen products using the money they would have spent on ordering bottled water and large, delivered water bottle containers. Further, considering that the most popular answer in terms of primary type of water consumed on campus for staff was bulk, delivered water bottle containers, staff stand to benefit the most from small interventions designed to reduce dependence on water coolers and their associated disposable products. Lastly, the implementation of small interventions stands to adequately address the main reasons staff choose to purchase individual bottles of water and bulk, delivered water bottle containers: convenience and for visitors. Pitchers and faucet fixtures increase the number of places staff can get drinking water, while pitchers and reusable cups offer a presentable and reliable choice for visitors.

C. Recommendation #3: Generate Funding for Interventions

Considering that, at present, continuing to use bottled water at the departmental and office level is more financially viable in the short-term than implementing large interventions, the generation of funds for non-academic offices and academic departments to install gooseneck faucets and hydration stations is imperative to alleviate this initial financial burden. The Office of Sustainability or individual offices and departments should look into campus funding sources (such as those within the Healthy Campus Initiative or related organizations) to evaluate whether or not they are eligible to receive funding for hydration stations. Additionally, a small fee on water bottle purchases at campus stores (especially the UCLA Store) might generate a substantial amount of money for investment in small and large interventions on campus. Lastly, voluntary staff donations and participation within non-academic offices and academic departments might be the most viable option, as staff members involved would be supportive and would see the direct benefits of the interventions.

D. Recommendation #4: Increase Educational Outreach

Considering that over two-fifths of survey respondents agreed or strongly agreed that bottled water is generally safer to drink than tap water, and about one-third agreed or strongly agreed that tap water might pose a risk to their health, it is imperative that the campus community become more educated about the actual risks involved in drinking tap water in order to address the inaccurate perception of drinking water choices. One idea is to educate incoming students about tap water safety and drinking water choices on campus during orientation—as a stand-alone presentation or as a component of any larger sustainability orientation on campus. Hosting informational workshops for academic departments and non-academic offices might also prove beneficial. Further, informational signage at tap water sources and throughout campus generally can provide the campus community with information about tap water safety (Savage and Nicolaison, personal communication, March 12, 2019). Promotional events on campus can also be fun, interactive ways for the campus community to learn about the reality of tap and bottled water especially in terms of health, which was one of the top reasons respondents indicated they do not drink tap water on campus.

E. Recommendation #5: Next Research Steps to Inform Additional Targeted Interventions

While this research provides a substantial amount of useful findings to inform future campus planning initiatives in terms of drinking water resources, there are still some key opportunities for future research that would supplement the findings in this report. First, in terms of purchasing data for academic departments and non-academic offices on campus, this research only looked at the available Nestlé data. Future research can look into the contract UCLA has with Coca-Cola, as well as look at other water brands found on campus. Secondly, in terms of survey distribution, the survey was only distributed to a fraction of the entire student and staff population on campus, and largely did not reach faculty or campus visitors. Future research can reach out to these groups in order to garner a larger sample and potentially more representative results at UCLA. By also understanding the basic demographics at UCLA, we can better understand the representativeness of the data collected for this report and future research, specifically in terms of number of undergraduate students, graduate students, staff, and more, as well as the gender identity distribution for each. Thirdly, since most survey respondents indicated taste was one of the top reasons for not drinking tap water on campus, future research can explore whether this answer is due to a preexisting negative opinion about tap water or if respondents can actually taste a difference, perhaps through a blind taste test. A fourth topic of future research would be to study the preferences of gooseneck faucets versus hydration stations

to understand if people view the water from each of these sources differently and the reasons for these viewpoints. Lastly, finding out the population sizes of each building on campus might also be helpful in determining where interventions can occur.

F. The Opportunity at UCLA

While UCLA still has a long way to go in terms of achieving zero waste, reducing its reliance on individual bottles of water and large, delivered water bottle containers provides a huge opportunity for improvement. The campus has already improved its efforts to increase proper recycling by procuring new waste stream receptacles aimed at making the signage easier to understand. Additionally, student groups are bringing awareness to the problem with plastic to the larger campus community through events like Waste Awareness Week. Transitioning away from bottled water and large, delivered water bottle containers on campus is an achievable, feasible goal especially considering the amount of progress and momentum this topic has gained in recent years. UCLA is well on its way to becoming a more environmentally sustainable campus, acting as a leader for other college campuses to emulate. While the problem with plastic waste is one of the most critical environmental threats facing the world today, UCLA has the exciting opportunity to play an important role in affecting local change that will benefit the greater global community in a tangible way for centuries to come.

