CAROLINA CUP-SHARE: INVESTIGATING THE NEED AND POTENTIAL STRATEGIES FOR IMPLEMENTING A CUP-SHARE PROGRAM AT UNC-CHAPEL HILL

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ABSTRACT
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Carolina Cup-share: Investigating the Need and Potential Strategies for Implementing a Cup-share Program at UNC–Chapel Hill
(Under the direction of Carol Hee)

An estimated 600 billion disposable cups are thrown away annually around the globe ("International Coffee Agreement," 2007). Research suggests that reusable cups are the only sustainable alternative to disposable cups, but the barriers to using reusable cups must be removed in order to make them a viable alternative (McKenzie-Mohr, 2011). The concept of a cup-share program presents the possibility of removing these barriers. The purpose of this thesis is to understand (1) the need for and possibility of a cup-share program and accompanying solutions to address disposable cup waste at UNC-CH, (2) the concerns and suggestions held by key stakeholders regarding these solutions, and (3) how these solutions might be implemented and paid for. Findings indicate there is a significant amount of disposable cup waste generated on campus, but there is also a strong possibility for a cup-share program and certain accompanying solutions to address this waste at UNC-CH.

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I. INTRODUCTION

An estimated 600 billion disposable cups are thrown away around the globe every year ("International Coffee Agreement", 2007). One contributing factor to the immense size of the disposable cup waste problem is that the most common type of disposable cup, the paper cup, has a polyethylene (plastic) lining, which allows it to hold liquid, but is also very difficult to separate from the paper shell. As a result, only a few cities have the recycling facilities that are able to recycle them, so almost all of them end up in a landfill, or worse, in the ocean (Houck, 2018). As a result, the disposable cup has caught the attention of many people in the sustainability field and has become a poster child for those demonstrating the impacts of consumerism on the planet (Fearnley-Whittingstall, 2016). Regardless of the number of studies, design competitions, and campaigns that have been done looking to address the disposable cup waste issue, no one has been able to find a solution with a significant or lasting impact.

Further, even after decades of being in the environmental hot seat, the disposable cup waste issue only caught mainstream media towards the end of 2017. Specifically, the introduction of a proposed “latte levy” in the UK that would require a £0.25 tax on all beverages served in disposable paper cups has brought the disposable cup waste issue into a more public light (Harrabin, 2018). As a result, activists have been capitalizing on this media attention by circulating petitions and calling out big coffee shop brands for their contributions to the problem. One of these petitions circulated in early March by Stand.earth, called out Starbucks, the largest coffee shop chain in the nation (Palmer, 2017; “Starbucks: Break Free from Plastic”, 2018). Under more pressure than they’d ever faced before on the issue, Starbucks responded by

announcing a $10M reward to anyone who can provide a more readily recyclable or compostable cup ("Starbucks and Closed Loop Partners to Develop Recyclable", 2018).

While this proposal by Starbucks may seem like a noble effort to tackle the disposable cup waste issue, promoting recyclable/compostable single-use alternatives is not as sustainable as many think. Several studies have found that compostable alternatives may actually be worse for the environment (Levis and Barlaz, 2011; Song *et al.*, 2009; Van der Harst and Potting, 2013; Vares and Häkkinen, 2010). Additionally, recycling and composting are actually the least preferred method of waste reduction (U.S. EPA, 2017b).

Almost everyone knows the three R's of waste reduction: reduce, reuse, recycle. However, not as many people are aware that it is a very purposeful hierarchy. When looking at the overall impact on the environment, the best thing people can do is reduce the amount of a resource they consume. This can be done either by simply reducing overall use of a resource or reusing the same resource. Only after these first two options have been exhausted, is recycling or composting the sustainable option (U.S. EPA, 2017b). However, in the 1950s, these three R's of waste reduction were not around, and the "throwaway living" era had just begun (Cosgrove, 2014). As a result, while reducing and reusing are the preferred methods of waste reduction, in reality, recycling, which has fit most easily with the throwaway lifestyle, has become the preferred option of consumers, who have become used to the convenience and ease of this lifestyle, and of the companies that benefit from this consumeristic lifestyle (Bradbury, 2017).

Starbucks may be able to calm consumer concern by promoting compostable and recyclable alternatives for the time being. However, if they, and other coffee companies alike, want to avoid facing the same criticism in the future when the public realizes that these alternatives are not as great as they were originally made out to be, they need to be investing in solutions that align with the hierarchy of the three R's and focus on source reduction rather than resource recovery. Specifically, the solution must find a way to substitute disposable cups with

reusable cups. However, while efforts to transition consumers to reusable cups have existed for decades, none have achieved any significant or lasting effects.

Community-based social marketing, CBSM, developed by Doug McKenzie-Mohr (2011) in the 90s, draws on insights from the field of psychology to understand why consumers engage in a certain behavior and not another and how their habits might be influenced. Using CBSM as a guide, I came to understand that the main barriers to reusable cup usage had to do with inconvenience, namely having to remember, carry around, and clean the cup—factors that prior research also found (Alsop *et al.*, 2004; Fairbairn *et al.*, 2008; Wittmer and Price, 2009; Guo *et al.*, 2015; Joongsup, 2016). Further, I discovered that these barriers, which are out of the control of the consumer, according to McKenzie-Mohr (2011), are extremely difficult to overcome and must be explicitly removed before the consumer will change their behavior. These findings helped explain why previous efforts to transition consumers to reusable cups had been so unsuccessful.

Further, these findings led me to conclude that a solution which removed these barriers was needed in order to address the disposable cup waste issue. Fortunately, in researching the issue, I also came across an idea that had the potential to accomplish this: a cup-share program. A cup-share program is similar to a library system for reusable cups. Once signed-up, a user is able to check-out a reusable cup at the location where they are getting their beverage. When they are finished with their beverage, they check it back in at return bins located at all of the participating locations and, ideally, around their community as well. The dirty cups are collected, cleaned, and returned back to the participating locations to be checked out again (Guo *et al.*, 2016; Ruskey *et al.*, 2016; "VESSEL", n.d.). At full scale, a cup-share program has the potential to completely eliminate the need for disposable cups.

Cup-share programs, along with bike-share programs, like Citi Bike in NYC, ride-share companies, like Uber and Lyft, and home-share companies, like Airbnb, are part of the newly emerging concepts of the "sharing economy" and "collaborative consumption" (Botsman, 2010).

The driving force behind these concepts is capitalization on resources that are typically found to be under-utilized through the creation of services that provides these resources for only when they are needed—often utilizing the resources already owned by others (Albinsson *et al.*, 2018). For example, the bike sitting in your garage, the person sitting on the couch with spare time and a decent black car, the air mattress sitting in your spare bedroom, or the travel mugs sitting in your kitchen cabinet are each a resource that are frequently underutilized. Instead of owning things that we only use a fraction of the time or cannot afford to own, we are increasingly able to rent them from someone else for just the time that we need them (Botsman, 2010).

The ability to create these services has emerged thanks to the growing availability and decreasing cost of internet-enabled devices. The pervasiveness of smartphones, specifically, has made several on-demand services possible by putting instant access to the internet in the palm of consumers (Botsman, 2010; Hassan *et al.*, 2017). Additionally, a new wave of possibilities is emerging with the rise of the 'Internet of Things', or IoT. Specifically, advancements in electronic components over the past decade have made devices smaller, cheaper, more power efficient, and more capable, which has made it possible to incorporate them into more products. From smart light bulbs to smart watches, we are increasingly more connected to things we own than we have have been before (Hassan *et al.*, 2017). Further, devices like the Arduino Uno and Raspberry Pi, which pack the capabilities of a mini computer into a package that fits in the palm of your hand and cost less than $50, have significantly lowered the cost of developing new autonomous electronic devices (Richardson, 2016). As a result, developing unique solutions to problems that have been around for decades can be accomplished even with limited resources. Cup-share programs are a prime example of these developments.

Specifically, internet-enabled devices have made the sharing economy possible because they solve the problem of accountability (Botsman, 2012). While programs like Airbnb and Uber can rely on user ratings to keep users accountable, programs that do not involve two parties in each transaction need a more direct solution. For instance, bike-share programs first started in

1965 in Amsterdam; however, due to theft of the bikes and no way to track the perpetrators down, these programs quickly failed (DeMaio, 2009; McKenzie-Mohr, 2011). With the advances in internet-enabled devices, bikes can now be registered to a known user with a linked payment account, making the user accountable for returning the bike or otherwise paying for the loss. In a cup-share program, the ability to register a cup to a user's account through an autonomous check-out device has made holding people accountable for the cups possible. Additionally, cheap cellular-enabled chips have made it possible to place autonomous return bins, which have the ability to check a user's cup back in, in the places where users are used to throwing away their disposable cups. These new possibilities have given cup-share programs the potential to remove the barriers of using a reusable cup and finally address the disposable cup waste issue.

Of course, an idea is not a solution until it has been tested and the success measured. Unfortunately, while a few tech-enabled cup-share programs have been piloted, each of them was significantly limited in scope and results on their success is also limited. Accordingly, my study investigates how a cup-share program along with other strategies could be implemented to address the disposable cup waste problem in my community: The University of North Carolina at Chapel Hill (UNC-CH). My hope is that, in addition to proving the validity of cup-share programs as a solution to the disposable cup waste issue, a successful cup-share program at UNC-CH can contribute to a new initiative launched at UNC-CH in the Fall of 2016, called the Three Zeros Initiative. This initiative lays out three goals for sustainability on UNC-CH's campus: "net zero water usage; zero waste to landfills; and net-zero greenhouse gas emissions" ("Three Zeros Environmental Initiative", n.d.). Particularly, I believe that a cup-share program falls in line with the priorities of the waste reduction goal, which aims to reduce waste "by first limiting the amount of waste brought on to campus and then by recycling and composting waste that leaves the campus" ("Zero Waste to Landfills", n.d.).

