

***Demystifying Retail Water Facilities
in Los Angeles County***

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Abstract

Retail Water Facilities (RWFs), as defined by the California Department of Public Health, are facilities “where water is processed, sold, and placed into containers. The water containers may be brought by the consumer or may be sold or given to consumers by the facility” (California Department of Public Health, 2015). They flood Los Angeles County: accounting for 509 locations, almost half of the 1209 RWFs in California. With almost half (42%) of the RWFs in California located in LA County alone, it begs the main research question of this study: what explains the prevalence and geographic distribution of Retail Water Facilities specifically in Los Angeles County? This paper explores this research question through a geographic analysis of the RWF locations and surrounding demographics, surveys with RWF customers, one RWF business owner interview, and interviews with industry stakeholders. Through the aforementioned methods, it was revealed that the majority of RWFs in Los Angeles County are located in low-income communities. Additionally, customers were buying water because their tap water looked unsafe to drink or because they were unsure if their tap water was safe. The stakeholders disclosed that the main reasoning behind why people may not trust their water could be due to their aging pipes in their respective residences. While that may be one possible explanation, an analysis of LADWP’s water regulation policies show that there are flaws within the water regulation process. Based on the aforementioned main findings, the majority of the recommendations focus on ways to help alleviate the cost of updating aging infrastructure and opportunities where loopholes in the water regulation system can be tightened.

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Table of Contents

Abstract – 2	
Acknowledgements – 3	
1	Introduction - 6
2	Literature Review - 6
	2.1 Introduction – 6
	2.2 Privatization of Water – 7
	2.3 Understanding the “Other Side” of Privatized Water: Tap Water - 11
	2.3.1 The Relationship Between Tap Water and Bottled Water – 11
	2.3.2 Alkaline Water – 14
	2.4 Contamination of Water in Low Income/Immigrant Communities – 15
	2.5 Common Theme for Low Income and Immigrant Communities – 16
	2.6 Tap Water for Other Countries – 17
	2.7 Why this topic matter. It’s happened in Flint, why not LA? – 18
	2.7.1 Flint, Michigan Water Crisis – 18
	2.7.2 It Happens/Is Happening in Los Angeles – 19
	2.7.2.1 <i>Sierra Madre, Los Angeles County</i> – 19
	2.7.2.2 <i>LAUSD</i> – 20
	2.7.2.3 <i>Gardena, Los Angeles County</i> – 21
	2.7.2.4 <i>Westwood, Los Angeles County</i> – 23
	2.8 So what? – 23
	2.9 Overview of LADWP – 24
	2.10 Retail Water Facilities – 27
3	Methods – 28
	3.1 Data Collection - 28
	3.2 Spatial Distribution – 29
	3.3 Pre-Analysis Examination and Processing of Data – 30
	3.4 Customers – 31
	3.4.1 Customer Survey Data Collection Limitations and Observations – 34
	3.5 Business Owners - 35
	3.5.1 Data Collection Limitations - 35
	3.5.2 Data Collection - 35
	3.6 Industry Accountability - 36
4	Findings - 37
	4.1 Background – 37
	4.2 Who is Buying Water? – 38
	4.3 How Much Water are Customers Buying? – 41
	4.4 Field Observations – 44

4.5	Advertisement – 46
4.6	Bought (RWF) Water Usage – 48
4.7	Tap Water Quality – 50
4.8	Why do Customers Buy Water? – 52
4.9	Interview with RWF Business Owner – 53
4.10	Summary of Key Findings – 55
4.11	Regulation of Vended and Tap Water - 57
	4.11.1 Regulating Vended Water - 58
	4.11.2 Regulating Tap Water – 65
5	Recommendations - 70
	5.1 Drinking Water Revolving Fund – 70
	5.2 National Level: Improve Lead Service Line Pipe Databases - 72
	5.3 Recommendations Align with Those of AMWA – 74
	5.4 Tap Water Education – 75
	5.5 Radical Recommendations – 79
6	Future Studies – 81
	Appendix A – 83
	Appendix B – 84
	Appendix C – 85
	Appendix D – 86
	Appendix E – 87
	Interviewees – 88
	Field Observations/Data Collection – 88
	Bibliography – 89

1. INTRODUCTION

In the United States, water is predominantly treated as a public good by the government. The United States offers water to all residents within all areas of United States at a subsidized cost, offers drinking water at public parks, and sets a relatively high standard for safety regulation in comparison to other countries (Fewtrell and Bartram 2001). Yet, water is also privatized: Retail Water Facilities (RWF) are a prime example. A RWF, as defined by the California Department of Public Health Food and Drug Branch, is a “facility where water is processed, sold, and placed into containers. The water containers may be brought by the consumer or may be sold or given to consumers by the facility.” RWFs flood Los Angeles County. In LA County alone, there are 509 retail water facilities out of a total of 1209 in all of California (California Department of Public Health, 2015). In the United States, where safe, potable water is provided by public authorities and agencies at extremely low cost to residents, it’s paradoxical that we would have an emergence of water stores when city utilities, specifically in Los Angeles, claim the city tap water meets regulation standards (Moline 2015). With almost half (42%) of the RWFs in California located in LA County alone, it begs the main research question of this study: what explains the prevalence and geographic distribution of Retail Water Facilities specifically in Los Angeles County?

2. LITERATURE REVIEW

2.1 Introduction

Seventy percent of the world is covered by water (Bakker 2010). Of that 70%, only 1% is drinkable (Bakker 2010). As water demands rise, this resource’s scarcity and value will only increase. In the last 20 years, a rising number of private water firms has taken control of this vital resource has increased, in hopes that the private sector could succeed where governments managements have failed: providing universal access to water (Jacobs

and Howe 2005). The United States is included in this shift, as it is also experiencing a controversial trend towards the privatization of water and water services (de Gouvello and Scott 2012). For this paper's purpose, privatization will be defined as the private ownership, control, development, exploitation, trade, and use of water for private purpose or gain. This includes water at its sources (i.e. rivers, streams, lakes, wetlands, etc.), in addition to water distributed by humans, such as public drinking sources, commercial use of water, agricultural irrigation systems and vended water.

Retail Water Facilities (RWFs) are a very specific case of privatization, falling into the category of vended water. This category is separate from the better-known categories such as *bottled water distributors* and *water vending machines*. The unique, niche characteristic of RWFs has meant little to no literature on RWFs. However, while very little literature exists on RWFs, the surrounding literature on the water industry provides a theoretical framework and methodology that can be applied the RWF industry and insight to likely targeted populations. This literature review will look at the privatization of water, the characteristics of people buying it, perceptions of tap water, and the impacts of this industry and similar sectors on low income and high immigrant populated communities. A summary of the aforementioned literature topics, reveals not only a clear lack of literature on Retail Water Facilities, but also guides the logic behind my methods and subject matter. My research aims to examine why retail water facilities exist: why customers are buying RWF water, why RWF business owners are selling it, and the differences between low and high-income RWFs and RWFs in low and high immigrant communities.

2.2 Privatization of Water

The private control or ownership of local water supply systems in the United States has increased dramatically since the 1980s (Bakker 2010). Currently, private water companies serve approximately 15% of the United States' population, take in about 14% of

total water revenues and hold about 11% of all water system assets in the US (de Gouvello and Scott 2012). The heightened interest in the private sector of public water services is the byproduct of public policies and political agendas favoring privatization of public services generally, and water resources specifically. The increase in contracts to privatize water services reveals that it has become increasingly attractive to many public water entities to enter this private market (de Gouvello and Scott 2012). States have been authorizing municipalities to enter the private sector to supply water to the public, in many cases, with no significant conditions that protect or advocate for the public's needs. The trend towards privatization is projected to increase due to a projected investment gap of as much as \$500 billion over the next 20 years that would cause essential infrastructure renovations to fall through the cracks if left as a public entity (Jacobs and Howe 2005). The water infrastructure in the United States is completely decentralized, as it's owned and operated by thousands of local municipalities, each specific to a local watershed. With so much diversity, little national data exists, making the controversy over the privatization somewhat subjective given the lack of comprehensive data on how privatization will actually affect local systems (Strayhorne 2014).

The literature around the privatization of water analyzes the causes of the increased trend and debates the pros and cons of privatization. The discussions about the benefits and disadvantages of privatization often revolve around the idea of government efficiency and inequity towards low-income communities. However, there is a clear lack of literature that systematically analyzes the effects of privatization on specific communities or even large cities such as Los Angeles, where privatization exists.

The 1990s fostered a turning point in history in regards to how the world approached water management. The era was defined by the commodification, internationalization, and institutionalization of a "global vision of water" (Schneier-

Madanes 2014). Soon after the 1980s, issues such as the management of water, the control of public services, and lack of access to said services by marginalized groups began to surface. When these issues surfaced, water was seen as an economic good, leading stakeholders to believe the protection and use of this good could be ensured through market avenues and government improvement (Cotta 2012). In the 1990s, the popular ideology around the growing privatization of water was that it would allow the public sector to become more efficient while promoting the commodification of water. This ideology was led by international organizations such as the World Bank (Hanke and Walters 2011). However, after several failed international contracts in the beginning of the 2000s and a growing failure to meet the minimum expectations to provide water and sanitation, this paradigm began to be questioned (Bakker 2010) even by those that originally promoted the ideology (Marin 2009). Under a new standard, water management was redefined as “a country’s capacity to organize the development of its water resources in a sustainable fashion” (Pena and Solanes 2003), which forced scholars to reexamine the relationship between public and private interests (Lobina and Hall 2007). Specifically, it forced scholars to reconsider the following variables as ones that intersect rather than ones that operate alone: “service provision, equitable access, attendant health, livelihood, economic development, and ecological outcomes” (de Gouvello and Scott 2012).