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VIII. Appendix

Appendix A: IRB Exemption Certification

UCLA OHRPP
Office of the Human Research Protection Program

University of California Los Angeles
10889 Wilshire Blvd, Suite 830
Los Angeles, CA 90095-1406

http://ora.research.ucla.edu/ohrpp
General Campus IRB: (310) 825-7122
Medical IRB: (310) 825-5344

EXEMPTION CERTIFICATION
New Study

DATE:	12/6/2018
TO:	GREGORY PIERCE, PhD LUSKIN CENTER FOR INNOVATION
FROM:	WENDY BRUNT PRINCIPAL ANALYST
RE:	IRB#18-001845 Drinking Water Consumption Choices on Campus

The UCLA Institutional Review Board (UCLA IRB) has determined that the above-referenced study meets the criteria for an exemption from IRB review. UCLA's Federalwide Assurance (FWA) with Department of Health and Human Services is FWA00004642.

Any modifications to the research procedures must be submitted to the OHRPP for prospective review and certification of exemption prior to implementation. The project must be renewed by the expiration date if work is to continue.

Submission and Review Information:

Certification Date	12/6/2018
Expiration Date	12/5/2023

Regulatory Determinations

-- **Exempt Certification** - This research has been certified as exempt from IRB review per 45 CFR 46.101, category 2.

Information Sheet For: DRINKING WATER CONSUMPTION CHOICES ON CAMPUS

Student Researcher: Bianca Juarros
Master of Urban and Regional Planning Student at UCLA, bjuarros@ucla.edu

Faculty Supervisor: Dr. Gregory Pierce
Professor of Urban and Regional Planning at UCLA, gspierce@ucla.edu

Client Advisor: Bonny Bentzin
Deputy Chief Sustainability Officer at UCLA Office of Sustainability, bbentzin@facnet.ucla.edu

Instructions

We are asking you to take part in a study conducted by researchers at UCLA. Participating in this study is optional. If you choose to be in the study, you will complete a survey about your water consumption choices on campus. This will help us inform future campus planning initiatives in terms of drinking water practices. The survey will take about 5 to 7 minutes to complete.

You can skip questions that you do not want to answer or stop the survey at any time. The survey is anonymous, and no one will be able to link your answers back to you. Please do not include your name or other information that could be used to identify you in the survey responses.

You must be at least 18 years old and be (or once have been) a student, faculty member or staff at UCLA. Please do not consent to take the survey if you do not meet these requirements.

If you have questions about your rights as a research subject, or you have concerns or suggestions and you want to talk to someone other than the researchers, you may contact the UCLA Office of the Human Research Protection Program by phone: (310) 206-2040; by email: participants@research.ucla.edu or by mail: Box 951406, Los Angeles, CA 90095-1406.

If you want to participate in this study and meet the above-noted eligibility requirements, please click the START button to start the survey. If you do not want (or are not eligible to) participate in this study, please click the EXIT button.

Introduction

We are conducting research with the UCLA Office of Sustainability on drinking water consumption choices on UCLA's campus. As UCLA strives to reach its goal of zero waste by the year 2020, it is imperative that the campus reassess its current dependence on single-use water bottles and bulk, delivered water bottle containers (i.e. Sparkletts, Arrowhead).

This survey should take you about 5 to 7 minutes to complete. You can only take the survey once, and once a question has been answered you cannot edit your responses. Your answers are completely anonymous.

Please answer based on your personal water consumption choices. If you are a staff member who purchases water for your department, you will find questions specifically relating to departmental water consumption choices later in the survey.

We appreciate your input.

Survey

1. What building do you spend most of your time in on campus? Please review the list thoroughly and select one. You may consider using the Control+F function to search for key words. (Select one)[19]
    a. 700 Westwood Plaza
    b. Ackerman Student Union
    c. Biomedical Sciences Research Building
    d. Brain Mapping Center
    e. Botany Building
    f. Boyer Hall
    g. Bradley Hall
    h. Brain Research Institute
    i. Broad Art Center
    j. Bunche Hall
    k. Cafés on campus
    l. Campbell Hall
    m. Carnesale Commons
    n. William Andrews Clark Memorial Library
    o. California NanoSystems Institute
    p. Collins Center for Executive Education
    q. Cornell Hall
    r. Dentistry, School of

[19] Most of this list of buildings is from (Building List, n.d.)