The research described in this thesis aimed to assess three things: (1) the need for and possibility of a cup-share program and other solutions to address disposable cup waste at UNC-

CH, (2) the concerns and suggestions held by key stakeholders at UNC-CH regarding these solutions, and (3) how these solutions might best be implemented and paid for.

II. LITERATURE REVIEW

Disposable cups, especially paper cups that are most commonly used to serve coffee and other beverages at cafes, present a significant barrier towards moving to a waste-minimizing society. Disposable cups make up a significant portion of our waste streams and have become ingrained in our consumption-centric culture (Bradbury, 2017; Houck, 2018). Additionally, the alternatives are not without their own challenges, especially when a change in consumer behavior is necessary. Community-based social marketing (CBSM) presents a framework for understanding why consumers do not engage in sustainable behaviors as well as how to influence consumers towards these behaviors. In this chapter, I will discuss the context of the disposable cup waste issue; evaluate the alternatives to disposable cups; review CBSM and its application in finding the most effective solutions to the disposable cup waste issue; review the concept of a cup-share program as a potential to be part of the most effective solution; and examine strategies that could be used in conjunction with a cup-share program to further reduce disposable cup waste.

A. Context of The Disposable Cup Waste Issue

Disposable cup waste contributes to the larger issue of municipal solid waste, which in 2014 in the U.S. amounted to 254 million tons of trash (U.S. EPA, 2017a). Specifically, disposable cup waste contributes to the containers and packaging category, which makes up almost one-quarter of the entire U.S.' waste stream (U.S. EPA, 2017a). Not only does this category contribute heavily to the overall waste stream, it also makes up the majority of litter found in natural spaces (Marsh and Bugusu, 2007). Further, the most popular disposable cups are paper cups, which belong to the paper products subcategory that makes up the largest portion of

the containers and packaging category (U.S. EPA, 2017a). As a result, disposable cup waste has become a recognized problem both by the public press and the scientific community.

Estimates of the size of the disposable cup waste problem on a broad scale have been frequently referenced in the press, but none of them are tied to any empirical evidence. Specifically, regarding the number of paper cups consumed every year in the US, the estimates range 25 billion to 60 billion (Frater, 2014; Kottasova, 2016; Green Motion, 2016). Globally, this figure is estimated to be ten times larger at 600 billion ("International Coffee Agreement", 2007). The sources of these estimates, however, do not provide any evidence to back up their calculations, so the true size of the problem is still not certain. An empirical study estimating the number of paper cups consumed annually in the U.S. or a broader region would help validate the arguments regarding the significance of the disposable cup waste problem.

Several small-scale studies have been conducted on the significance of disposable cups' contribution to local waste streams. These waste audits have mainly been conducted on university campuses where the waste stream is easier to survey as the sources of waste are contained within a relatively small geographic region. Waste audits done in Canada at Dalhousie University (Alsop *et al.*, 2004) and the University of Northern British Columbia (Smyth *et al.*, 2010) found that disposable cup waste made up 9% and 7.5% of their overall waste stream, respectively. A study conducted at Seattle University (Wittmer and Price, 2009) found that waste from disposable coffee cups took up the largest volume in the waste bins located in the University's academic and administrative buildings. These studies indicate that disposable cups, especially paper cups, can contribute significantly to the consumer waste stream, especially on university campuses.

Further, of disposable cups, paper cups present a particular challenge because, while a significant amount of people believe they are recyclable; they are, in fact, only recyclable in a hand full of cities (Houck, 2018). This is due to a plastic polyethylene lining that is commonly used to allow these cups to hold liquid and requires very specific and expensive recycling facilities to separate it from the paper shell (Mitchell et. al, 2014). A study conducted at

Dalhousie University found that 35% of consumers thought their paper cups were recyclable and were improperly disposing of them as a result (Guo *et al.*, 2015). Improper disposal of paper cups can have major negative impacts on local waste management services. When regular paper cups are improperly placed in recycling or composting receptacles in areas where they cannot be processed, they become a form of contamination that can cause entire batches of collected recycling or compost to be thrown away (Vares and Häkkinen, 2010).

B. Evaluation of The Alternatives

Three potential alternatives to the most commonly used paper cup exist: more easily recyclable paper cups, compostable cups, and reusable cups. In this section, I will review the factors that must be considered when using one of these options as an alternative disposable cups as well as evaluate which option appears to be the most sustainable.

i. Recyclable and Compostable Cups

A potential solution to reduce disposable cup waste is to replace paper cups with more readily recyclable or compostable alternatives. While a startup in the UK, called FrugalPac, has started work on developing a more easily recyclable paper cup, this option is not yet commercially available (Smithers, 2016). The currently most popular single-use alternatives to traditional paper cups are cups made completely compostable by the substitution of traditional paper cups' plastic inner liner with a liner made with polylactic acid (PLA), which comes from corn (Van der Harst and Potting, 2013; Ziada, 2009). This compostable alternative is readily available and is the preferred choice of many university dining services and coffee shops (Alsop e. al., 2004; Fairbairn *et al.*, 2008; Guo *et al.*, 2016; and Ziada, 2009).

Compostable alternatives seem like simple solutions to the disposable cup waste issue; nevertheless, a life cycle perspective reveals that there are significant problems with these alternatives.

Lifecycle Assessment

While recyclable and compostable alternatives prevent some of the natural resources used to make them from going to waste, they are not without an environmental impact. Specifically, a significant amount of greenhouse gas emissions is generated from the energy and fuel requires to produce, transport, and recycle/compost (Van der Harst and Potting, 2013; Vares and Häkkinen, 2010). To be able to understand how much energy is generated from a product, a lifecycle assessment, or LCA, is needed. An LCA factors in the environmental impacts of a product during its entire lifecycle, from raw material acquisition through manufacturing and consumer use to disposal (Schaubroeck and Rugani, 2017). As a result, LCAs allow for a more accurate comparison of the sustainability between two products. Van der Harst and Potting (2013) examined LCAs of various types of disposable cups, including compostable cups, and found that "no cup material ranks consistently better than other cup materials in all studies, and neither can one cup material be labeled as the most environmentally friendly one." This study indicates that compostable alternatives are likely no better for the environment than the paper cup they replace.

Improper Disposal

The issue of improper disposal is not exclusive to non-recyclable paper cups. Compostable cups can actually cause more problems when they are improperly disposed of. Specifically, compostable materials are meant to be broken down in oxygen-rich, aerobic environments; however, if compostable materials end up in a landfill they become buried along with other garbage in an anaerobic environment. As a result, instead of producing a small amount of CO_2 during the breakdown process, they produce methane (CH_4), which has 72 times the

global warming potential as CO_2 (Lindeberg and Radiwon, 2017). Consequently, compostable alternatives may actually be *worse* for the environment (Levis and Barlaz, 2011). Further, since the adoption of these alternatives by cafes and other beverage locations would not be immediately unanimous, the offering of compostable or recyclable alternatives could further the confusion that causes improper disposal and exacerbate the existing issues with paper cup contamination (Ziada, 2009).

Facility Availability

Recycling facilities for paper cups are not available in all locations, nor are the facilities needed to process compostable cups. Compostable cups made with PLA require specific composting facilities because, in order to break down, PLA must go through an industrial process that includes heating to a temperature of 140 degrees Fahrenheit (Van der Harst and Potting, 2013). As a result, any business that offers compostable cups in areas where this type of composting facilities is unavailable is actually causing harm to the environment because these cups will inevitably end up in anoxic landfills where their decomposition will produce methane.

Legitimizing and Exacerbating a 'Throwaway Lifestyle'

Some researchers and journalists alike argue that replacing disposable cups with compostable or recyclable alternatives only perpetuate the "throwaway lifestyle" that developed in the 1950s with the introduction of more convenient, disposable items (Cosgrove, 2014; Gabbatiss, 2018; Hall, 2017; O'Higgins, 2018; Ziada, 2009). This lifestyle centers around the idea that it is more convenient to be able to use something once and then toss it rather than having to clean or maintain it (Bradbury, 2017). Durning (1992), a senior researcher at the Worldwatch Institute, writes that the trend of focusing on convenience and consumer-centric business practices has caused most consumers to take convenience for granted and to ignore the impacts that providing this convenience cause. Tim Cooper (2010), an expert on the effect product

lifespans have on environmental sustainability, suggests in his book, *Longer Lasting Products: Alternatives to The Throwaway Society*, that moving away from single-use consumption is the only way for society and a healthy biosphere to coexist in the long term. Since compostable and recyclable alternatives allow consumers to use something once and then discard it, these products reaffirm this kind of unsustainable lifestyle.

Further, Sun and Trudel (2017) found that making products recyclable might make people consume *more* of a product because the availability to recycle a resource causes people to feel less guilty about wasting that product. Further, they found that the act of recycling a product elicits positive emotions in consumers that can cause the consumer to use more of that resource than they need. Combined, these results indicate that offering a compostable or recyclable alternative would likely cause people to use even more single-use cups than they currently do, which would exacerbate the impacts of a throwaway lifestyle.

ii. Reusable Cups

Altogether, the conclusions of Cooper (2010), Levis and Barlaz (2011), Sun and Trudel (2017), Van der Harst and Potting (2013), and Ziada (2009) indicate that compostable and recyclable alternatives are not a sustainable alternative to disposable cups and might even be worse for the environment. This conclusion leaves only one option: reusable cups. Nevertheless, the environmental impact of reusable cups and the element of consumer behavior change required still need to be considered.

Lifecycle Assessment

Several researchers have conducted LCAs on reusable cups in comparison to traditional single-use paper cups. The first, and most commonly cited, is Hocking (1994), which found that the average plastic and ceramic mug must be used at least 17 and 22 times, respectively, in order to have a net positive impact on the environment as compared to the average paper alternative.