One of the major factors that has contributed to the water privatization trend is that many publicly owned water utilities lack the financial capacity to update their infrastructure, as it has not been a priority for the government to fund these projects. Additionally, with almost no barriers to enter the privatized market, there is no incentive for the government to intervene when it, in turn, doesn’t have to incur the large costs. With a growing demand for water, operational costs of public water supply systems have increased. Privatization not only allows for financial gain for investors, but it provides

financial incentive for the state and government who can't afford the necessary infrastructure improvements when compared to other more prioritized projects or issues (Glennon 2005).

Privatization has not been a popular reform (i.e. Cotta 2012; Strayhorne 2014; de Gouvello and Scott 2012). Critics argue that privatization unfairly hurts low-income individuals and benefits the privileged. It is described as forcing large numbers of people into jobs with lower pay, less security and fewer benefits, raising the price of a commodity that is argued to be a human right, and making the rich richer and the poor poorer. Even if privatization allows for improved efficiency and financial benefits (as some argue this), it widens the inequitable income gap (Birdsall and Nellis 2003).

Some scholars argue that privatization can cause prices to decrease if the change of ownership causes increased competition. Additionally, if privatization is more efficient, the savings could be passed on to customers. Others argue that privatization can cause prices to increase if weak or ineffective infrastructure firms regulate them (Cotta 2012). Proponents of privatization also argue that private ownership could increase access through business expansion that might not have been possible through investment capped public management (Whitehead Jr. and Block 2002). On the other hand, private ownership could also ignore certain markets that a public enterprise is obligated to serve.

There is a clear gap in the literature that provides a systematic approach to examine the impacts on local communities given various variables that need to be accounted for between each community (Hanke and Walters 2011). With such a variety of factors that need to be taken into account when analyzing the effects of privatization on a given community including differing ownership, management, customer base, demographics, the city's financial state, city officials, and other stakeholders it is clear how there is little to no research regarding the effects of privatization on local communities.

2.3 Understanding the “Other Side” of Privatized Water: Tap Water

It is important to look at tap water as it is part of the larger water industry and because literature reveals a direct relationship between the perceptions of tap water with the purchasing of privatized or vended water (i.e. Hu, Morton, and Mahler 2011; Saylor, Prokopy, and Amberg 2011). Thus, it's important to look at the factors that influence the perceptions of tap water to understand the motivations behind buying vended water. The literature around this topic suggests that perceptions of water quality result from a complex interaction of diverse factors: organoleptic (involving the use of sense organs) properties of water, health/risk concerns, trust in suppliers, past problems associated with water quality and information provided by the mass media and interpersonal sources (Teillet et al. 2010). There is a relatively large literature base that connects perceptions of tap water to the purchasing of bottled water, thus for the purpose of this literature review I will use bottled water as a specific case of vended water in hopes that a better understanding of the factors that influence the buying of bottled water can be applied towards the purchasing of water at RWFs, as RWFs, like bottled water, are a form of vended water.

2.3.1 The Relationship Between Tap Water and Bottled Water

For some consumers, bottled water has become a replacement for tap water because of its convenience, better taste, and perceived purity (Doria 2006). However, perceptions that bottled water is safer are challenged by numerous studies that have revealed otherwise (i.e. McSpirit and Reid 2011; Whelton et al. 2015). For example, Lalumandier and Ayers (2000) collected fifty-seven samples of bottled water purchased from various pharmacy, grocery, discount, and wholesale stores in Cleveland, in order to capture the total market share, and found that only five percent had the required fluoride recommended by the state, whereas all local tap water samples met this standard. In this

same experiment, the researchers measured bacterial content in both the tap water and bottled water and found that the tap water samples had under 3 CFUs/mL (colony-forming unit, a measure of viable bacterial or fungal numbers), whereas bottled water sample' bacterial content ranged from 0.01 to 4,900 CFUs/mL (Lalumandier and Ayers 2000).

Yet, despite the demonstrated inferiority of bottled water quality, studies have proven that when blindly tested, participants who prefer tap water still choose to buy bottled water over tap water (i.e. de França Doria 2010; Lalumandier and Ayers 2000). For example, Teillet et al. (2010) presented six-bottled mineral water samples and six types of tap water samples to 389 consumers who were asked to give their preferences of all the sample choices. Prior to them tasting the samples, they were asked to state whether they purchase tap water or drink tap water instead. The researchers found that most consumers could not tell the difference between bottled water and tap water. Additionally, they found that this study “highlighted the gap between consumer preferences and consumption habits.” Over 80% of participants who stated they purchased water preferred the tap water samples (Teillet et al. 2010).

The literature around bottled and tap water shows that there's a clear lack of accountability regulations for bottled water, a privately owned sector. Additionally, it reveals that there's an obvious gap in public knowledge around the differences in water quality between tap and bottled water. Paradoxically, despite these flaws in the system, the United States still marks itself as treating safe drinking water as not only a public good, but also a human right (providing free water at public spaces i.e. parks etc.). Yet, there are continuous flaws in this system as well and the shift towards privatization only results in less government accountability. Other faults in this system include: unequal access to public spaces, degraded, rusted, water fountains at parks, lack of knowledge of the quality of tap water etc. (Hanke and Walters 2011).

Eighty-five million bottles of water are consumed in the United States every day totaling up to more than thirty billion bottles a year (Hu, Morton, and Mahler 2011). The consumption of bottled water stems from the perception of risk associated with alternate forms of drinking water, mainly tap water (Hu, Morton, and Mahler 2011). Thus, perceptions of drinking water safety are often influenced by beliefs regarding ground and surface water quality in the local area. These perceptions then influence decisions to choose bottled water over tap water. Hu, Morton and Mahler (2011) found that US consumers are more likely to report bottled water as their primary drinking source when they believe that drinking water is unsafe, and those who believe that the quality of their ground water is not sufficient are more likely to regularly purchase bottled water (Hu, Morton, and Mahler 2011).

Another factor influencing consumer decisions to select bottled water over tap water is the type of water supply system that exists where the consumer lives (Whelton et al. 2015). Small water systems in the US were found to not meet federal and state quality standards. A study found that small water systems reportedly violated more federal drinking water regulations than larger ones due to inadequate funding and infrastructure. Another concern with bottled water is its affordability, given that it's on average 500 to 1000 times more expensive than tap water (Whelton et al. 2015). Additionally, increased consumption of bottled water can take away from public tap water revenues, limiting the capacity for the government to provide needed infrastructure updates.

Many reports have pushed for stricter guidelines and regulations on the bottled water industry. Just like Retail Water Facilities, bottled water production facilities are monitored and inspected by the US Food and Drug Administration. However, even the few inspection requirements that bottled water production facilities are supposed to be held accountable for are given low priority compared with other food production sites due to

FDA's staffing and financial constraints (Hu, Morton, and Mahler 2011). There's a gap in literature that explores this flaw in the system. However, we can assume that if there are reservations pertaining to FDA regulation of bottled water production facilities due to lack of staff and financial capacity, it is likely the same flaw in regulation can be applied to the regulation of RWF water.

2.3.2 Alkaline Water

With a quick glance of the list of approximately 500 RWFs in Los Angeles County, the store names, for the most part, completely encompass the core of RWFs: 358 out of the 504 RWFs include some version of water (i.e. agua, aqua, H2O) in their store title. Additionally, 57 of the 504 RWFs include the word 'pure' in their store name. What may not be so obvious though are the 21 RWFs that have "alkaline" or "alka" in their store name, both terms referring to Alkaline Water, a growing sector of the vended water industry, thus it is important to give brief literature review on this aspect of the water industry, especially as it pertains to RWFs.

Alkaline drinking water is water that has a pH above 7.0 and is said to have numerous health benefits. It is usually produced by electrolysis of drinkable source water. Electrolysis is a type of electrolyzer that essentially separates the water into alkaline and acidic parts using two electrodes. Alkaline water can also be produced by adding alkaline minerals to drinking water such as tap water (Weinberg 2015).

A brief literature review reveals that there is some controversy around the actual health benefits of alkaline water. While several clinical trials have shown some specific benefits to health, critics argue that not enough research has been done to back up the claims stores are making about the health benefits of their water (Zeratsky, n.d.).

Water companies claim that alkaline water can help maintain your internal pH, reduce side effects from acidosis, increase your energy, improve your thinking, reverse aging, and even help you lose weight. Part of this ideology comes from the assumption that many of their customers have some form of acidosis caused by a high fat diet, which is true of most Americans. Since there is almost no literature backing up these claims, it comes into question how these water companies are making these statements to their customers.

2.4 Contamination of Water in Low Income/Immigrant Communities

There is a lack of research on the disproportionate contaminants exposed to drinking water faced by low-income and minority communities. However, the few studies that have looked into this phenomenon have proved the issue exists and that more research needs to be done around the impacts on these marginalized communities. A literature review in the 1990s (Calderon et al. 1993) suggested more quantitative studies need to examine the impacts of drinking water contamination on vulnerable populations that include people of color and low-income communities. Since then, several studies have been published studying various aspects of that calling. In San Joaquin County, California, Byrne (2003) found a significant correlation between poor drinking quality and areas with a high percentage of minorities and of low socio-economic status (Byrne 2003). A study done by Balaz, Morello-Frosch, and Hubbard in 2011 looked into the social disparities in nitrate-contaminated drinking water in California's San Joaquin Valley. Specifically, the study analyzes the relationship between the amount of nitrate in community water systems (CWSs) and the racial/ethnic and socioeconomic characteristics of the customers. They found that CWSs serving large percentages of Latinos and renters receive water with higher nitrate levels revealing an environmental inequity in drinking water quality (Balazs et al. 2011).