s. Dodd Hall
t. Engineering IV
u. Engineering V
v. Entrepreneurs Hall
w. Factor Health Sciences Building
x. Fernald Center
y. Fowler Museum at UCLA
z. Franz Hall
aa. Geology Building
bb. Gold Hall
cc. Gonda (Goldschmied) Neuroscience and Genetics Research Center
dd. Graduate School of Education and Information Studies Building
ee. Haines Hall
ff. Hershey Hall
gg. Center for the Health Sciences
hh. Kaplan Hall (formerly Humanities Building)
ii. Kaufman Hall
jj. Kerckhoff Hall
kk. Kinsey Science Teaching Pavilion
ll. Knudsen Hall
mm. Korn Convocation Hall
nn. La Kretz Hall
oo. Law Building
pp. Life Sciences
qq. MacDonald Medical Research Laboratories
rr. Macgowan Hall
ss. Macgowan Hall East
tt. Marion Davies Children's Center
uu. Melnitz Hall
vv. Molecular Sciences Building
ww. Moore Hall
xx. Morton Medical Building
yy. Medical Plaza 100
zz. Medical Plaza 300
aaa. Mathematical Sciences
bbb. Murphy Hall (Administration)
ccc. Neuroscience Research Building
ddd. Northwest Campus Auditorium
eee. Ostin Music Center
fff. Physics and Astronomy Building
ggg. Perloff Hall
hhh. Portola Plaza Building
iii. Powell Library Building
jjj. Public Affairs Building (formerly Public Policy Bldg)

kkk. Public Health, School of
lll. Ueberroth Building
mmm. Reed Neurological Research Center
nnn. Rolfe Hall
ooo. Royce Hall
ppp. Student Activities Center
qqq. Semel Institute for Neuroscience and Human Behavior (formerly NPI&H)
rrr. Slichter Hall
sss. Schoenberg Music Building
ttt. Terasaki Life Sciences Building
uuu. UCLA Lab School, Seeds Campus
vvv. Young Hall
www. Wooden Recreation and Sports Center
xxx. Young Research Library
yyy. Other (please specify): _____

2. How often do you drink water from this building?
    a. Everyday
    b. 2-3 times per week
    c. Once per week
    d. Once per month
    e. Never

3. What type of water do you primarily drink on campus? (Select one)
    a. Tap water from fountains
    b. Tap water from dispensers/fill-up fountains
    c. Tap water from kitchen or bathroom sinks
    d. Individual plastic bottles of water
    e. Water from home
    f. Bulk, delivered water bottle containers (i.e. Sparkletts, Arrowhead)
    g. Other (please specify): _____
    h. I don't drink water on campus

4. Do you drink any other types of water on campus? (Select all that apply)
    a. Tap water from fountains
    b. Tap water from dispensers/fill-up fountains
    c. Tap water from kitchen or bathroom sinks
    d. Individual plastic bottles of water
    e. Water from home
    f. Bulk, delivered water bottle containers (i.e. Sparkletts, Arrowhead)
    g. Other (please specify): _____
    h. I don't drink water on campus

5. If you do not drink tap water on campus, why? (Select all that apply)

a. Health concerns
b. Don't like the taste
c. Don't like the smell
d. Don't like the color
e. Not convenient
f. I don't drink water on campus
g. Other (please specify): _____

6. Approximately, how much water do you drink on campus per day?
    a. Equivalent to less than 1 water bottle (less than about 16 ounces)
    b. Equivalent to 1 water bottle (about 16 ounces)
    c. Equivalent to 1-2 water bottles (about 16 – 32 ounces)
    d. Equivalent to 2-3 water bottles (about 32 – 48 ounces)
    e. Equivalent to 3-4 water bottles (about 48 – 64 ounces)
    f. Equivalent to more than 4 water bottles (more than about 64 ounces)
    g. I don't drink water on campus

7. How much money do you spend on bottles of water on campus per week?
    a. $0
    b. $1 - $5
    c. $6 - $10
    d. $11- $15
    e. Over $15

8. Do you drink tap water at home?
    a. Yes
    b. No
        i. If "No,"
            1. If you do not drink tap water at home, why? (select all that apply)
                a. Health concerns
                b. Don't like the taste
                c. Don't like the smell
                d. Don't like the color
                e. Not convenient
                f. I don't drink water at home
                g. Other (please specify): _____
            2. What kind of water do you drink at home?
                a. Filtered tap water
                b. 1-5 gallon jug(s) of water
                c. Individual bottles of water
                d. I don't drink water at home
                e. Other (please specify): _____

9. How much do you agree or disagree with the following statement: "Drinking tap water might pose a risk to my health."
    a. Strongly agree
    b. Agree
    c. Neutral
    d. Disagree
    e. Strongly disagree