The second LCA study, Woods and Bakshi (2014), aimed to update and correct errors found in Hocking's study and found similar results but noted that the specific number of times can vary greatly based on the energy efficiency of the dishwasher used to wash the cup, as well as the location where the cup is produced and washed. Location plays a role because the particular mix of clean- and fossil-fuel-based power of a local grid has a significant impact on the greenhouse gases produced as a result of the energy consumed (Woods and Bakshi, 2014). Neither Hocking (1994) nor Woods and Bakshi (2014) included compostable alternatives in their studies; however, Van der Harst and Potting's (2013) findings suggest that the evidence in favor of reusables reported by Hocking, Woods, and Bakshi is applicable to compostable cups as well as paper cups.

Additionally, despite these favorable conclusions for reusable cups, none of the LCA studies included a stainless steel cup in their analysis. According to multiple studies, the most common reusable cups used to replace paper cups are traditional ceramic mugs and plastic or stainless steel travel mugs (Joongsup, 2016; Ruskey *et al.*, 2016; Ziada, 2009). Additionally, two studies suggest that stainless steel is the preferable reusable cup material amongst consumers (Guo *et al.*, 2016; Ruskey *et al.*, 2016). An LCA on a stainless steel travel mug would be beneficial to understanding the break-even point for all the common types of reusable cups. Further, a study resulting in a formula by which someone can calculate the break-even point of their specific cup (e.g. by inputting material composition, weight, dishwasher model, and location) would be even more useful.

Consumer Behavior Change

Moving from disposable cups to reusable cups comes with a unique set of challenges because it traditionally requires users to switch to a different set of behaviors including bringing and washing their own cup, which turns out to be very difficult. In 2008 Starbucks set a goal of selling 25% of their beverages in reusable cups by 2015. However, despite several initiatives, in 2011, this goal was revised to 5%, and in 2015 they abandoned the goal all together as they were

never able to achieve more than 1.9% of their beverages being sold in a reusable cup (Starbucks Corp, 2009, 2012, 2016). In fact, in their 2015 sustainability report, Starbucks went as far as to say "we believe this behavior change is ultimately up to customers" (Starbucks Corp, 2016). In order to be able to replace disposable cups with reusable cups, the reasons that Starbucks, the largest coffee shop chain in the nation (Palmer, 2017), concluded that they are unable to switch their customers to reusable cups need to be understood.

C. Using CBSM to Find a Solution to Disposable Cup Waste

Community-based social marketing, or CBSM, presents a framework for understanding why consumers engage or do not engage in particular behaviors. Further, CBSM presents strategies for fostering pro-environmental behaviors amongst consumers. In this section, I will review the history and theories supporting CBSM as well as review what CBSM suggests regarding the difficulty of switching consumers to reusable cups and the strategies that may be able to address these issues.

i. Review of CBSM

CBSM is part of the larger field of social marketing, which is the study of marketing for a social good, rather than a consumer good. The father of CBSM, Doug McKenzie-Mohr, originally published his book on the concept in 1999 with the intent of creating a relatively easy to follow guide for tackling sustainability-related social problems that require a change of consumers' behavior (McKenzie-Mohr, 2011). McKenzie-Mohr built CBSM off of empirical evidence that showed using traditional, information-intensive advertisements are ineffective at changing consumer behavior to more environmentally-friendly alternatives (See Geller *et al.*, 1983; Jordan *et al.*, 1986).

Rather than using a mass-informing technique, CBSM aims to promote consumer behavior change by developing a solution that is tailored to a specific community and approaches

the problem from a psychological and practical perspective. McKenzie-Mohr organized the CBSM process into five steps: (1) identify the specific behavior that will have the highest impact on the problem, (2) identify the barriers and benefits to the selected behavior as well as the undesirable behavior currently being engaged in, (3) develop strategies to addresses these barriers and benefits, (4) conduct a pilot program implementing those strategies and measure the realized impact, and (5) develop a broad scale implementation plan based off of key learnings from the pilot program (McKenzie-Mohr, 2011). This process has proven successful in numerous studies promoting a wide range of consumer behaviors related to residential energy reduction, preventative lung cancer diagnosis appointments, public transportation, recycling, and more (see Anda and Temmen, 2014; Athey *et al.*, 2012; Cooper, 2007; Dietz *et al.*, 2009; Flocks *et al.*, 2001; Haldeman and Turner, 2009; Kemp *et al.*, 2005; Kennedy, 2010; Martin *et al.*, 2015; Schuster *et al.*, 2016; Streimikiene and Vveinhardt, 2015).

ii. Applying CBSM to the Disposable Cup Waste Issue

Regarding reducing disposable cup waste, for step one, the findings of Cooper (2010), Hocking (1994), Levis and Barlaz (2011), Sun and Trudel (2017), Van der Harst and Potting (2013), and Woods and Bakshi (2014) suggest that promoting the use of reusable cups is the behavior with the highest potential impact to address disposable cup waste, since reusable cups are the only truly sustainable alternative. For step two, the results from the surveys conducted by Alsop *et al.* (2004), Fairbairn *et al.* (2008), Wittmer and Price (2009), Guo *et al.* (2015), and Joongsup (2016) indicate that the top barriers to using a reusable cup are the inconveniences of remembering, carrying, and cleaning the cup, and the top benefits are reducing waste and beverage discounts.

According to McKenzie-Mohr (2011), the barriers present with using a reusable cup are likely the reason why initiatives to switch consumers to reusable cups have been so unsuccessful. McKenzie-Mohr asserts that when barriers are largely out of the control of the consumer (e.g. the

need to wash a cup after it's been used), initiating consumer behavior change is extremely difficult to achieve using conventional techniques. Further, a solution that removes these barriers will be needed for the consumer to engage in the desired behavior, McKenzie-Mohr suggests.

iii. Cup-share Programs

Fortunately, a new concept referred to as a mug-share, or cup-share, program looks to be able to remove these top barriers to using a reusable cup and potentially provide a real solution to the disposable cup waste problem. Similar to bike-share programs that have been successfully expanding into cities around the world, such as the Citi Bike system in NYC (DeMaio, 2009), a cup-share program allows users to check-out a reusable cup at the location where they are getting their beverage. When customers are finished with their beverage, they can check it back in at return bins located in the same places where they are used to throwing away their disposable cups. The dirty cups are then collected, cleaned, and returned back to the participating locations to be checked out again (Guo *et al.*, 2016; Ruskey *et al.*, 2016). As a result, a cup-share program eliminates the need to remember, carry around, or clean a reusable cup.

The idea is still in its infancy, having only been implemented at limited scale with a few pilot programs, but the commercialization of the concept is catching on. In London, for instance, a cup-share program, called "Cup Club," is set to launch in 2018 for the entire city center (Hooker, 2017). Another program, Vessel, ran a pilot in NYC; however, the results of their pilot are not published ("VESSEL", n.d.).

Other similar programs also exist. These programs focus mostly on to-go boxes but work in a similar way. GOBox and Durham GreenToGo provide reusable to-go boxes to restaurants in Portland, OR, and Durham, NC, respectively, which users can check out and return to bins located at participating locations ("GO Box", n.d.; "Durham GreenToGo", n.d.). OZZI, is a full set of reusable food and drink containers for universities and healthcare providers that come with autonomous return bins that are able to check the containers back in around campus, but the

service of collecting and cleaning the containers is not provided ("Welcome to OZZI", n.d.). However, specific measurements of success for these programs have not yet been published either.

The majority of research that has been done on cup-share programs was conducted at two universities in Canada, specifically Dalhousie University and the University of British Columbia (UBC). The study done at Dalhousie University approached the topic from a consumer behavior change point of view (Guo *et al.*, 2016), while the studies done at UBC (Evans *et al.*, 2016; Ruskey *et al.*, 2016) and UNBC mostly commented on the challenges and implementation options of a cup-share program.

A cup-share program actually introduces an entirely new behavior to address disposable cup waste. In step one of the CBSM process (i.e. identifying the behavior that will have the highest impact on the problem), McKenzie-Mohr says that the behaviors explored should be non-divisible. Non-divisible means the behavior cannot be broken down into sub-actions. Since using a reusable cup can be broken down into "using a personal reusable cup" and "using a reusable cup that is accessed through participation in a cup-share program," a cup-share program is a separate behavior. Accordingly, step two needs to be revisited, and the barriers and benefits to participating in a cup-share program need to be addressed.

Fortunately, the study at Dalhousie examined these barriers and benefits. The results showed "concern for cleanliness" and "inconvenience [of] returning [the cup]" were the top barriers selected by 59.5% and 53.25% of respondents, respectively, and "reducing waste," "convenience of not [carrying] travel mugs," and "10 cent financial incentives" as the top benefits reported by 78%, 47%, 37.25% of the respondents, respectively. However, further research with a larger variety of potential barriers and benefits explored is needed to understand what the true barriers and benefits to participating in a cup-share program are.

The challenges and insights reported by Evans *et al.* (2016) and Ruskey *et al.* (2016) from UBC regarding implementing a cup share program included setting up a tracking system, providing labor to run the program, and finding ways to fund the program.

Evans *et al.* (2016) and Ruskey *et al.* (2016) reported that the system for keeping track of cups can be complicated to establish. In a pilot program conducted at the UBC, researchers attempted to use a paper and digital entry system but found that the system laid an undue burden on the cafe staff and frequently resulted in errors. The researchers concluded that a computerized system that could scan in and out cups, either through RFID or barcode technology, would be the best option; however, these technologies add a significant setup expense that might be impractical for a small pilot program.

Second, Evans *et al.* (2016) and Ruskey *et al.* (2016) reported a significant amount of labor is required in collecting, cleaning, and redistributing the cups back to the cafes. At UNBC, the program partnered with a local pub to use their industrial dishwasher and set up a volunteer program to supply the labor. Unsurprisingly, the UBC program has not been able to sustain itself for more than a semester due in part to the impractical tracking option and issues faced with staff turnover due to a reliance on student labor, which has a naturally high turnover rate.