However, it is not just low-income communities and communities of color that have been proven to be disproportionately affected; immigrant communities have been as well. A study examined two low-income, immigrant rural towns in California's Central Valley representing a population of Latino agricultural workers. Assessing water quality by the frequency of violations reported by EPA EnviroFacts, contaminant level data from CDPH Water Quality Monitoring Database, and interviews to evaluate perception of water quality, the study concluded the water systems serving these low-income immigrant communities in agricultural areas have drinking water contamination levels that do not meet federal standards (Flora, Flora, and Gasteyer 2015).

The Case for Los Angeles. There is a clear history of low-income, high immigrant communities being disproportionately exposed to contaminants in their drinking water. Yet, according to Melinda Rho, the water quality manager for the L.A. Department of Water and Power, as of March 2015, claims the city's tap water meets all standards (Moline 2015). However, in the same *L.A. Times* article, Renee Sharp, senior scientist and research director at the Environmental Working Group (EWG) states, "Every city, suburb and rural community has specific contaminants of concern. And it's actually trickier than you might think. LA is huge, and there are many water utilities," hinting that there may be faults (Moline 2015). There's a lack of literature that systematically explores the process in place for regulating privately and publicly owned water suppliers and a shortage of public available data that supports these safety regulation claims. This leaves the possibility that customers of RWFs may in fact be buying water because their tap water is unsafe.

2.5 Common Theme for Low-Income and Immigrant Communities: Disadvantaged Access to Public Services

There's a large literature that focuses on the disadvantages low-income and high-populated immigrant areas face in regards to access to public services and basic human

needs. From unequal access to public spaces such as parks (Abercrombie et al. 2008), to unequal distribution of hazardous toxins/pollutants (Boer et al. 1997) to unequal access to healthy food (i.e. food deserts) (Lang and Caraher 1998), disadvantaged communities at the intersection of class and race have long had a history of unjust and limited access to basic needs such as decent breathing air. We can imagine RWFs following the same trend, that is, targeting the same communities, but under unequal access to clean drinking water. Additionally, research reveals that immigrants experience various obstacles as a newcomer when it comes to access to and knowledge about public services, which could explain why customers are spending money at RWFs (i.e. Kullgren 2003; Simon 1996). However, we could also imagine the aforementioned reasons, such as low quality tap water, as possible reasons why immigrants may be drawn to these facilities.

2.6 Tap Water in Other Countries

One possible reason why people could be buying water at RWFs is because they immigrated from another country where their respective drinking water wasn't safe to drink. Thus, when they came to the United States they had the same assumption about local tap water and buy water as a result. There's a large literature base about water not being safe to drink in developing countries. In fact, till this day, it remains a large issue that continues to be fought for on almost all fronts: education, policies, technology etc.

Additionally, a study done in Parral, Mexico surveyed and conducted semi-structured interviews at 70 households gathering 398 valid responses with a response rate of 94.76%. The researchers found that households in this area were willing to pay anywhere from 1.8% to 7.55% of their reported household income above the amount they pay for their tap water for safe drinking water depending on how unsure they were about the safeness of their tap water (Vásquez et al. 2009).

In a study done in Salt Lake City study, the researchers found that the majority of the children drank bottled water exclusively. They found that these children's parents, the majority of whom were Latinx immigrants believed that tap water made them sick. The study gave context as to how many Latinx countries do not have well regulated water systems. The researchers believed that these beliefs carried over to influence Latinx who immigrate to the US. The study states that more studies need to be done to understand drinking water preferences across different ethnic population groups (Balazs et al. 2011).

2.7 Why this topic matters. It's happened in Flint, why not LA?

One of the underlying questions to this research project remains: is the prevalence of RWFs in Los Angeles County due to the fact that some tap water is unsafe to drink? At first glance, the answer to this question might be deemed as too obvious since LADWP states all of its tap water is held to the highest regulation standards. However, it happened in Flint, so why not LA?

2.7.1 Flint, Michigan Water Crisis

California may be miles away from Michigan; however, both of them have aging infrastructure in common linked to water contamination issues. The Flint Water Crisis began in April 2014 when Flint, Michigan, switched its water source from treated Detroit Water and Sewerage Department water to the Flint River. The city thought that they could save between \$6 to \$8 million by switching water supplies, which was of high priority for them as the city was trying to solve its \$13 million budget deficit. Before switching water sources, the city had been receiving its water from Detroit for approximately 50 years and while Flint has many decades-old lead water service lines, the water from Detroit didn't pose any health risks or quality concerns (McWhirter 2016). Flint used orthophosphate to treat the water, which essentially coated the inside of the pipes as water flowed through to prevent corrosion of the pipes. However, when Flint decided to switch water suppliers, what

was overlooked was difference in the composition of the water. Flint River water has eight times more chloride than the water from Detroit, which is a compound known to deteriorate lead pipes (McWhirter 2016).

The State Department of Environmental Quality failed to require Flint to add separate chemicals to account for the change in the water composition, thus allowing the corrosion of the lead pipes to continue. Attorney General Bill Schuette also confirmed that the Flint River water contained other chemical compounds such as *E. coli* and other bacteria that causes Legionnaires' disease. Since the switch, residents of the area almost immediately noticed a difference in the odor, color and taste of their tap water, and the water has now been tested and revealed it contains levels of lead 10 times the safety level of lead a human can consume. Now, an estimated 6,000 to 12,000 children have been exposed to health threatening levels of lead and a possible outbreak of Legionnaires' disease in the country that has killed 10 people and affected 77 other individuals (Bosman 2016).

2.7.2 It Happens/is Happening in Los Angeles

Sierra Madre, Los Angeles (2014-present)

Again, just as Flint's old infrastructure was the main reason for Flint's crisis, Los Angeles' increased leaks and increasingly old piping system can be directly compared to Flint's crisis. Sierra Madre, a suburb of Los Angeles, encountered a disturbingly similar situation and is still looking for ways to solve the issue today (Palma 2015). In 2014, Sierra Madre like Flint switched water systems; however, this time they were forced to do so because of the drought. Sierra Madre began importing water from the Metropolitan Water District and just like the Flint River, the water had a different composition from the original water source, causing a different reaction with the pipes. Residents began to notice their tap water turning yellow and smelling poorly, which was a result of iron oxide being released from the inside of the pipes (Scauzillow 2015). Only recently this past October did

the city council finally decide that it needs to replace the pipes instead of finding ways to temporarily fix the situation. In addition to the tainted drinking water the city is also facing fines from the State Water Resource Control Board because it is not meeting its target reduction of 32 percent in the last three months since the article was posted in December 2015—again due to old infrastructure (Scauzillow 2015).

2.7.2.1 LAUSD Children Exposed to Lead Tainted Water (2008-present)

In 2008, KNBC news began an investigation of LADUSD elementary schools after getting a tip from a concerned parent that children were being exposed to lead tainted water in their drinking fountains. KNBC decided to test water at 30 elementary schools across the city and test for levels of lead (Grover and Schrader, n.d.). Of the 30 schools, they found that 9 of them had drinking fountains with unsafe levels of lead due to the poorly maintained brass fittings schools used for its water fountain pipes, which caused lead leaching. However, in the middle of the investigation, KNBC found out that the district knew that it had at least 356 unsafe fountains that failed to meet the government lead standard. The district's solution was to adopt a "flushing policy," which requires schools to flush the water out of the drinking fountain every morning for at least 30 seconds to rinse out any accumulated lead (Grover and Schrader, n.d.). To keep track, schools were required to have a custodial daily log of the daily flushing. To continue with the investigation, KNBC watched the fountains at five different schools to see whether or not custodians were actually flushing out the water fountains. On three separate occasions, KNBC saw the custodian at a certain elementary school walk passed the water fountain and not flush it at all, yet they also found that the same custodian signed off on the daily flushing log. KNBC noticed similar patterns at the various other elementary schools in the city (Grover and Schrader, n.d.).

In 2009, the District stated that it would either replace the lead containing pipes with lead free ones or install filters on the older lead pipes that would remove the majority of the lead from the water coming out of those fountains. In 2013, KNBC found that the district had only replaced pipes at one elementary school, the one school where parents had protested at in 2008 to get their water tested for their children. Additionally, KNBC found that the district installed filters for only some fountains at 200 of the 900 schools in the district saying they did not have enough funds to install filters for the remaining 700 schools (Ludden 2016).

Yet, even with another attempt to urge LAUSD to solve the issue in 2013, seven years later from the original investigation, according to KNBC's latest article on this investigation published on February 18, 2015, "thousands of children are still drinking from fountains that might be unsafe" despite LADUSD pledging to fix the water problem (Grover and Schrader, n.d.). Finally, an article released September 4, 2015 stated that LAUSD board approved \$20 million to get the lead out of the water. However, while that may seem like a large victory given the numerous years that have passed with this ongoing issue, LAUSD is now in a large debate on how to go about removing the lead (Grover and Schrader, n.d.).

2.7.2.2 Gardena, Los Angeles County (June 2015-Present)

News of Gardena's black tap water surfaced in July 2015. Residents began taking pictures and videos of their black water demanding an explanation (See Figure 1). The black water wasn't just coming from their tap water—it was in their toilets, and showers too. In fact, not only was it black, but residents described the smell as well as an odor similar to rotten eggs (Hernandez 2016).

Gardena gets its water from Golden State Water, and when the complaints surfaced and got media attention, Golden State Water's response is quite shocking. At a community

meeting Gardena residents rallied, bringing containers of their black water, their black and brown stained water filters, and photos and videos of the water as well to show the Golden State Water representatives at the meeting hard evidence that their water was unacceptable. Most residents stated they would not even shower in this water, describing the water as moldy (Vives 2016). Some even blamed the water for some of their health issues ranging from skin to respiratory issues. However, even after the Gardena residents showed their black water (exact pictures of the water brought to this meeting seen in Figure 1), the Golden State Water representative stated that the water was still safe to drink since all of their water has met health standards. Yet, when the representative was asked if she wanted to drink one of the black water samples a resident brought to the meeting, the representative declined. The Golden State Water representative attributed the black water to aging pipes, but still said that the water should not have any negative health effects. Gold State Water told the Gardena residents that they would look into the issue and in the mean time would flush the pipes with clean water from (Hernandez 2016).