10. How much do you agree or disagree with the following statement: "Bottled water is generally safer to drink than tap water."
    a. Strongly agree
    b. Agree
    c. Neutral
    d. Disagree
    e. Strongly disagree

11. How long have you been on campus?
    a. Less than 1 year
    b. 1-3 years
    c. 4-6 years
    d. 7-10 years
    e. More than 10 years

12. Do you recycle?
    a. Yes
    b. No

13. How important is it to you to recycle?
    a. Very important
    b. Somewhat important
    c. Neutral
    d. Somewhat not important
    e. Not important at all

14. How do you best describe your gender identity?
    a. Female
    b. Male
    c. Prefer not to state
    d. Other

15. How are you affiliated with UCLA?
    a. Undergraduate Student
    b. Graduate Student
    c. Staff
    d. Faculty

e. Other (please specify): _____
    i. If “Staff”
        1. Do you purchase water for your department?
            a. Yes
                i. What types of water do you purchase? (Select all that apply)
                    1. Single-use water bottles
                    2. Bulk, delivered water bottle containers (i.e. Sparkletts, Arrowhead)
                    3. Other (please specify): _____
                ii. Why do you purchase single-use water bottles or bulk, delivered water bottle containers (i.e. Sparkletts, Arrowhead) for your department? (Select all that apply)
                    1. Convenience
                    2. No water source
                    3. For visitors
                    4. Other (please specify): _____
            b. No
        2. Do you have bulk, delivered water bottle containers (i.e. Sparkletts, Arrowhead) in the office you work in on campus?
            a. Yes
                i. If “Yes,” do you drink the water from the bulk, delivered water bottle containers (i.e. Sparkletts, Arrowhead)?
                    1. Yes
                    2. No
                        a. If you do not drink from the bulk, delivered water bottle containers (i.e. Sparkletts, Arrowhead), why not? (Select all that apply)
                            i. Health concerns
                            ii. Environmental concerns
                            iii. Don’t like the taste
                            iv. Don’t like the smell
                            v. Don’t like the color
                            vi. Not convenient

vii. I don't drink water on campus
viii. I bring water from home
ix. I get water elsewhere at work/on campus
x. Other (please specify):
_____

b. No

ii. If "Faculty,"
1. Do you have bulk, delivered water bottle containers (i.e. Sparkletts, Arrowhead) in the office you work in on campus?
a. Yes
i. If "Yes," do you drink the water from the bulk, delivered water bottle containers (i.e. Sparkletts, Arrowhead)?
1. Yes
2. No
a. If you do not drink from the bulk, delivered water bottle containers (i.e. Sparkletts, Arrowhead), why not? (Select all that apply)
i. Health concerns
ii. Environmental concerns
iii. Don't like the taste
iv. Don't like the smell
v. Don't like the color
vi. Not convenient
vii. I don't drink water on campus
viii. I bring water from home
ix. I get water elsewhere at work/on campus
x. Other (please specify):
_____

b. No

16. Is there anything else you'd like to add?
    a. _____

Appendix C: Recruitment Email (Undergraduate and Graduate Students)

From: bjuarros@g.ucla.edu
Subject: Water Bottle Assessment Survey (5-7 min)
Body:

Dear Student,

We are asking you to take part in a study conducted by researchers at UCLA. Participating in this study is optional. If you choose to be in the study, you will complete a survey about your water consumption choices on campus. This will help us inform future campus planning initiatives in terms of drinking water practices. See below for more information. The survey will take about 5 to 7 minutes to complete.

Study Title: Drinking Water Consumption Choices on Campus
IRB Study Number: 18-001845

Click here to take the survey: **https://www.surveymonkey.com/r/2BLW97P**

More Information:
We are conducting research with UCLA Office of Sustainability on drinking water consumption choices on UCLA's campus. As UCLA strives to reach its goal of zero waste by the year 2020, it is imperative that the campus reassess its current dependence on single-use water bottles and bulk, delivered water bottle containers (i.e. Sparkletts, Arrowhead). Right now, the campus uses water bottles in a variety of capacities, including events (large and small), daily office consumption, emergency supplies, and daily student boxed lunches; oftentimes there are also inadequate refuse systems (means of collecting and sorting waste) or lack of education surrounding proper container disposal. A partial transition from "single-use" water bottles to vended water from public resources across several parts of campus may offer the campus as a whole an opportunity to not only reduce its ecological footprint and increase access to clean drinking water, but also save money in the long-run. While there are many types of water bottles used on campus, the main focus of this project will be the bulk, delivered water bottle containers (i.e. Sparkletts, Arrowhead) used primarily by larger entities on campus with additional data collected on single-use bottles. We would also like to collect information about current drinking water consumption choices as they relate to tap and bottled water sources. Your responses will help us inform future campus planning initiatives in terms of drinking water practices.