Finally, Evans *et al.* (2016) and Ruskey *et al.* (2016) reported that it is difficult to ask customers to pay for a cup-share program membership when the paper cup alternative is free, but the lack of generated revenue is likely another reason the UBC program has struggled to sustain itself. The program's only revenue was a required $5 deposit paid at the time of signup in order to support the set-up costs of the program. A study testing the viability of different revenue sources for a cup-share program would support the argument that cup-share programs are a viable solution to address the top barriers to using a reusable cup.

D. Examination of Additional Strategies

The third step of the CBSM process involves examining past strategies that have been used to increase engagement in a behavior to see if any may be worth incorporating into a new solution. Specifically, McKenzie-Mohr lists seven types of strategies that should be explored, including incentives, prompts, social norms, social diffusion, convenience, communication, and commitment strategies. Since very little research regarding cup-share programs is available, in this section I will explore each of the strategy types by first briefly explaining what the strategy type involves and then examining how the strategies have been used to increase engagement in other behaviors, specifically reusable cup use as this is the closest behavior to participating in a cup-share program.

i. Incentives

Incentives: Using rewards or penalties that motivate the individual to engage in the desired behavior. Incentives should be large enough to actually change the individual's behavior and should be presented as close in time as possible to when the desired behavior is completed (McKenzie-Mohr, 2011).

Offering financial rewards, in the form of beverage discounts for using a reusable cup, has been the most common strategy to be implemented to increase reusable cup use; however, these programs have seen very limited success. Starbucks has been offering a 10¢ discount since 1985, but their rate of beverages served in reusable cups has never been above 1.9% (Starbucks Corp., 2016). One consumer study conducted in Wales found that most customers do not see discounts below £0.25, or roughly $0.35, worth the inconvenience of carrying a reusable cup, suggesting Starbucks' incentives may not have been large enough (Harris and Probert, 2008). However, an empirical study to test this hypothesis is needed in order to support higher financial rewards as a means for increasing reusable cup use and participation in a cup-share program.

Alternatively, there is evidence that financial penalties, such as fees or taxes, might be a more incentivizing approach. The traditional theory behind this strategy is called a Pigouvian tax (Pigou, 1933). A Pigouvian tax takes into account the cost the consumer good has on the environment in terms of a financial figure, which is then used as the amount of the tax on the good. However, as applying this theory would require an LCA for each specific consumer good, which in most cases would be unfeasible, many consider this theory to be impractical to apply in its traditional fashion (Fisher, 2008; Convery *et al.*, 2007; Poortinga *et al.*, 2016).

However, the success of taxing a disposable good in order to incentivize alternatives and reduce its impact on the environment has been seen with single-use, plastic retail bag taxes in Europe. A study conducted in Ireland (Convery *et al.*, 2007) found that the implementation of a €0.15 tax on all single-use plastic retail bags reduced consumption of the bags by 94% within less than a year. Another study was done in the UK (Poortinga *et al.*, 2016) found that a smaller £0.05 tax reduced consumption of plastic bags by 85% also within less than a year. The most profound part of these studies is that surveys of both the retail locations and the consumers found the reactions to the taxes to be overwhelmingly positive (Convery *et al.*, 2014; Poortinga *et al.*, 2016). While growing pressure to implement a similar tax on paper cups, popularly known as the "latte levy," is present in the UK, their lawmakers have been hesitant to take this step (Harrabin, 2018). A study proving the similar effectiveness of taxing paper cups would help the UK and other areas implement this disincentive strategy.

A further alternative that is similar to a discount or tax, called price signaling, changes the way that the financial implications on the consumer of using or not using a reusable cup is framed. In terms of paper cups, price signaling includes (1) calculating the cost of the cup, lid, and sleeve; (2) reducing all menu prices for beverages that come in a paper cup by this amount' and (3) adding a menu item labeled "cup, lid, and sleeve" priced at the same amount (Fisher, 2008). Even though the total price of a cup of coffee in a paper cup does not change before and after the price signal has been implemented, the consumer is made aware that there is a cost to not

bringing a reusable cup when they see the additional line item added to their total. One study conducted at an on-campus cafe at Tufts University found this strategy to increase the rate of reusable cup use from about 3% to 8% in just 5 weeks. Similar to the studies on the Irish and UK plastic bag tax, the Tufts study also found the reactions from the cafe staff and customers regarding the new price structure to be overwhelmingly positive (Fisher, 2008). Price signaling may present a solution to the disposable cup waste problem that does not require the full cooperation of a local or national government; however, a longer study is needed to see if this method can be as effective as the plastic bag taxes were in Ireland and the UK.

ii. Prompts

Prompts: Reminding people to engage in the desired behavior through visual or audible cues. Prompts should occur as close in time and distance from the point when and where the desired behavior will take place (McKenzie-Mohr, 2011).

Similar to how taxes and price signals alert the customer to change their behavior, McKenzie-Mohr suggests similar results can be achieved with visual and verbal prompts. However, some seem to work better than others with regards to increasing reusable cup use. A study in Toronto, Canada used McKenzie-Mohr's book as a guide to creating their prompts. The main researcher and author of the study, Ziada (2009), reported that even though a visual prompt in the form of a sign placed next to the cash register specifically reminded customers to bring and use a reusable cup, no increase in reusable cup use was observed. However, when the sign was combined with a verbal prompt where cashiers were trained to ask if customers needed a cup with every order, a notable increase in reusable cup use was observed. Similarly, a study conducted by the Alliance for Environmental Innovation (2000) in partnership with Starbucks found that a similar verbal prompt almost doubled the reusable cup use of the stores that implemented it.

These results suggest that part of the success of the Tufts study could be due to the need for cashiers to ask whether the customer needed a paper cup for their order (Fisher, 2008).

iii. Social Norms

Social norms: Displaying evidence of the desired behavior as a social norm. The norms should be made highly noticeable and should be presented at the time the desired behavior is likely to occur (McKenzie-Mohr, 2011).

One potential reason verbal prompting has seen such success is the social pressure behind it. For instance, through customer interviews, Ziada (2009) found that several customers thought that other people must be bringing in a reusable cup if the cashier was asking if they needed a cup each time they purchased a beverage. A study done in California in attempt to get residents in a suburban neighborhood to engage in energy-saving activities found that while most people listed environmental appeals as those that contributed the highest to their behavior change, the correlation between type of appeal and actual decrease in energy consumption was highest for socially normative appeals such as, "in a recent survey of households in your community, researchers at Cal State San Marcos found that 78% of San Marcos residents often use fans instead of air conditioning to keep cool in the summer" (Nolan *et al.*, 2008, p. 918). The idea that this pattern might apply to increasing participation in a cup-share program is supported by the survey results showing reducing waste as the top reason for using a reusable cup (Alsop *et al.*, 2004; Fairbairn *et al.*, 2008; Guo *et al.*, 2015; Joongsup, 2016; Wittmer and Price, 2009), but a study similar to the one conducted in California is needed to prove this idea.

iv. Social Diffusion

Social diffusion: Encouraging adopters of the desired behavior to promote the behavior to others. Visual elements, such as stickers, or personal social media posts can be used to facilitate social diffusion (McKenzie-Mohr, 2011).

Social diffusion has been used with reusable cup branding to further utilize the effect social pressure has on increasing reusable cup use, but evidence of its effectiveness is lacking. Wittmer and Price (2009) used bright-red cups clearly branded with their campaign slogan, "got mug?" to initiate conversation amongst those who had joined the initiative and those who had not, but Wittmer and Price did not include any metric for determining the effectiveness of this strategy. Additionally, Starbucks ran a "white cup contest" in 2014 that encouraged customers to submit social media posts sharing their artwork on Starbucks' new $1 white reusable cups in an effort to generate more awareness of their reusable alternatives. However, Starbucks reported only a 0.1% decrease in reusable cup use during that time period, suggesting that social diffusion may not be an effective strategy for increasing reusable cup use on its own (Starbucks Corp., 2016).

v. Convenience

Convenience: Implementing tactics to help the individual engage in the desired behavior more easily. Generally, removing as many of the identified barriers as possible will result in convenience for the individual (McKenzie-Mohr, 2011).

A cup-share program is inherently the best convenience strategy for increasing reusable cup use, by making reusable cups more convenient. However, like disincentive taxes on disposable cups, strategies can be used on the undesirable behavior as well. Specifically, several places around the world have turned to banning disposable products that are causing environmental problems, including Styrofoam as well as straws and plastic bags. These policies are obviously the ultimate solution to the problem by completely removing the convenience of the wasteful option, which causes consumers to switch to the sustainable alternatives (Taylor and Villa-Boas, 2016).

vi. Communication

Communication: Captivating the attention of the target population through vivid, personal, and specific messages. Messages should focus on what the individual is losing if the customer does not act and be delivered through a medium with the highest chance of reaching the target population (McKenzie-Mohr, 2011).

Several studies attempting to increase reusable cup use found that one of the largest challenges the researchers encountered was their target population's awareness of the initiatives (Evans *et al.*, 2016; Fairbairn *et al.*, 2008; Guo *et al.*, 2004; Harris and Probert, 2009; Smyth *et al.*, 2010; Wittmer and Price, 2009; Ziada, 2009). As McKenzie-Mohr (2011) specifies, in order to increase awareness of the issue, communication needs to be vivid, personal, and specific. For instance, Smyth *et al.* note that the use of discarded paper cups strung together with letters on each spelling out "UNBC sends 5000 disposable cups to landfill each week" was effective at UNBC because the cups made the message stand out and because the statistic used was personal to the audience and specific regarding the impact (Smyth *et al.*, 2010, p. 1014).

However, McKenzie-Mohr (2011) also notes that messages should end with a call to action and focus on what the individual is losing if they do not act—neither of which is present in the UNBC example. Ziada (2009), in contrast, used CBSM as a reference when designing posters encouraging consumers in Toronto to dispose of their coffee cups properly and included as part of his message that the customers should use a reusable cup instead and that if they do not use a reusable cup, they were missing out on a discounted coffee.