Over a little bit of time, while the main black color went away, residents still complained that there were still particles floating in the water. In addition, while the water appeared clear, their water filters still stained a yellowish color. Ten months later from the first articles that began surfacing about Gardena's water, assembly member David Haldey of California District 66 (consisting of mostly the South Bay) received 75 complaints within the week of March 9, 2016. Yet, Denise Kruger, senior vice president of regulated utilities for Golden State Water Company stated "We have not had reports of complaints or any issues for quite some time...The issue has been fixed" (Vives 2016).

Figure 1: Pictures of Gardena Residents' Water Brought to a Community Meeting



Source: Abc7.com, "Gardena Water a Cause for Concern Among Residents; Officials Seek Answers"

2.7.2.3 Westwood, Los Angeles (2014-2015)

In 2014, a 93-year-old main water pipe broke in the neighborhood of Westwood of Los Angeles, in close proximity to UCLA's campus. In no means was this incident a small leak; the pipe leakage was estimated to have leaked around 8 to 10 million gallons of water. Making headlines, the incident caused massive damage to UCLA's recently \$133 million renovation to Pauley Pavilion, the campus' main on-campus basketball court, and several other campus facilities including some parking lots. This example is given to show other ways we can tell that our aging pipes is an issue (Pamer et al. 2014).

2.8 So What?

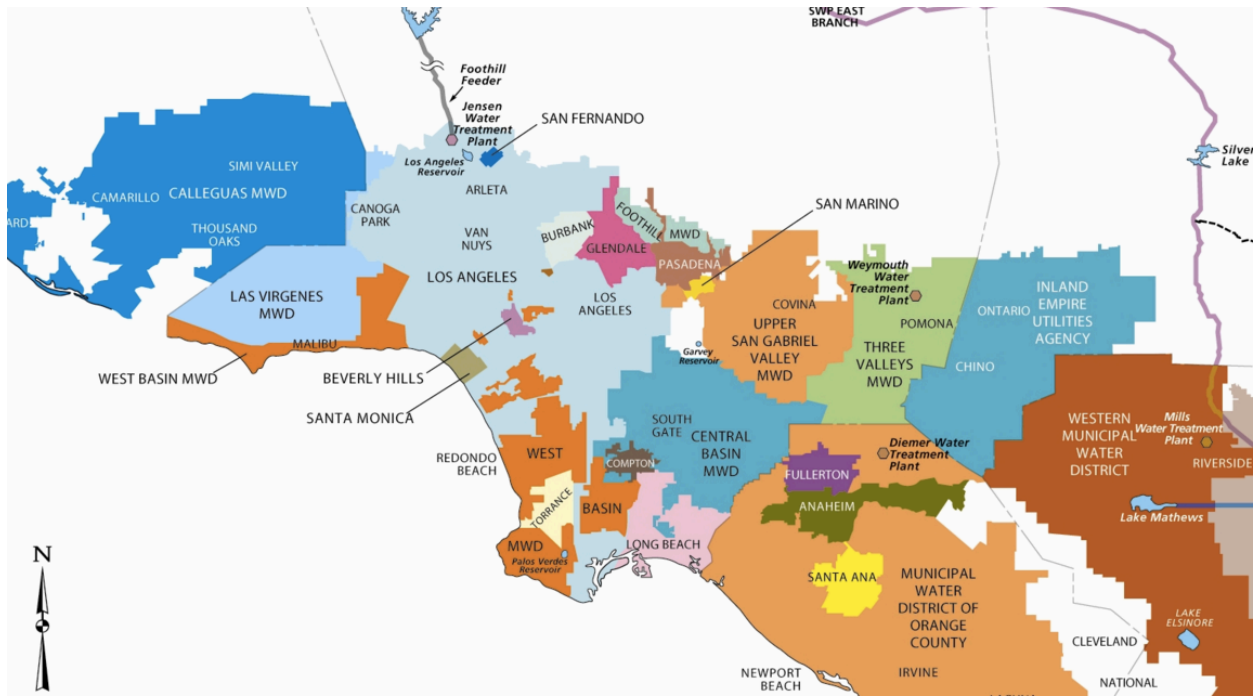
These examples are just a few instances in Los Angeles that show there are flaws in our drinking water regulation system. First, that these contaminated water instances exist, second, that it can take more than a year to solve the issue, and lastly, that these issues are reoccurring. And with the most recent Flint crisis, a terrible situation that has been

brought to the nation’s attention, the incident has proven to a large media audience that there are large consequences as a result of these flaws within our regulation system. Gardena’s most shocking (and current) example tells us that there may be other similar instances in Los Angeles that might be contributing to the prevalence of RWFs in LA County.

2.9 Overview of LADWP

For reference and visual representation, it is important to state that while LADWP is the largest municipal utility in the United States and serves over four million residents, there are other municipal utilities that provide water to Los Angeles County. Figure 2 shows a map of the various water utility areas within and around Los Angeles County.

Figure 2: Map of Water Utility Areas Near Los Angeles County



Source: www.waterwisenow.com

LA Pipes

According to a *LA Times* article published February 16, 2015 nearly one-fifth of the city's water pipes were installed before 1931, which means they will reach their full capacity in the next 15 years. These same pipes are responsible for almost half of the main water leaks in the city, and it is estimated that it will take \$1 billion to fix. See figure 3 for a quick breakdown of the numbers (Poston and Stevens 2015).

Figure 3: LADWP Key Facts and Figures

By the numbers

6,730 — Miles of pipe in the DWP water main network

435 — Miles of deteriorated water mains that DWP wants to replace, about 6.5% of the network

\$1.34 billion — Cost to replace at-risk water mains by 2025

\$44 million — Annual average amount DWP has spent on pipe replacement in the last eight fiscal years

\$135 million — Annual spending needed to reach 10-year pipe replacement goal

Source: Los Angeles Department of Water and Power

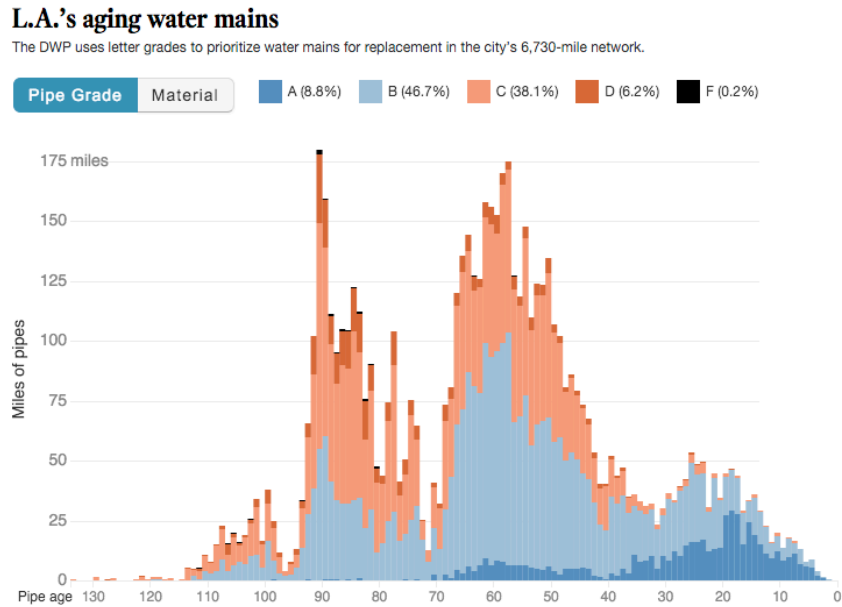
Currently, LADWP has a \$1.3 billion plan in place to replace 435 miles of aging pipes within the next 10 years; however, there is still controversy as to how the plan will be implemented, where the money will come from, and whether the plan is feasible to carry out (Poston and Stevens 2015). With its current plan, LADWP would have to double the amount of pipes it replaces annually and more than triple the amount the department pays for replacements every year. Foreseen obstacles mainly come from the funding aspect, as the department has to partially rely on getting city leaders to approve higher water rates to which Mayor Eric Garcetti stated “Like the average rate-payer, I will have to be shown the case...but I'm interested in not burying my head on this problem.” With such a large issue

at hand, it seems worrisome that it is not one of the Mayor's higher priorities, especially as millions of gallons of water from these leaks are wasted during California's worst droughts on record (Poston and Stevens 2015).

Approximately 250,000 pipes make up DWP's 6,730-mile water main network and of which there are nearly 4 leaks a day that happen across the city. The department has spent on average \$44 million a year, in the past 8 years, replacing approximately 21 miles of pipes annually while about 8 billion gallons of water are lost each year to leaky pipes.

DWP engineers use a letter grade scale to prioritize water pipe replacements based on key factors they believe contribute most to the breakage of pipes such as pipe age, soil quality, water pressure and leak history. The department's 10-year plan is focused on replacing pipes that fall on the lower end of this grading scale. Through analyzing the pipes on this system they found that 6% of them earned grades of D and F. DWP believes they will be able to replace all of those pipes by 2025 (Poston and Stevens 2015). While 6% may seem like a low percentage, in looking at Figure 4, one can see the extensive percentage of pipes that received the letter grade C. Yet, there is little information publicly available regarding the tangible consequences associated with each letter grade. However, given the millions of water that leak from this pipe system, one could assume that we should not be comfortable with having a large portion of our pipes receiving the letter grade C, and only a small portion of our pipes receiving the letter grade A (Poston and Stevens 2015).