Your participation is greatly appreciated. If you have any questions or concerns, please contact us using the information below.

Thank you,

Bianca Juarros, Student Researcher
Master of Urban and Regional Planning Student at UCLA
bjuarros@g.ucla.edu

Dr. Gregory Pierce, Faculty Supervisor
Luskin Center for Innovation and Professor of Urban and Regional Planning at UCLA
gspierce@ucla.edu

Bonny Bentzin, Client Advisor
Deputy Chief Sustainability Officer at UCLA Office of Sustainability
bbentzin@facnet.ucla.edu

Appendix D: Recruitment Email (Staff)

To: **[CONTACT EMAIL]**
Cc:
Bcc:
From: bjuarros@g.ucla.edu

Subject: Water Bottle Assessment Survey (5-7 min)
Body:

Dear **[CONTACT NAME]**,

I am working with UCLA Office of Sustainability on a project assessing the use of water bottles on campus. Please read below for more information.

I am reaching out to you to better understand the use of bottled water within the **[DEPARTMENT / ORGANIZATION]** specifically. If you are not in charge of purchasing for this department, please kindly forward this email to the person who is. The survey should only take 5 to 7 minutes, and your input is greatly appreciated. Please click the link below if you wish to participate in this survey.

Study Title: Drinking Water Consumption Choices on Campus
IRB Study Number: 18-001845

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More Information:
We are conducting research with UCLA Office of Sustainability on drinking water consumption choices on UCLA's campus. As UCLA strives to reach its goal of zero waste by the year 2020, it is imperative that the campus reassess its current dependence on single-use water bottles and bulk, delivered water bottle containers (i.e. Sparkletts, Arrowhead). Right now, the campus uses water bottles in a variety of capacities, including events (large and small), daily office consumption, emergency supplies, and daily student boxed lunches; oftentimes there are also inadequate refuse systems (means of collecting and sorting waste) or lack of education surrounding proper container disposal. A partial transition from "single-use" water bottles to vended water from public resources across several parts of campus may offer the campus as a whole an opportunity to not only reduce its ecological footprint and increase access to clean drinking water, but also save money in the long-run. While there are many types of water bottles used on campus, the main focus of this project will be the bulk, delivered water bottle containers (i.e. Sparkletts, Arrowhead) used primarily by larger entities on campus with additional data collected on single-use bottles. We would also like to collect information about current drinking water consumption choices as they relate to tap and

bottled water sources. Your responses will help us inform future campus planning initiatives in terms of drinking water practices.

Your participation is greatly appreciated. If you have any questions or concerns, please contact us using the information below.

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Appendix E: Additional Results

E-1. Table 1: 2016-17 Annual Gross Income for UCLA Store[20]