Finally, McKenzie-Mohr notes that communication should be delivered through mediums that are likely to reach the target audience. However, regarding the disposable cup waste problem, evidence of a clear target audience does not exist. Accordingly, in the study conducted by Wittmer and Price (2009), which also followed the CBSM process, a wide variety of communication tools ranging from a blog to paper fliers around the university campus were used.

As a result, after only a few months of the campaign running, a majority of the campus was aware of the campaign and its purpose, suggesting many different mediums are important for communicating initiatives aimed at reducing disposable cup waste. However, a study determining the target population of disposable cup consumers would assist in decreasing the effort and cost of achieving similar awareness.

vii. Commitment

Commitment: Having consumers make a commitment to engage in a particular behavior. Commitments should be public, voluntary, and actively involve the person making the commitment. (McKenzie-Mohr, 2011)

Of all of McKenzie-Mohr's strategy types, the effectiveness of the commitment strategy in increasing reusable cup use is the least studied. While Wittmer and Price (2009) implemented a small commitment component to their study, because this component was combined with many other strategies, no clear evidence was provided that the commitment component played a significant role in increasing reusable cup use. An empirical study showing a positive, direct correlation between an implementation of a commitment strategy and reusable cup use is needed to support its use in future campaigns to reduce disposable cup waste.

E. Conclusion

The disposable cup waste problem is significant and complicated to solve. CBSM suggests that finding solutions should be done by understanding the barriers to engaging in the behaviors that address the issue on a granular, community level. The literature on disposable cup waste suggests that promoting reusable cup use is the only truly sustainable alternative to disposable cups. However, the top barriers to using a reusable cup are the inconvenience of remembering, carrying, and cleaning the cup, which according to McKenzie-Mohr (2011) are

difficult to overcome with traditional approaches and need to be removed before the consumer is likely to use a reusable cup instead of a disposable cup. A cup-share program is a solution that removes these barriers. Accordingly, participating in a cup-share program is the behavior that may have the highest potential to reduce disposable cup waste. Further, combining other strategies to promote behavior change are likely to increase the effectiveness of a cup-share program. The strategies that show the most potential are disposable cup fees, verbal and visual prompts, and a disposable cup ban. Finally, McKenzie-Mohr (2011) suggests the strategies that are ultimately chosen should address not only the barriers and benefits to participating in a cup-share program, but also the barriers and benefits to using a paper cup.

In the next sections, this study explores the significance of the disposable cup waste problem at UNC-CH specifically; identifies the current initiatives to address disposable cup waste at UNC-CH and their level of success; evaluates whether the conclusions drawn from secondary research hold true for the UNC-CH community; assesses the likelihood of adoption of a cup-share program and other solutions; assesses any concerns and suggestions held by key stakeholders at UNC-CH regarding how these solutions might be implemented, including how they might be paid for; and assesses the barriers and benefits to participating in a cup-share program as well as using a paper cup.

III. METHODOLOGY

The purpose of my thesis is to understand the need for and possibility of better solutions to the disposable cup waste problem at UNC-CH, the concerns and suggestions held by key stakeholders at UNC-CH for implementing these solutions, and how these solutions might be paid for. In this chapter, I will describe an overview of my research design and procedure.

My study can be considered a mixed methods study because my research design includes collecting both qualitative and quantitative data in the form of interviews of key stakeholders at UNC-CH, a questionnaire of beverage consumers at UNC-CH, a data set of the sales volumes of beverage locations on campus, and a brief survey of the beverage locations' reusable cup discount policies. My qualitative research provides more in-depth insights that were important due to the subjective and complicated nature of the potential solutions, while my quantitative research provides support for specific conclusions and suggestions (D. O'Gorman *et al.*, 2015). Additionally, my qualitative research helped develop a more concise and useful quantitative questionnaire.

A. Sampling Locations for Interviews and Questionnaire

I chose the beverage locations for interviewing customers, employees, and managers as well as gathering respondents for the questionnaire based on the geographic area of campus and the sub-populations generally represented there. The goal was to attain a sample that was representative of my target population: those that purchase beverages on UNC's campus, including undergraduate and graduate students as well as faculty and staff. Locations were selected by looking at a map of all beverage locations on campus and choosing those that were most centrally located in the different geographic areas. Below is a list of the geographic areas

along with a short description of the geographic area, the selected beverage location for that area, and the sub-populations that are predominantly represented. Appendix A contains a map showing all beverage locations on campus.

1. **North Campus**: North Campus is the main section of campus where a majority of lecture halls and administrative buildings are located.
    - *Selected Location*: Meantime Coffee Co. (located inside of the building called the Campus Y)
    - *Population*: General student, faculty, and staff population. Likely more undergraduate than graduate students.
2. **The Pit**: The Pit is the main student hub of campus with a dining hall, student union, two libraries, and the student stores. Although The Pit is technically a part of North Campus, The Pit is distinguished because it has the highest amount of foot traffic of anywhere on campus.
    - *Selected Locations*: Bottom of Lenoir (dining area with several 3rd party food vendors), Student Union (study, meeting, and event space with a bagel and coffee shop and a Wendy's), and Stone and Leaf (café located inside Student Stores)
    - *Population*: General student and faculty population; likely more undergraduate than graduate students
3. **Central/South Campus**: Central/South Campus is the part of campus where underclassman residential halls, athletics facilities, the second dining hall, and administrative buildings are located.
    - *Selected Location*: Starbucks (café located in same building as dining hall)
    - *Population*: Largely underclassman, athletes, and administrative and athletic faculty

4. **Health Sciences Area**: The Health Sciences area is by the Health Science Library, which is near many of UNC's professional schools related to the health sciences.
    - *Selected location*: Friends Café (inside Health Sciences Library)
    - *Population*: Mostly graduate students and faculty
5. **Business School**: The business school is a professional school for both undergraduate and graduate students that is largely separated from other parts of campus and contains its own café and gym, which causes many to remain in the same building for their entire workday.
    - *Selected location:* Einstein's (inside Café McColl)
    - *Population*: Business school undergraduate students, graduate students, and faculty

B. Qualitative Data Collection

Semi-structured interviews were conducted on six different populations: beverage customers on campus, beverage location employees, beverage location managers, the university dining services administration, other university administration, and individuals with experience conducting a cup-share or similar project. Below is an outline of the justification, collection method, and the number of respondents for each set of interviews.

i. Beverage Customers on Campus

- *Purpose/Justification:* I chose to limit my customer interviews to beverage consumers at UNC-CH considering that a cup-share program and other solutions would only involve those that actually purchase beverages on campus, so only this population was relevant to my study.
- *Content of Interview:* The questions asked during customers' interviews were intended to gather preliminary data on the barriers and benefits to using a reusable cup, participating

in a cup-share program, and using a paper cup in order to inform the answer choices to the questions on the questionnaire that would aim to quantify these results. Additionally, questions were included to understand customers' concerns and suggestions regarding a cup-share program and disposable cup fee/future ban.

- *Collection Method:* I conducted the semi-structured interviews in person at the beverage locations in Figure III-1 with the exception of the Student Union and the Bottom of Lenoir. Respondents were selected by asking every third person waiting for their order, "Hi, do you have time to answer a few questions related to disposable cup usage on campus?" If the individual responded positively, they received a briefing before the interview began reassuring the confidentiality of their identity and responses, the intended length of the interview, and the voluntary nature of the interview. The respondents were not informed about the exact nature of the study until the end of the interview in order to limit biased responses (D. O'Gorman *et al.*, 2015).
- *Number of Respondents:* I was able to interview roughly six respondents from five beverage location for a total of 31 respondents.

ii. Beverage Location Employees

- *Purpose/Justification:* Beverage location employees were interviewed to provide insight on the current initiatives to reduce disposable cup waste on campus as well as considerations for the other potential solutions.
- *Content of Interview:* The questions asked during employee interviews were limited to understanding any patterns they had noticed regarding reusable cup usage on campus and any concerns and/or suggestions they had regarding a cup-share program, a disposable cup fee/future ban, and verbal prompts.

- *Collection Method:* I conducted the semi-structured employee interviews in exactly the same manner as the customer interviews, except respondents were chosen by who was available to be interviewed.
- *Number of Respondents:* I was able to collect an average of two respondents from five beverage locations for a total of 10 respondents.

iii. Beverage Location Management

- *Purpose/Justification:* I chose to interview beverage location management as they likely had the best understanding of the current and past initiatives to reduce disposable cup waste as well as the potential operational challenges of a cup-share program.
- *Content of Interview:* The questions asked during these interviews were designed to gather an understanding for the current and previous initiatives to reduce disposable cup waste on campus; patterns of reusable cup use on campus; and concerns and suggestions for a cup-share program, disposable cup fee/future ban, verbal prompts, and in-store visual prompts.
- *Collection Method:* Each manager was contacted through email. They were notified that the purpose of the interview was to understand disposable cup usage and waste reduction initiatives at their location as well as their sentiments regarding other potential initiatives. As a result, each respondent was at least somewhat aware of the nature of the study before the interview began.
- *Number of Respondents:* I was able to interview four beverage location managers, specifically the managers from Meantime, Starbucks, Einstein's, and Stone and Leaf.

iv. University Dining Services (CDS) Administration

- *Purpose/Justification:* I chose to interview university dining services administration, more commonly known as CDS or Carolina Dining Services, as they oversee the

operations of almost all beverage locations on campus and likely had a broader understanding of the initiatives to reduce disposable cup waste as well as a broader understanding of the operational challenges to implementing a cup-share program and other potential solutions.