Figure 4: Letter Grades for LA's pipes Used by LADWP



Source: LA Times, "LA's aging water pipes; a \$1-billion dilemma"

LA's deteriorating pipes are not only causing a loss of millions of gallons of water, but they are also causing damage to water quality in LA. With so many pipes to replace and little information as to how these pipes are affecting all areas of LA, it comes into question how effective is our water testing. As mentioned earlier, there are various examples in LA where the tap water is not safe to drink due to the corrosion of aging pipes. Then begs the question, are aging pipes correlated to the prevalence of RWFs in LA County?

2.10 Retail Water Facilities

Using the evidence found in the aforementioned literature regarding the inequitable distribution of water quality in low-income and high immigrant communities and the subsequent effect of purchasing bottled water, I intend to use this same framework but applied to Retail Water Facilities' customers to see if the observations remain true. The first part of my research aims to understand why customers are buying water at Retail

Water Facilities through their relationship and access to tap water and compare results of RWFs in low and high income communities and low and high immigrant populated communities. The second part of my research explores the systematic flaws in our water regulation system, both in LA County and nationally.

3. METHODS

Since 1996, according to the most recent and only media and academic scholarly coverage of RWFs, the number of RWFs has risen dramatically: increasing from 292 to 1201 RWFs in California (Leovy 1996). With a 311% increase, it is obvious the next question is why? My research question explores just that asking: what explains the prevalence and geographic distribution of Retail Water Facilities? In order to get an understanding of this foreign phenomenon, it is necessary to look at both the demand and supply side of RWFs. To do so, my research is broken into three parts: an analysis of the spatial distribution of RWFs, surveys of customers, interviews with stakeholders, and a brief analysis of the regulation of tap water.

3.1 Data Collection

Three categories of data were collected for the study. These include: data containing socioeconomic status and demographic variables, data for RWF locations, and GIS data representing the Los Angeles County area tracts and geography. RWF locations for the county were requested and acquired (October 2015) from the California Department of Public Health's (CDPH) Food and Drug Branch. The dataset is comprised of a list of the current retail water licenses that includes the address, city, county code and license code for each RWF in California. Median household income (in 2013 inflation adjusted dollars) data, foreign born percentages, and place of birth for foreign born population, were acquired from the 2009-2013 (5-year estimate) American Community Survey for Los Angeles County census tracts as distributed by the U.S. Census Bureau, the most recently available ACS

data set. Lastly, ArcGIS and Social Explorer were used as spatial distribution analyzing tools.

3.2 Spatial Distribution

One of the research goals of this study is to gain a better understanding of the possible relationship between RWFs and socioeconomic and demographic variables of their respective locations in Los Angeles County, California. Over the past two decades, GIS has been proven to be a useful and common tool in environmental justice research because it allows for the examination of spatial relationships that often reveal to target certain at risk populations (i.e. Maantay 2007; Mennis and Jordan 2005; Pearce et al. 2010). GIS offers a large set of analysis tools that can be employed to further enhance the study of the relationships between RWFs and other variables by allowing researchers to not only map these associations but also conduct higher-level spatial analyses.

Using ArcGIS, one of several geographic information systems, relationships among median income levels and foreign-born density were examined using the Los Angeles County's census tracts as the geographic units of analysis. Specifically, I imported the addresses and cities from the data set provided by the CDPH, only within LA County, and overlaid that information with the 2013 Median Household Income layer provided by ArcGIS. I used their analysis "Find Hot Spot" and "Overlay Layers" tools to analyze the relationship between the two variables. ArcGIS allowed for a deeper understanding of the aforementioned demographic and socioeconomic variables that correlate with RWFs in Los Angeles County.

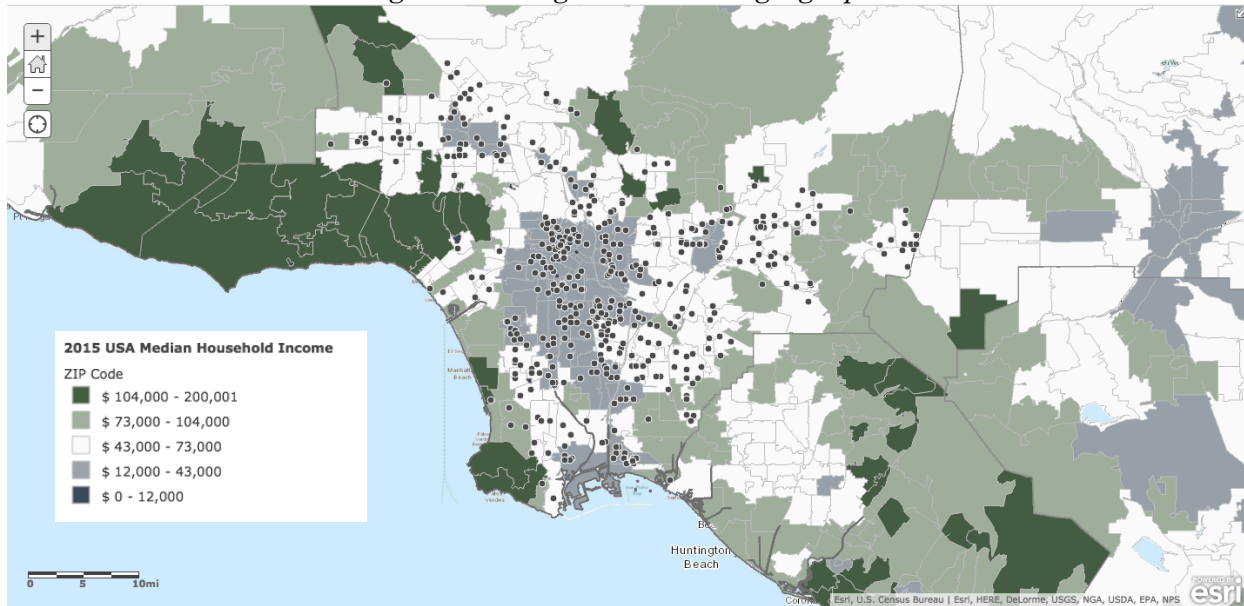
Definition and selection of neighborhood. Existing quantitative studies that explore the spatial distribution of issues that typically exploit low-income communities and communities of color define neighborhoods as census tracts (Moore and Diez Roux 2006; Morland, Diez Roux, and Wing 2006; Cummins 2003; Block, Scribner, and DeSalvo 2004) or

zip codes (K. B. Morland and Evenson 2009; Chung and Myers 1999). However, given the income disparities that exist within zip codes, it's important to examine the spatial distribution of RWFs at as fine a geographic scale as feasible. As such, in this study, census tracts are used as a unit of spatial analysis, not only because this method is used in previous literature, but also because it's the smallest available spatial unit available for the ACS data.

3.3 Pre-Analysis Examination and Processing of Data

I created a choropleth map in order to gain an initial understanding of the distribution of RWFs across the census tracts (Figure 5). ArcGIS provided the 2015 USA Median Household Income base layer. Then, I imported the addresses and cities from the data set provided by the CDPH, within Los Angeles County, creating an additional layer on ArcGIS (Figure 5).

Figure 5. Retail Water Facility locations across 2015 USA Median Household Income, categorized using Census 2010 geographies.



Source: ArcGIS

In looking at the map, it's clear that there's a relationship between RWF locations and low-income communities, as the majority of the RWF locations on the map fall into the periwinkle shade, the \$12,000-42,000 median household income range. Thus, to further explore this relationship, I wanted to compare RWF locations between differing income levels, while also taking into account likely targeted populations such as low-income, high immigrant communities (as alluded to in the literature review).

3.4 Customers

The main research questions for this part of my study is: why are customers buying water? To answer this question, I surveyed 20 customers at four RWFs. Using the same map in Figure 5, I chose at least one RWF for each of the three different income ranges to conduct the surveys: \$12,000-43,000; \$43,000-73,000; \$73,000-104,000 to use for this study. I attempted to keep the same water utility for each of the RWF locations; however, due to the limited choices available for the higher income area, I was only able to choose the lower and middle income RWF under the same water utility (LADWP). The higher income RWF is serviced by the Santa Monica Public Works. Since, the water utilities were not constant in this research project, no conclusions or comparisons can be made in regards to this variable.

For the high-income level group, I decided to forgo the highest income level range given on the map \$104,000-200,001 because there was only one RWF located in that group. Thus, I used the next income level range down, as it had sufficient number of RWF locations: \$73,000-104,000 (light turquoise). With limited choices of RWFs in areas that adhered to the income criteria, I decided to narrow the choices based on areas that were most feasible for I to access and surveyed *Beyond O2 Premium Alkaline Water* located in Santa Monica. The next income range was \$43,000-73,000 (show by white in Figure 5). There was an increase of RWFs to choose from that fit the criteria in comparison to the

previous income range, supporting the initial observational relationship: higher level of RWFs in low-income communities. Again, I chose the RWF based on location accessibility and surveyed *Water Gourmet No. 11* located in Eagle Rock.

The last income range used for comparison was \$12,000-43,000 (shown by periwinkle shade in Figure 5), the income range with the highest number of RWF locations. However, for this income range, I also needed to take into account immigrant population, as I identified in my literature review that low-income, high immigrant areas are likely targets for RWFs. Thus, I used Social Explorer to compile a table, using ACS 2009-2013 (5-Year Estimates), that ranks percent foreign born from highest to lowest, and median household income from lowest to highest for all of the census tracts in Los Angeles County. In looking at both columns, I systematically went down both sets of data to find the first census tract in common from both columns. With each census tract that I found in common between both columns, I cross-referenced it with the map in Figure 5 to ensure there were at least two RWFs in that area.