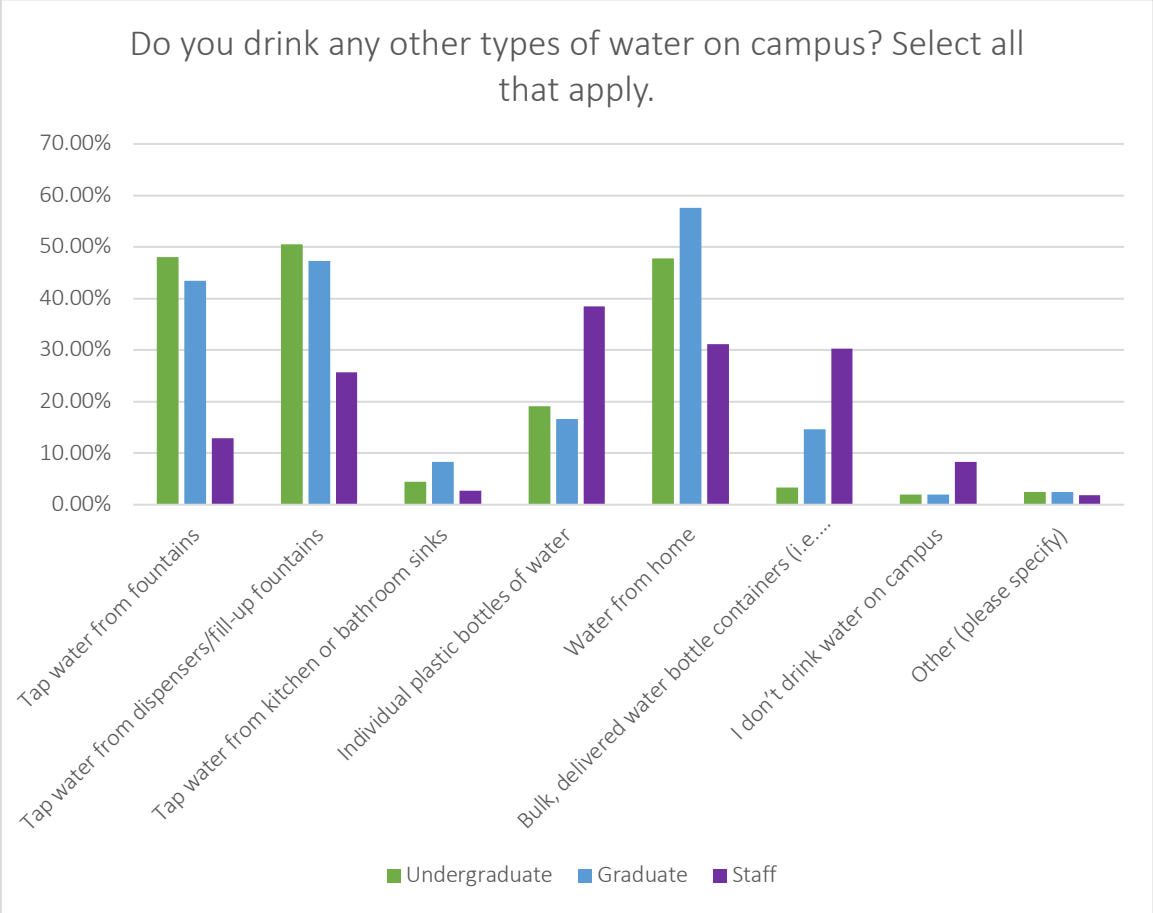
Month and Year	Actual Gross Income
August 2016	$3,484,000
September 2016	$7,610,000
October 2016	$3,251,000
November 2016	$2,182,000
December 2016	$3,408,000
January 2017	$4,388,000
February 2017	$2,680,000
March 2017	$3,099,000
April 2017	$4,134,000
May 2017	$3,718,000
June 2017	$3,837,000
July 2017	$3,126,000
TOTAL	$44,917,000

E-2. Table 2: 2017-18 Annual Gross Income for UCLA Store[21]

Month and Year	Actual Gross Income
August 2017	$3,466,000
September 2017	$7,416,000
October 2017	$4,003,000
November 2017	$2,459,000
December 2017	$3,236,000
January 2018	$3,754,000
February 2018	$2,773,000
March 2018	$3,282,000
April 2018	$4,280,000
May 2018	$3,639,000
June 2018	$3,982,000
July 2018	$2,718,000
TOTAL	$45,008,000

[20] (ASUCLA Financials 2016-2017, 2019)
[21] (ASUCLA Financials 2017-2018, 2019)

E-3.



Notable "Other" responses: Fruit/flavored water, FloWater, filtered water, Brita filtered water.

E-4. How often do you drink water from this building?