- *Content of Interview*: The questions asked during this interview were designed to gather an understanding of the current and past initiatives to reduce disposable cup waste at UNC-CH taken by the dining services as a whole; concerns and/or suggestions for a cup-share program as well as other potential solutions; and potential options for funding these solutions.
- *Collection Method:* The members of the CDS administration were contacted through email with the intention of interviewing them to understand CDS' initiatives to reduce disposable cup and other waste on campus as well as their thoughts on a cup-share program and other potential solutions. Two members of the CDS administration were available to be interviewed, and their interviews were conducted together at the same time. Similar to the location managers, each respondent was at least somewhat aware of the nature of the study before the interview began.
- *Number of Respondents:* I interviewed two members of CDS during one interview.

v. University Administration

- *Purpose/Justification:* I chose to interview a set of other university administration as they would be able to provide insight on waste management as a whole at UNC-CH and the potential structural and bureaucratic challenges of a cup-share program and other potential solutions.
- *Content of Interview*: The questions asked during these interviews were designed to understand any current and/or past initiatives that had been taken by the university

administration other than CDS, the concerns and/or suggestions for a cup-share program as well as other potential solutions, and potential options for funding these solutions.

- *Collection Method:* Each person was contacted through email with the intention of interviewing them to understand UNC-CH's initiatives to reduce disposable cup and other waste on campus as well as their thoughts on a cup-share program at UNC-CH. Similar to the location managers and CDS administrators, each respondent was somewhat aware of the nature of the study before the interview began.
- *Number of Respondents:* I interviewed one employee from the Sustainability Office, two employees from the Office of Waste Reduction and Recycling, and one university employee from the 'Three Zeros' sustainability initiative for a total of 4 respondents.

vi. Individuals with Experience Conducting Cup-Share or Similar Projects

- *Purpose/Justification:* I chose to interview individuals with experience conducting similar pilot projects as they would be able to provide the best insights on the specific and unexpected implementation challenges of a cup-share pilot program.
- *Content of Interview*: The questions asked during these interviews were designed to understand some of the specifics of their programs, the challenges they faced in starting and conducting their programs, and any suggestions they had for implementing and funding a cup-share program.
- *Collection Method:* As I found these individuals while conducting my initial secondary research, I made note of their names and/or contact information and reached out to them via email as well as Facebook Messenger when I was ready to interview them. I informed each of them that I wanted to interview them about their experiences conducting their programs for a study on reducing disposable cup waste on UNC-CH's campus. Since I found out about more individuals at different times, not all interviews were conducted at the same time.

- *Number of Respondents:* I was able to interview individuals representing MugShare UBC, Durham GreenToGo, OZZI, and Vessel for a total of four individuals.

The questions for the interviews were developed with the help of the Odum Institute for Research in Social Science to ensure clear wording and avoid biases. The semi-structured format was chosen since it gives interviewees more flexibility to express their thoughts while being easier to administer than a completely unstructured interview. Additionally, I chose an in-person format for the first five sets of interviews as it is preferable when conducting a semi-structured interview because additional information can be collected through the observation of non-verbal communication from the interviewee (D. O'Gorman *et al.*, 2015). Due to travel constraints, in-person interviews could not be conducted for the sixth set of interviews.

Focus groups were also considered for collecting qualitative data, however, I chose interviews as a more appropriate way of getting results from a larger set of individuals on a small budget. Additionally, concern that social influences of a more sustainable group member might bias the responses of the others in a focus group affected my decision (D. O'Gorman *et al.*, 2015).

C. Quantitative Data Collection

Three sets of quantitative data were collected: a questionnaire of beverage consumers at UNC-CH, sales data of the beverage locations on campus, and a brief survey of beverage locations where formal interviews were not conducted.

i. Questionnaire of Beverage Consumers at UNC-CH

A digital questionnaire was used to collect data regarding the prevalence of improper disposal at UNC-CH, the barriers to using a reusable cup, the likelihood of participating in a cup-share program, the barriers and benefits to participating in a cup-share program as well as using a paper cup, potential membership fees for a cup-share program, the preferred check-out and

payment methods for a cup-share program, and attitudes towards a disposable cup ban. I also collected basic demographic information to understand how representative my sample population is of the UNC-CH community. The questions for the survey were also developed with the help of the Odum Institute for Research in Social Science to avoid biases and ensure the validity of results. I used my literature review and the results from the preliminary interviews to inform the answer choices for many of the questions, especially those related to the barriers and benefits to the different behaviors. The full list of questions and results from the questionnaire can be found in Appendix C.

My procedure for administering the survey was similar to the procedure for the customer interviews. The population for my questionnaire was almost exactly the same as the first set of interviews: beverage customers on UNC-CH's campus. The only exception was due to the solicitation of responses of initially under-represented demographics (i.e. graduate students, faculty, and staff) through email. Otherwise, I selected respondents for the questionnaire in-person at the same locations used for the interviews with the addition of two locations with high student concentrations: Bottom of Lenoir and the Student Union. I selected respondents at random by approaching every third person either waiting for their order or seated with the prompt, "Hi! Do you have five minutes to take a survey about disposable cup usage on campus for a cookie?" Cookies from a local favorite cookie shop, Insomnia Cookies, were used as an incentive as they were cheap and generally liked by most people on campus. If the individual responded positively, they were offered the option of taking the survey on their own device using a link or a QR code or taking the survey on a provided tablet device. This self-administered approach is preferable to reduce resources required and potential for researcher bias (D. O'Gorman *et al.*, 2015). Each survey began with a brief reassuring the confidentiality of their identity and responses, the intended length of the survey, and the voluntary nature of their participation.

ii. Sales Data from Beverage Locations On Campus

I also obtained quantitative data in the form of sales volume numbers of the individual sale items at different beverage locations on campus for the calendar year 2017. I used these data to calculate an estimation of annual cups sold, broken down by the type of cup, as well as refill rates at different locations. My procedure included going through each sales item listed in the data sets for each location and categorizing them as one of the following: sold in a paper cup, sold in a paper cup that is known to be compostable, sold in a plastic cup, sold as a refill, and not relevant (e.g. food items and prepackaged items). I totaled each category for each location and aggregated these totals to get an estimate of the total number of cups sold on campus.

iii. Survey of Beverage Locations Where Formal Interviews Were Not Conducted

The survey of beverage locations where formal interviews were not conducted was for the singular purpose of identifying the discount offered at these locations for bringing in a reusable cup. My procedure included calling or going in person and asking, "What discount do you offer on beverages to people that bring in a reusable cup?"

D. Study Limitations

Selection Bias for Questionnaire: The proportions of the respondents from each university affiliation demographic group (75.67% undergraduate students, 10.58% graduate students, 6.88% staff, and 4.23% faculty) were statistically different from the known population proportions of UNC-CH: 44.32% undergraduate students, 25.96% graduate students, 20.59% staff, and 9.13% faculty. Accordingly, the results of the questionnaire may be subject to a selection bias, specifically towards the responses of undergraduate students who were overrepresented.

Unavailable Sales Data: Detailed sales data from some locations was either unavailable or indecipherable due to item labels. Specifically, estimation of the total number of beverages sold in disposable cups did not include:

- Cups used to takeaway coffee from dining halls
- Beverages sold and given away at events on campus, especially athletics events, which are a major producer of disposable cup waste due to a high volume of beverage sales
- Beverages sold and given away at the campus hospital, which contains its own Starbucks
- Beverages sold at Meantime Coffee Co.
- Cups offered for free to faculty, guests, and students

As a result, the true volume of disposable cup waste produced on UNC-CH's campus in 2017 is likely much larger.

Calculating Reusable Cup Use Rate: In order to assess the success of discount initiatives on campus, I analyzed the sales data in an attempt to calculate the percent of beverages sold in reusable cups at each of the beverage locations on campus. Unfortunately, along with unavailable sales data from some locations, the methods used to ring up beverages sold in reusable cups varied across campus, which made estimating reusable cup usage very difficult. Specifically, some locations marked a beverage sold in a reusable cup as a "refill," which showed up on the sales volume datasheet and allowed for calculating a percent of beverages sold as refills in order to estimate the percent of beverages served in a reusable cup. Some locations, however, simply charged for a small, which made determining the number of beverages served in reusable cups impossible as they were indistinguishable from regular small beverages sold in disposable cups. Finally, other locations charged a separate discount (e.g. 20% off or 15¢ off), which did not show

up on the sales spreadsheet. As a result, I was only able to estimate the reusable cup usage at each location by the percent of total beverages sold as refills.

Limited Responses for Disposal Question: Responses to the question asking respondents to choose where they have thrown away their disposable cup in the last three months were limited to a single choice. However, compostable and non-compostable paper cups are both widely available on campus, so it is likely that more respondents would have selected compost had they been given the option to select more than one answer choice.

Order of answer choices

Weight of Cups Estimation: The weight of a single cup was based on an estimation from the U.S. EPA (2017) Food Packaging Guide, which was based on a 12oz cup. Since most of the cups sold on campus in 2017 were at least 16oz, the total weight of the waste produced from disposable cups in 2017 is likely significantly larger.

IV. RESULTS

In this section, I will review the results and key insights from my data collection, interviews, and customer questionnaire. First, I will briefly review some statistical information regarding the results of my questionnaire. I will then assess the need for a cup-share program and other accompanying solutions by examining the significance of the disposable cup waste problem at UNC-CH; identifying the current initiatives to address disposable cup waste on UNC-CH's campus and their level of success; and evaluating whether the conclusions that gave a cup-share program the highest potential to reduce disposable cup waste is applicable to the UNC-CH community. I will next review the likelihood of adoption for a cup-share program and other potential solutions as well as the concerns and suggestions that should be considered when planning the implementation and funding of a cup-share program at UNC-CH. Finally, so that further strategies to improve the effectiveness of a cup-share program can be selected in the future, I will review the top reported barriers and benefits to both participating in a cup-share program as well as using a paper cup.

201 respondents finished the questionnaire, which is in D. O'Gorman *et al.*'s (2015) suggested ideal sample size range of 200 to 300 respondents. Since I limited the scope of my study to beverage consumers at UNC-CH, I did not include the results of those who reported never getting a beverage from a location on campus, which was only 5.03% of all respondents. Additionally, in order to assess different membership fee options, the respondents were randomly placed into one of two groups (Group A and Group B) for the questions pertaining to a cup-share program. As a result, the following sample sizes were obtained: Group A, n = 92; Group B, n = 99; combined, n = 189. Additionally, due to these sample sizes the relevant margins of error for reported proportions are ±10.21% for Group A, ±9.84% for Group B, and ±7.81 combined.