The only media/scholarly article written about RWFs was published in 1996, and it states “the industry’s largest growth has been in communities of immigrants from Southeast Asia and Latin America” (Leovy 1996). Thus, I wanted to be able to compare areas that had varying ACS *Place of Birth for the Foreign Born Population* demographics. While going through both columns of data (percent foreign born and median household income), I also cross-referenced the common census tract with an Excel sheet that included a breakdown of place of origin for each census tract. In looking for the right census tract, many census tracts were disregarded if they had a similar “place of birth” immigrant percent distribution even if they were the next census tracts in common between both columns. For the last census tract, not only did I want to find one where the majority of the immigrants came from Latin America, but I also wanted to choose an area that had a large

percentage of native-born Latinos and immigrant Latinos. By doing this, I wanted see whether or not the usage of RWFs is an immigrant limited phenomena. This criterion led to a census tract chosen in Highland Park and the RWF *LA Pure Water*. Table 1 includes the aforementioned statistics for the final census tract areas chosen. Additionally, to provide more specific data regarding the location of the census tracts chosen above in Table 1, maps of the tracts and surrounding area are provided in Figure 6.

To keep the number of surveys consistent among the four RWFs, I surveyed exactly 16 customers at each location. Additionally, in an attempt to try to keep all variables as consistent as possible I went to each location on the same day of the week (in this case a Saturday) and at approximately the same time period (for this project from 10am-1pm). After completing the surveys, I manually input the responses into Qualtrics and analyzed the data accordingly comparing responses between RWF locations and within each location as well. See Appendix A for customer survey.

Table 1: Summary of Demographic Information for Chosen Census Tracts

Income Category	Larger Area	Census Tract	Foreign Born %	Median household income (In 2013 Inflation Adjusted Dollars)	Place of Birth for the Foreign Born Population (majority % shown)
Low	Highland Park	1838.10	45.9%	\$30,125	92.8% - Latin America 6.2% - Asia
Middle	Glassel Park	1862.02	35.6%	\$63, 438	37.7% - Latin America 57.6% - Asia
High	Santa Monica	7020.02	18%	\$74, 301	39.60% - Latin America 19.9% - Asia

Source: Data Compiled From Social Explorer Tables: ACS 2013 (5-Year Estimates) (SE), ACS 2013 (5-Year Estimates), Social Explorer; U.S. Census Bureau

Figure 6. Visual geographical boundaries of census tracts (blue shaded area with red outline) from Table 1 and surrounding areas.

Figure 6A: Census Tract 1838.10

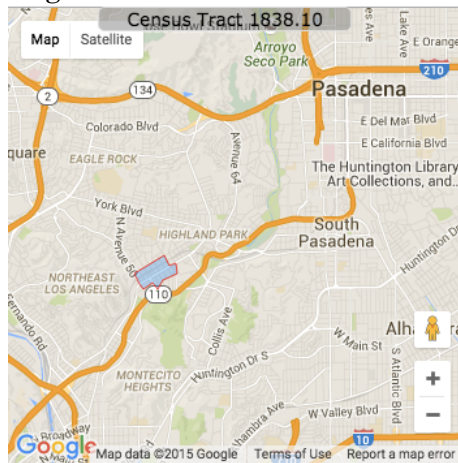


Figure 6B: Census Tract 1862.02

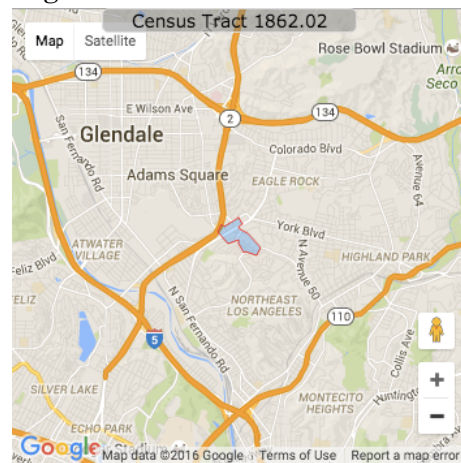
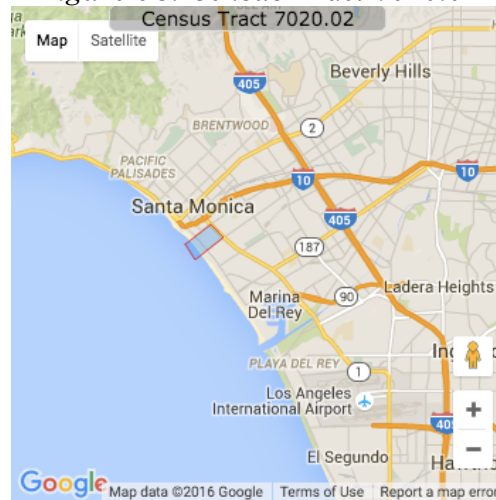


Figure 6C: Census Tract 7020.02



3.4.1 Customer Survey Data Collection Limitations and Observations

I encountered various limitations based on the income area I was investigating in. The major characteristics that I felt influenced my data collection were the following identifications: female, Occidental College student, Asian American, and monolingual (English).

In the predominantly Latino/a areas, I obviously had a language barrier not speaking Spanish as well as the obstacle of physically looking like an outsider being Asian American. Alongside this, in the high immigrant areas, physically looking like an outsider

further caused many potential survey respondents to dismiss I as they thought I was undercover and worked for the government seeking to find undocumented immigrants. Many asked to see my ID to make sure I was in school, others directly asked if I worked for the government.

Additionally, in the areas I was surveying that were near Occidental, I faced unforeseen obstacles identifying as a student of Occidental College. Numerous respondents referenced some aspect of gentrification and Occidental's role in participating in it with a negative connotation linked to it.

On the other hand, in the higher income areas, I felt that identifying as a student actually helped gain more respondents and trust, which could attribute to the higher response rate seen in this income area compared to the lower income areas. Additionally, physically looking like an Asian American, I did not look as much of an outsider also aiding in the higher response rate.

Overall, in all of the areas, I believe that identifying as a young, female, student probably helped gain more responses. In the future, to try and overcome the two major obstacles, I would pick low-income areas away from Occidental, and find ways to account for the language barrier in both the high Asian immigrant and Latino/a immigrant areas.

3.5 Business Owners

3.5.1 Data Collection Limitations

The original purpose of this section of this study was to learn more about the supply side of these RWFs. To do this, I originally intended on interviewing RWF business owners and comparing the responses between varying demographic areas. Generally, I wanted to figure out why and how RWF business owners entered this industry, how they treat the water, and whom they cater their business to. I sought to interview at least one business owner from at least two of the three areas, for a minimum of 12 business owners. Over the

span of four weeks, I went through the list of RWF phone numbers provided by the California Department of Public Health, Food and Drug Branch asking if the store owner was present and if not when he or she would be back in the store. Many of the workers I spoke to on the phone didn't know exactly when the store owner would be back at the store and wouldn't provide further contact information for the store owner. In other instances, when the worker on the phone gave a specific time they thought the storeowner would be back at the store, I drove to that RWF at the given time only to find out that the storeowner was not present. When I realized that calling was not working, I thought that perhaps asking in person might help. This was true to a certain extent.

3.5.2 Data Collection

I was able to get in contact with one RWF storeowner. For anonymity reasons, I can only state that the owner was from a RWF in a low-income area as defined earlier. The fact that I was able to interview at least one business owner seemed possible only because the interviewees' RWF had only been open for two months, thus it seemed reasonable that the storeowner was present. See Appendix B for the interview questions.

3.6 Industry Accountability

To fully understand the reasoning behind retail water facilities, it is important to learn about the industry and the larger system RWFs are a part of. I needed to know which people and departments are held accountable for these stores within the state. To accomplish this part of this research project, I conducted semi-constructed interviews with stakeholders across the RWF industry:

- Jane Reich, Chief, Food Safety Inspection Unit at the California Department of Health
- Frances Spivy-Weber, Vice-President, State Water Control Resources Board
- Albert Gastelum, Director, Water Quality Division, Los Angeles Department of Water and Power
- John Kemmerer, Associate Director, Water Division, U.S. EPA Region 9

4. FINDINGS

4.1 Background

As mentioned earlier in the methods section, I surveyed customers at three different RWF locations: one RWF in a low-income/high immigrant area, a middle-income area, and high-income area. For all three locations, 16 surveys were collected to keep the number of respondents consistent. As a reminder, here is a quick summary from the methods section:

The RWF that was surveyed for the low income/high immigrant area was LA Pure Water located in Highland Park. This RWF is located in census tract 1838.10 with 45.9% foreign born and median household income of \$30,125. According to the ACS 2009-2013 data set, 92.8% of the foreign born in this area were born in Latin America. I chose this area, not only because it classified as a low-income area based on the median household income, but also because about half were foreign born. Thus, I wanted to see whether or not the usage of RWFs is an immigrant limited phenomena. The response rate was approximately 42%.

For the middle-income category, an area where the median income ranged from \$43,000-73,000 was *Water Gourmet No. 11*, a RWF located in Glassel Park. The median household income for this area is approximately \$63,000 per year. Lastly, the RWF that I collected surveys from that fell under the category high income was Beyond O2 Premium Alkaline Water located in Santa Monica (census tract 7020.02). The average median income of this area is approximately \$74,000.

For the purposes of this section, I will be using the following abbreviations for the aforementioned RWFs with the goal of helping the readers remember which RWFs are associated with their perspective income areas:

Table 2: Abbreviations of RWFs

Income Level Census Tract Category	Name of Retail Water Facility	Abbreviation Used for This Paper
Low-Income/High Immigrant	<i>LA Pure Water</i>	RWF L (for low-income)
Middle-Income	<i>Water Gourmet No. 11</i>	RWF M (for middle-income)
High-Income	<i>Beyond O2 Premium Alkaline Water</i>	RWF H (for high-income)

4.2 Who is Buying Water?

Are the customers representative of the surrounding community’s demographics or are RWFs targeting specific groups of people within each location?