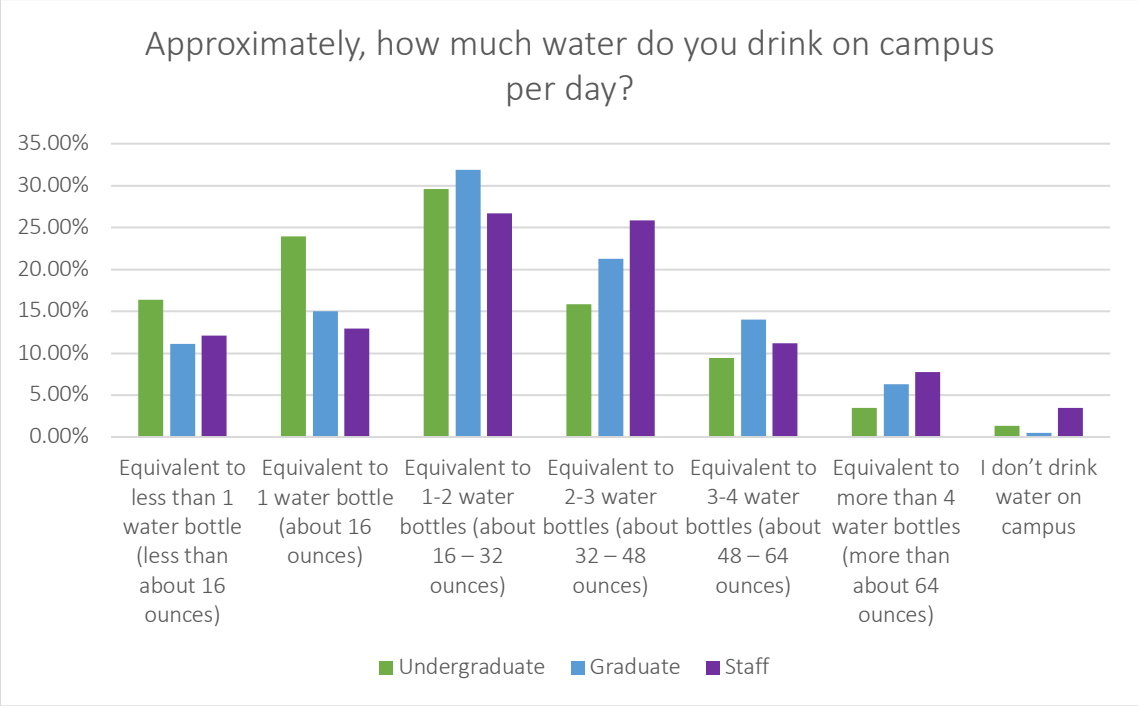
Building	Year Built[22]	Total Responses	"Never" Responses	% "Never" drink water in this building
Young Hall	1952	43	24	55.81%
Haines Hall	1929	20	10	50.00%
Franz Hall[23]	1940	21	10	47.62%
Kaplan Hall (formerly Humanities Building)	1929	19	8	42.11%
Bunche Hall	1964	24	9	37.50%
Moore Hall	1930	14	5	35.71%
Powell Library Building	1930	39	13	33.33%
Center for the Health Sciences	1954	27	8	29.63%
Young Research Library	1964	37	10	27.03%
Campbell Hall	1954	12	3	25.00%

Of the 10 buildings identified for interventions, the average year of construction is about 1944. Of all the buildings in the survey for which there was data included in (All Buildings…, 2019), the average year of construction is 1972.

[22] (All Buildings..., 2019)

[23] Tied address of Franz Hall from (Main Office, n.d.) to address in (All Buildings..., 2019) for Psychology Building.

E-5.


Approximately, how much water do you drink on campus per day?
35.00%
30.00%
25.00%
20.00%
15.00%
10.00%
5.00%
0.00%
Equivalent to less than 1 water bottle (less than about 16 ounces)
Equivalent to 1 water bottle (about 16 ounces)
Equivalent to 1-2 water bottles (about 16 – 32 ounces)
Equivalent to 2-3 water bottles (about 32 – 48 ounces)
Equivalent to 3-4 water bottles (about 48 – 64 ounces)
Equivalent to more than 4 water bottles (more than about 64 ounces)
I don't drink water on campus
Undergraduate
Graduate
Staff

E-6. Undergraduate Students

	Do you drink tap water...	
	...on campus? [24]	...at home?
Yes	*242 (64.88%)*	*252 (67.56%)*
No	*131 (35.12%)*	*121 (32.44%)*

E-7. Graduate Students

	Do you drink tap water...	
	...on campus? [25]	...at home?
Yes	*140 (67.63%)*	*149 (71.98%)*
No	*66 (31.88%)*	*58 (28.02%)*