A. Significance of the Disposable Cup Waste Problem at UNC-CH

In order to assess the significance of the disposable cup waste problem at UNC-CH, I will review the estimated volume of disposable cup waste calculated through data on the beverage sales that occurred on UNC-CH's campus in 2017. Additionally, I will review the results of the questionnaire that provide insights into the level of improper disposable of cups by UNC-CH beverage consumers.

i. Volume of Disposable Cup Waste

Using the sales data provided by CDS administration, I calculated that at least 1,200,000 beverages were sold in disposable cups on UNC-CH's campus in the calendar year of 2017. This figure works out to be approximately 37,440lbs, or 18.72 tons, of solid waste, added to UNC-CH's waste stream as a result of disposable cup use (U.S. EPA, 2017b). Of these disposable cups, approximately 1,069,000 were paper cups and 132,000 were plastic cups. Further, of the paper cups, approximately 506,000 were known to be compostable.

ii. Improper Disposal at UNC-CH

The results from the questionnaire illustrated in Figure IV-1 indicate that approximately one-third (31.11%) of beverage consumers at UNC-CH are incorrectly disposing of their paper cups into recycling receptacles. Further, considering approximately half (47.35%) of the paper cups counted were known to be compostable and only 11.11% of respondents said they had disposed of their cups in the compost, there are likely a large volume of compostable cups from UNC-CH's campus ending up in the landfill—either directly through placement into trash receptacles or once filtered out at recycling facilities, if placed in recycling receptacles. These results are statistically congruent with the results found by Gou *et al.* (2016) (59.5% trash, 35.5% recycling, and 5% compost) in their survey of Dalhousie's campus where there are no beverages

that are served in compostable cups, suggesting that efforts taken at UNC-CH and Dalhousie University to avoid improper disposal are ineffective.

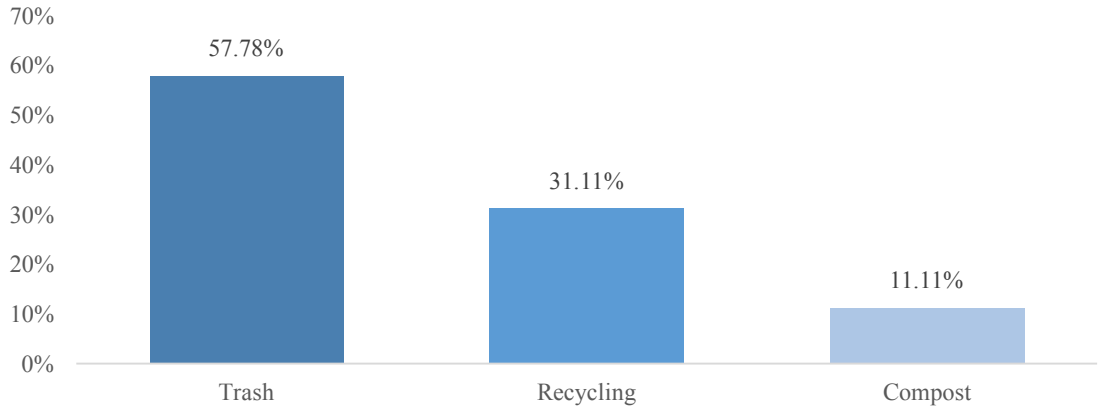


Figure IV-1. Self-reported disposal of paper cups. This figure illustrates where beverage consumers are disposing of their disposable cups

B. Identifying and Assessing the Success of Current Initiatives at UNC-CH

Through my interviews with Carolina Dining Services (CDS) as well as the management and employees of several of the beverage locations on campus, I found that aside from a few locations that offered "for here" cups, the only initiatives to reduce disposable cup waste on campus were discounts offered on beverages.

These discount initiatives were significantly more successful in certain circumstances than those historically observed by Starbucks (Starbucks Corp., 2016). Comparing the specific discounts offered at each location to the percent of beverages sold as refills (when available), I was able two identify two potential factors that contribute to a higher rate of success amongst these discount initiatives. Specifically, the locations with the largest percent refills were Law Bar located in the law school (34.04%); Einstein's located in the business school's Cafe McColl (31.73%); Blue Ram Café located underneath the Campus Y on North Campus (22.98%); and Alpine Bagel Deli located in the Thurston Bowles School of Medicine building (20.67%) (See Appendix A for a map of beverage locations on campus and Appendix B for a list of the refill rates at each beverage location). The next largest percent refill location, Atrium Cafe located in

the Michael Booker Research Center, had a significantly smaller refill rate of 7.02%; however, this number is still rather high, especially when compared to the other locations on campus as well as Starbucks' international average of less than 2%.

Of the top four, three offered a flat refill price between $1.09 and $1.19 for beverages purchased with a reusable cup compared to the regular $2.05 to $2.35 price for beverages served in a disposable cup (Law Bar, Einstein's, and Blue Ram Cafe); and three were located in a graduate/professional school building (Law Bar, Einstein's, and Alpine Bagel Deli). Additionally, Atrium Café is in a graduate/professional school building and is the only other beverage location that was found to offer a $1.19 refill rate; however, this price is only offered for refills purchased after the initial refill, which is offered at the price of a small regular beverage ($1.99). It is highly likely that this particular discount scheme masked the sale of beverages in reusable cups since the first refill is not rung up as a refill, which means Atrium's actual refill rate is likely larger. These results indicate that the framing of discounts as a flat price per refill that is close to $1.00 less than the regular price of a beverage is the most effective incentive to drive reusable cup use and beverage locations located inside of graduate/professional school buildings are likely to have higher reusable cup use. These conclusions were also reflected in my interview with the manager of Einstein's and indicate these types of discounts should be incorporated with a cup-share program and, additionally, cup-share pilot programs will likely be most successful when located in graduate/professional school buildings.

C. Confirming the High Potential of a Cup-share Program Is Applicable to UNC-CH

In my literature review, I identified that promoting the use of reusable cups was the best solution for reducing disposable cup waste. However, I also identified that the behavior of using a reusable cup can be divided into "using a personal reusable cup" and "using a reusable cup that is accessed through participation in a cup-share program." Of the two, I determined that the latter

has a higher potential to increase reusable cup use because a cup-share program removes the top three barriers to using a reusable cup, which according to McKenzie-Mohr (2011), are very difficult to overcome with other strategies that do not directly remove the barrier. To confirm that this conclusion is applicable to the UNC-CH community, I used my questionnaire to assess the top barriers to using a reusable cup perceived by the UNC-CH beverage consumer population.

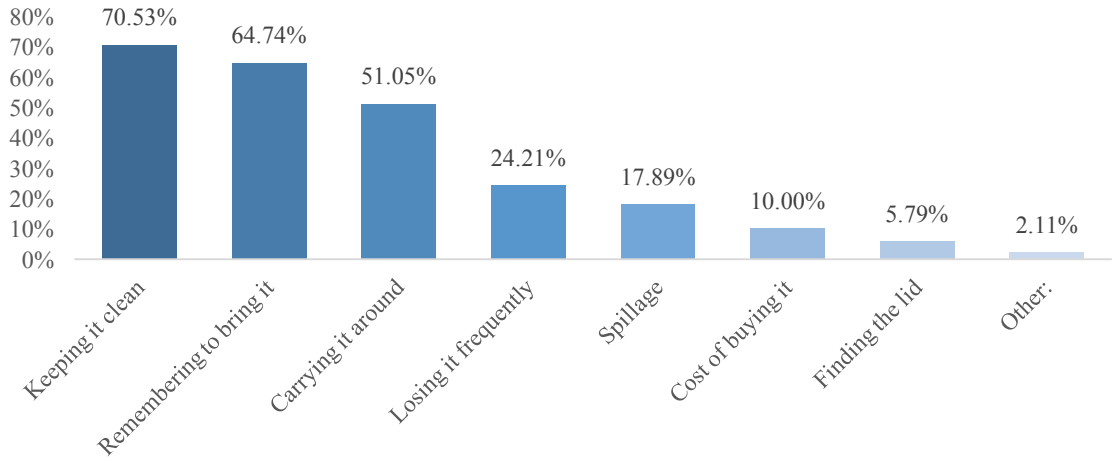


Figure IV-2. Barriers to using a reusable cup. This figure illustrates the top barriers to using a reusable cup.

Figure IV-2 indicates that the top reported barriers to using a reusable cup were "keeping it clean" (70.53%), "remembering to bring it" (64.74%), and "carrying it around" (51.05%) with secondary barriers of "losing it frequently" and "spillage" selected by 24.21% and 17.89% of respondents, respectively. These results confirm that the UNC-CH consumer beverage population perceives the same barriers to using a reusable cup as reported by Alsop *et al.* (2004), Fairbairn *et al.* (2008), Guo *et al.* (2015), Joongsup (2016), Wittmer and Price (2009), and that a cup-share program has the highest potential to increase reusable cup use at UNC-CH.