One of the major questions, on the consumer side, that I looked into was: who is buying water? Specifically, I wanted to know the ethnic breakdown and percent foreign born. Again, I wanted to look at percent foreign born because in the literature review, we found that there was speculation that people could be buying water because they are immigrants carrying over an ideology about unsafe tap water back where they originated to the United States. However, I did not just solely want to look at ethnic background and percent immigrants. I wanted to see if the demographic of the RWF customers matched the demographics of the surrounding area. By doing so, I wanted to see if RWFs were targeting a specific demographic population.

Figure 7 shows the demographic breakdown of RWF L’s census tract and of RWF L’s customers. As mentioned above, RWF L’s census tract reveals that 92.8% of the foreign born were born in Latin America. As seen in both Figure 7 and 8, the percent of foreign-born that were born in Latin America is almost exactly the same for the community and customers. Overall, in looking at Figure 7, at first glance, the demographics of the customers match closely to those of the surrounding community. However, if one were to look at the percent difference between the two data sets, one would be able to see if there’s any significance in the percent changes.

Figure 8 shows a plot of the percent change of demographic variables using ACS census tract 2009-2013 data (See Appendix C for Tables). The percent changes are in relation to the ACS data. In other words, the percentages shown in Figure 8 represent the change in demographics of RWF L, for example, in relation to the demographic data for RWF L's census tract. Thus, the bar data below 0% in Figure 8 show a percent decrease of the demographic variable for RWF customers in comparison to the community demographics.

Figure 7: RWF L Demographics vs. Surrounding Community Demographics

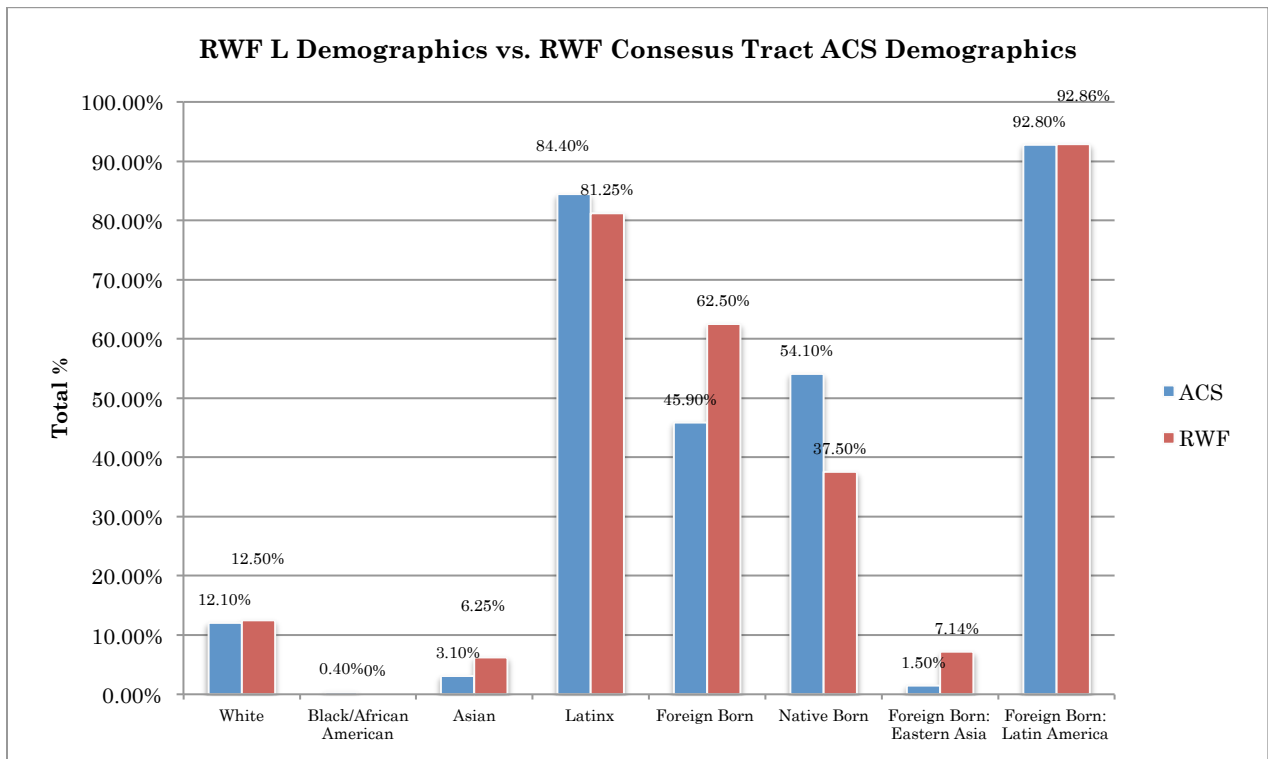
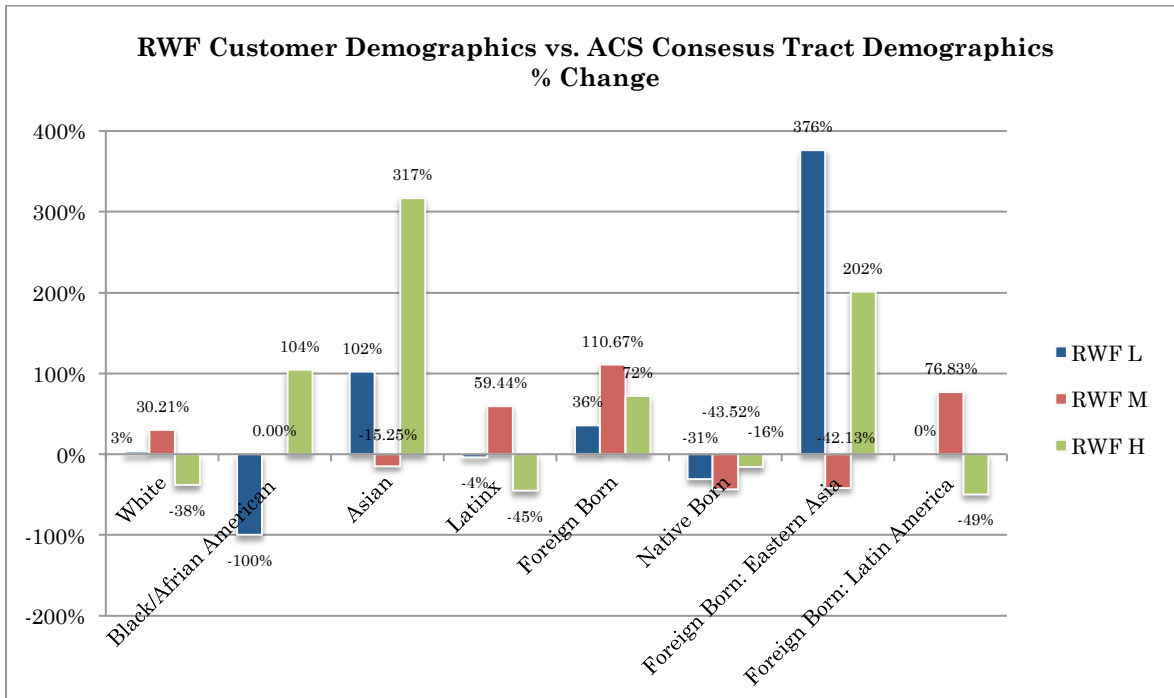


Figure 8: Percent Change of Demographics Between RWF and Surrounding Area



For RWF L, while there was 0% change in percent of foreign born, born in Latin America, there was a significant increase in percent of immigrants born in East Asia (376%). This finding is particularly interesting due to the fact that 92.8% of foreign born in this area is born in Latin America. This finding is also reflected in the increase of Asian costumers (102%), not necessarily immigrants, showing that this RWF phenomenon may not be limited to immigrants and may in fact be a result of a cultural ideology. Also shown in Figure 8 is an increase in foreign-born customers in general (36%) and a *decrease* in native-born customers in comparison to the community demographics. Overall, there is a clear increase in foreign-born customers, Asian customers, and specifically immigrant customers born specifically in East Asia all relative to the surrounding demographics of the community. This finding, therefore, at least for the low-income/high immigrant area

matches what was predicted in the literature review in regards to the speculation that RWF customers were most likely immigrant driven (from Latin America and East Asia).

The most significant data shown in Figure 8 is that the only variable where we see a consistent increase for all three locations is for the category foreign born, with percentage increase ranging from 36-111%. From this, we can cautiously state that RWFs are (intentionally or non-intentionally) targeting immigrants. Due to the limitations of this study, there is not enough information to comprehensively dissect that observation. That is, where did they learn not to trust their tap water? From their parents and grandparents? Because their tap water is actually unsafe to drink? These are some initial questions that would be a great starting point for a future study on this topic.

There's also a significant increase of immigrants born in East Asia for RWF H (202%). Again, this finding is also reflected in the significant increase of Asians (317%) for RWF H. As mentioned earlier, it would be interesting to follow up with these individuals to learn more about how they came about buying water and to what extent is buying water a cultural perception of unsafe tap water back where they were born.

4.3 How Much Water are Customers Buying? How often are people buying water? How much are they Spending?

To better understand RWFs, it is important to understand how much water customers are buying at these RWFs, how much money they are spending, how often customers return to the store, and whether or not there are any differences across the different income level areas. Figure 9 shows that as you increase in income level, there is a decrease in the average number of gallons bought per month per person. In other words, customers at RWF L, on average, bought the most number of gallons per month per person. Figure 9 also shows that customers at RWF L spent on average the most per month per household. Customers at RWF H spent more on average per month in comparison to

customers at RWF M despite having a lower average of gallons bought. This can be explained through RWF H's higher price per gallon of water. Figure 10, however, shockingly shows that not only do customers at RWF L buy on average more gallons of water per month in comparison to the other two RWF locations, but also RWF L customers go back to the store more often. As the RWF income level increases, Figure 10 shows that customers visit the store less often.