E-8. Staff

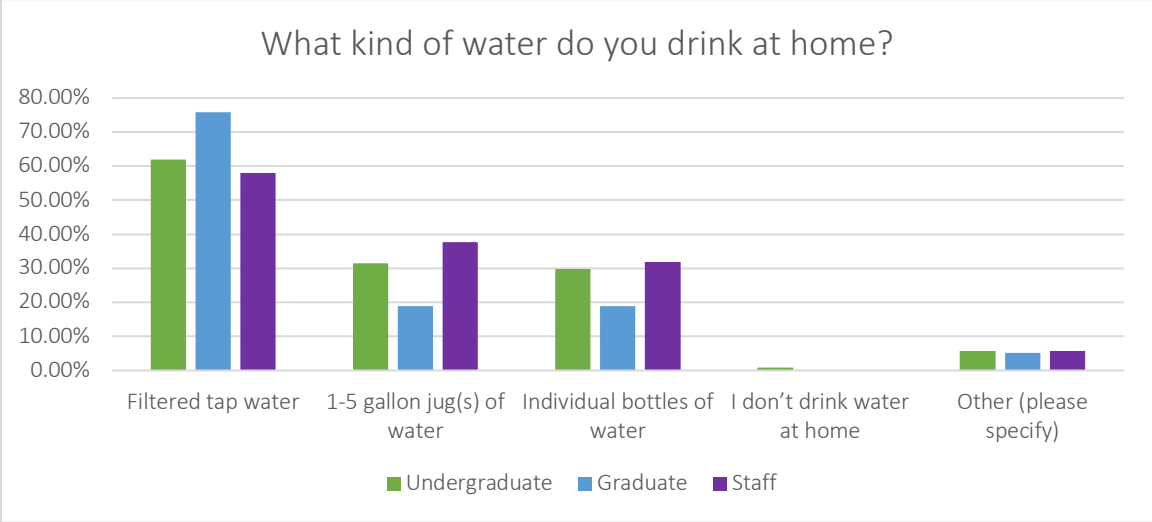
	Do you drink tap water...	
	...on campus? [26]	...at home?
Yes	*14 (11.97%)*	*48 (41.03%)*
No	*103 (88.03%)*	*69 (58.97%)*

[24] Based on question "What type of water do you primarily drink on campus? (select one)." "Yes" if answer choices were "Tap water from fountains," "Tap water from dispensers/fill-up fountains," and "Tap water from kitchen or bathroom sinks." "No" if answer choices were any other choice, including "Other (please specify)."

[25] Same as Footnote 24. Additionally, 1 Graduate Student skipped the question about the type of water they primarily drink on campus. Still used total of 207.

[26] Same as Footnote 24.

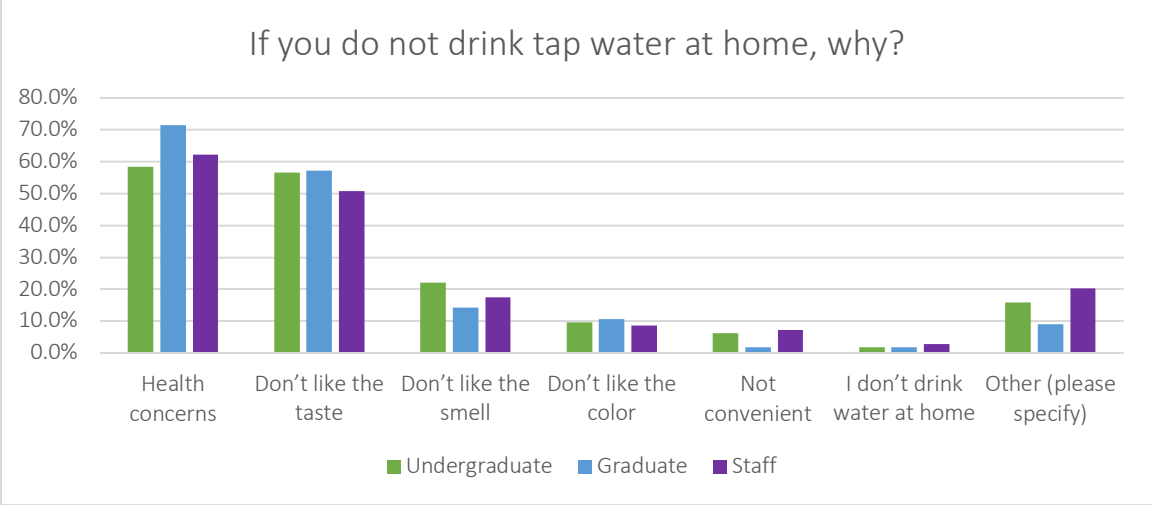
E-9.



Top "Other" Responses:

- Undergraduate students: boiled water, FloWater or other dispensed water
- Graduate students: hot water, sparkling water, alkaline water
- Staff: Brita filtered water, sparkling water, alkaline water

E-10.



Top "Other" responses (undergraduate students, graduate students, staff, and overall trends):

- Undergraduate students: use a filter instead, use bottles/large containers
- Graduate students: use a filter instead
- Staff: use a filter instead, concerns about the pipes
- Across all three groups:
    - Generally, there appears to be a misunderstanding that dispensed water is different than tap water and that tap water is not safe without a filter.

E-11.

Do you recycle?	Yes	No
Undergraduate Students	*95.98%*	*4.02%*
Graduate Students	*97.58%*	*2.42%*
Staff	*97.44%*	*2.56%*

E-12.