Figure 9: Gallons Bought Per Person and Average Amount of Money Spent Per Month

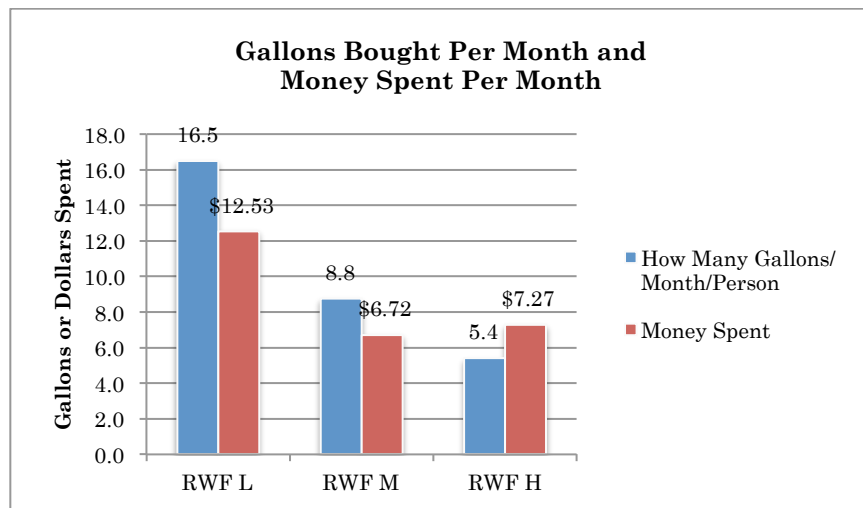
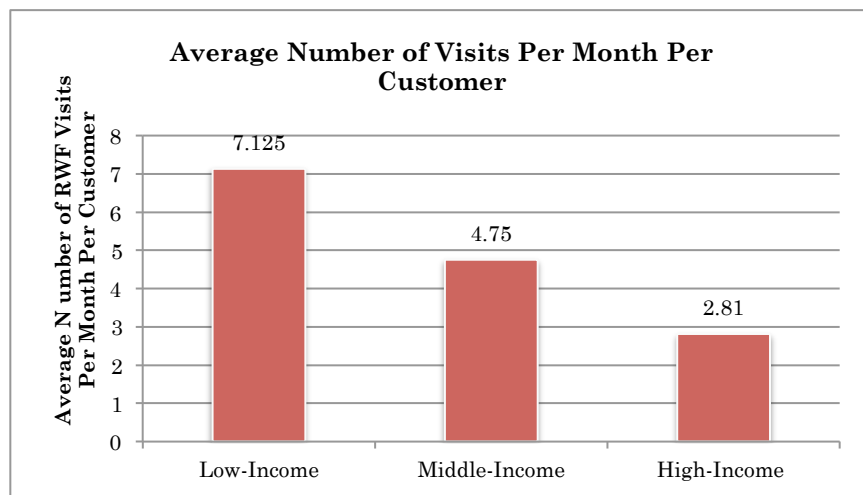


Figure 10: Average Number of Visits Per Month



More importantly is how much these customers are paying for water. There's an evident increase in price per gallon for RWFs as you increase in income level, which is to be expected. Between the three RWF locations, the average price per gallon for water was 35 cents (Figure 11). At first glance, these value seems low; however, if you compare that value to the average price per gallon for tap water in California, the results are shocking. According to the Water Works Association, a gallon of tap water costs 0.0047 cents, meaning individuals who buy water at 35 cents per gallon are paying approximately a 7300% increase (Figure 12) for something the United States government deems as a subsidized public good that is publicized to the public as not only being highly regulated, but also safe to drink. It is almost unimaginable that some individuals come to this RWF more than two or three times a week to purchase water at a 7300% increase. To put this in perspective, a 7300% price increase is equivalent to buying an apple for \$74 instead of \$1. If all grocery stores started selling apples for \$74, people would certainly be outraged and most likely would refuse to purchase that fruit even though fruit is not considered a basic human right. So, it is even more outlandish that individuals all over LA County are doing the same for water, yet no one seems to care.

Figure 11: Price of RWF Water vs. Tap Water

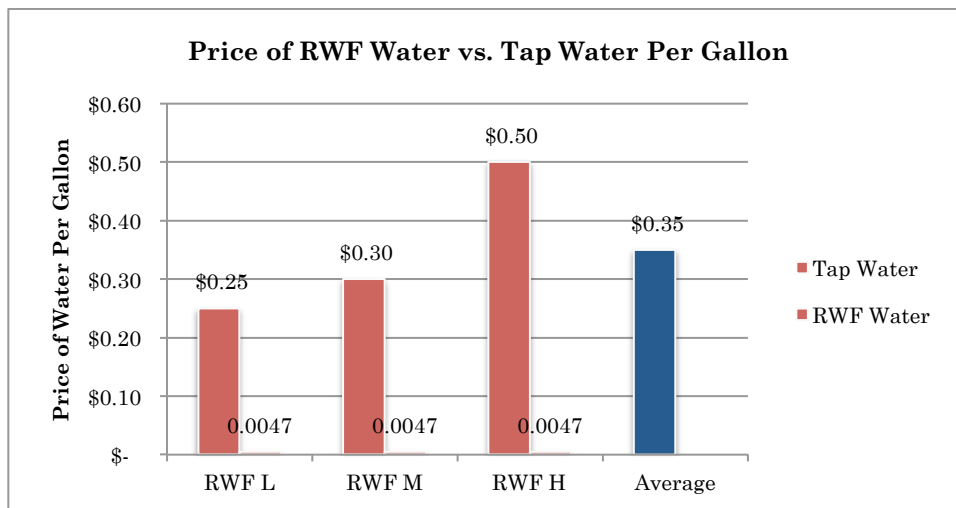
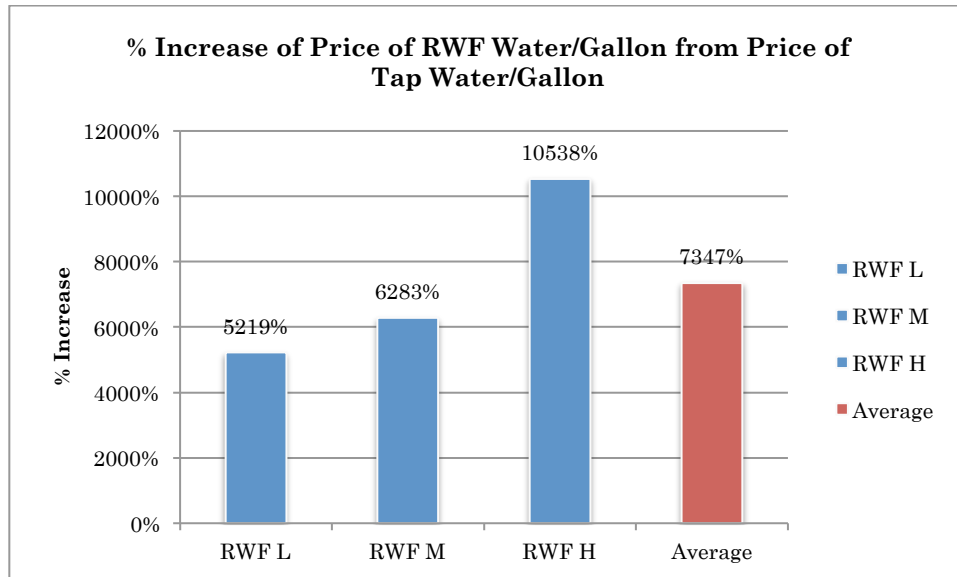


Figure 12: Percent Increase of RWF Water from Tap Water



4.4 Field Observations

While there were subtle physical differences between the middle income RWF and the low-income RWF, Beyond O2 Premium Alkaline Water (RWF H) shown in Figure 13c showed the most prominent differences appearance wise. Outside of the store there were nice umbrellas, glass tables, and some comfortable chairs for people to lounge on and supposedly enjoy their water. On the side of the store, there were various informational posters explaining how the water was filtered and why their pH would give you the best physical benefits. Inside the store, everything was much newer and kept in good condition in comparison to the other two RWFs. They even sold trendy glass jugs with knitted bags that you could carry your water jugs in. The store inside was decorated nicely with a modern, beach vibe, as the store was located near the ocean. The appearance both inside and out clearly revealed a profound difference between the other two RWFs. It was even apparent in the signage, as it wasn't worn down; in fact, it looked brand new. Additionally, the fact that the store's name was in cursive automatically made the store feel of a certain prestige. There was little difference between RWF L and RWF M appearance wise. Both

RWFs looked a little run down, with old signage on the windows and little to no decoration inside the stores. The linoleum floors in both stores were scratched and had plenty of dirt stains, presumably from the water carts used to help roll out the water jugs to customers' cars. Figure 13a shows the storefront of RWF L. Figure 13b is not a picture of RWF M, as I did not take a picture of that store, but it is of another RWF in the same income range.

While I stood outside each RWF, I also decided to count the number of customers entering the store per hour. To maintain some consistency I made sure to collect surveys at each RWF on the same day of the week at the same time. For this research project, I chose to collect surveys on Saturdays from 10am-1pm. I counted customers entering each RWF from 10am-11am and found that the number of customers per hour was significantly higher for RWF L with 30 customers/hour in comparison to 23 customers/hour for RWF M and 12 customers/hour for RWF H. This observation matches the findings section of this paper, where we found out that the average number of visits per month per customer is the highest for RWF L.

Figure 13a: RWF L



*Figure 13b:
RWF in Middle Income Area*



Figure 13c: RWF H