D. Likelihood of Adoption for Cup-Share Program and Other Solutions

The likelihoods of adoption for a cup-share program as well as a disposable cup fee, a disposable cup ban, and verbal and visual prompts were identified through the customer questionnaire as well as through different sets of interviews.

i. Cup-share Program

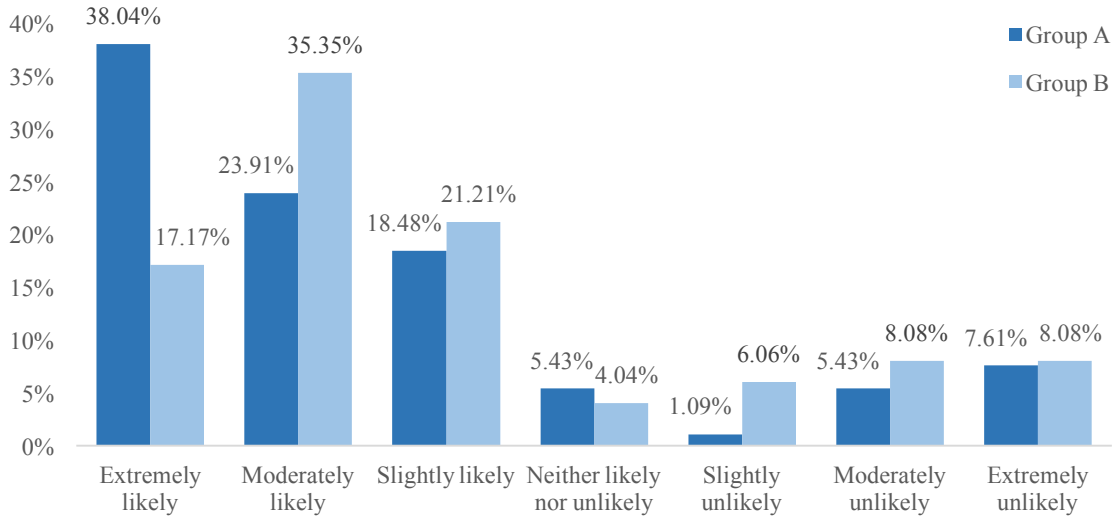


Figure IV-3. Likelihood of participating in a cup-share program. This figure illustrates the proportion of respondents who would be likely or unlikely to participate in a cup-share program depending on the availability of a free membership option.

The results in Figure V-3 indicate that approximately 61.95% of beverage consumers at UNC-CH are at least moderately likely, and 80.43% are at least slightly likely, to participate in the program when there is a free membership option (Group A). These figures are slightly less for Group B when the base membership fee is $1/month at 52.52% and 73.73%, respectively. However, a one-tailed hypothesis test revealed that the proportion of beverage consumers that are at least somewhat or at least moderately likely to participate is not statistically lower when there is no free membership option (i.e. Group B). However, there is a statistically smaller proportion of respondents that indicated they are extremely likely to participate in Group B than Group A (17.17% vs. 38.04%, $p < .01$). These results indicate that including a free membership option does not significantly increase the total proportion of beverage consumers likely to participate, but rather increases the proportion of beverage consumers who are likely to participate without much hesitation.

While the minimum proportion of beverage consumers at UNC-CH likely to join a cup-share program is less than that reported by Guo *et al.* for Dalhousie University (2016) (52% vs

88%, p <.001), this proportion is still higher than any of the current refill rates of the beverage locations on campus reaffirming that participating in a cup-share program has a higher probability of adoption than using a personal reusable cup.

ii. Disposable Cup Fee

All stakeholders interviewed were not opposed to a fee on disposable cups and most suggested a fee ranging from 10 to 25 cents. However, several individuals noted that they would first want to see the cup-share program operational at the locations where the fee will be implemented in order to provide customers with an adequate alternative.

iii. Disposable Cup Ban

Figure IV-4 shows the results of the questionnaire regarding respondents' attitudes toward a hypothetical disposable cup ban that would take place three years after a cup-share program had been implemented. Respondents were told to respond as if they would still be in the UNC-CH community and thus would be affected by this ban regardless of whether they actually will be or not. Almost all respondents in both Group A and Group B (91.31% and 90.82%, respectively) felt at least slightly positive towards the idea of a ban.

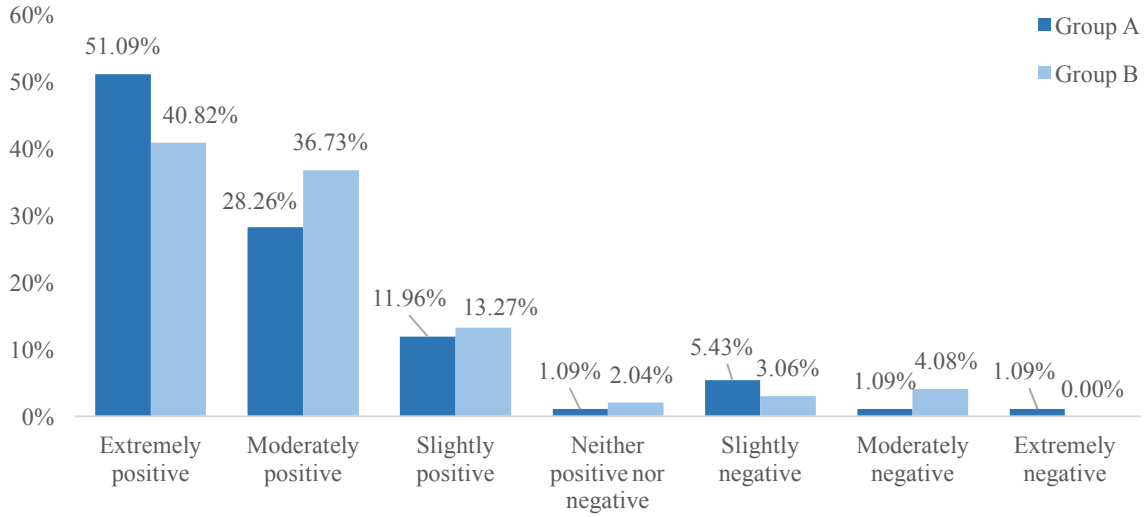


Figure IV-4. Attitudes toward disposable cup ban. This figure shows that most respondents feel positive towards a ban on disposable cups.

iv. Verbal and Visual Prompts

Almost all employees and managers at the beverage locations where interviews were conducted were receptive to the idea of implementing a verbal prompt to ask costumers if they needed a cup; however, similar to the disposable cup fee, many respondents felt that an adequate alternative, such as a cup-share program should be in place before this verbal prompt was appropriate to implement.

Visual prompts received mixed reactions from the beverage location managers that were interviewed. Half of the managers said that as long as the visual prompts were not too big or obnoxious that they would be acceptable. However, the managers of Starbucks and Einstein's expressed strong concern over corporate approval of any visual prompts. According to these managers, anything that is visible in the store must be approved by corporate and the corporate managers tend to have very strict rules as to what these items can be.

E. Concerns Regarding Implementing a Cup-Share Program

In order to understand the considerations that should be made when planning the implementation of a cup-share program, the concerns of the stakeholders of the program need to be addressed. The following are concerns regarding implementing a cup-share program at UNC-CH, as well as implementing a cup-share program in general, identified through my interviews with beverage location employees and management, CDS and other university administrators, and individuals with experience coordinating a cup-share or similar program. The more straight-forward concerns have been explained briefly in a list below, while the concerns that require a more detailed explanation are reviewed immediately following the list.

- *Awareness*: The student coordinator at UBC mentioned that one of their biggest challenges has been increasing awareness of the program on campus.

- *Not Having Space to Store/Stock Cups*: One manager and two members of CDS administration were concerned about having space behind the ordering/checkout counter to be able to stock the cups.
- *Stocking Out of Cups*: Two managers and a member of CDS administration expressed concern about stocking out of cups and having to deal with frustrated customers.
- *Increasing UNC-CH Water Consumption*: One member of the university administration mentioned the concern that this program may significantly increase water usage at UNC-CH.
- *Developing Tech*: Three of the individuals with experience coordinating cup-share or similar programs noted that the tech to implement these programs can be complicated and difficult to develop. This is congruent with the findings of Evans *et al.* (2016) and Ruskey *et al.* (2016).
- *Increased Checkout/Ordering Line*: Several employees, managers, as well as members of CDS administration expressed concern that the additional step of checking out a cup would slow down the payment/ordering lines.

Cost Concerns: Cost concerns were among the most emphasized during the interviews. CDS administration and members of university administration were worried that the up-front investment in return bins and cups would be higher than expected. Specifically, they mentioned that the bins/receptacles they purchase are usually in the thousands of dollars' range. They were also worried that the life of the cups would be too short and cause the cost of continuously replacing them to prevent the program from ever breaking even. Finally, they were concerned that the cost of insurance and maintenance on the equipment and collection vehicles as well as the cost of labor for collection and cleaning would be higher than expected.

Funding the Program and ROI: Further, CDS administration and members of university administration were concerned about where exactly the funding for the program would come from. CDS administration also mentioned they would want to see the program turn a profit within

3 to 4 years and produce an ROI within 5 to 7 years. Additionally, they were concerned about the tradeoff between trying to develop an affordable program and an effective/efficient program.

Providing Precise Potential Impact of a Cup-share Program at UNC-CH: A member of the university administration working closely with the Three Zeros Initiative noted that the administration has to weigh different options to reduce waste based off their potential impact and cost. Accordingly, they mentioned that understanding the precise impact that a cup-share program would have at UNC-CH was important before they were willing to dedicate resources towards the program. Specifically, they requested a statistically significant figure on the percent of UNC-CH's total waste stream that disposable cups comprise.

Adoption Rate/Utilization: CDS administration and university administration all expressed concern that the adoption rate/utilization of the program would be too low to justify the effort and cost of implementing it. Additionally, the coordinator from Durham GreenToGo expressed that while they have a lot of users, many of their users forget to actually use the program and, as a result, they have a very low utilization.

Getting Big Brands On Board: The Einstein's and Starbucks managers, as well as CDS administration, expressed concerns for getting approval from Einstein's, Starbucks, and other big brand name locations' corporate management. Specifically, in addition to the issue of visual displays in the stores, incorporation of non-corporate branded cups behind the counter may present a particular challenge.

Space for Cleaning Cups: CDS administration explained that according to health code, food utensils and containers must be air-dried, which requires a lot of space. Due to this constraint, they reported that their cleaning facilities, and likely all other cleaning facilities on campus, are at capacity. They mentioned that a separate cleaning facility would likely be needed if the program is going to grow to any significant size.

Cups Not Being Returned: Almost all of the managers, CDS administration, and university administration members expressed concern over cups being returned. Some felt that users would lose them, while others were worried that they may be accidentally thrown away. Two of those that expressed this concern feared that the loss of cups would end up producing a net negative impact on the environment.

Disposable Cup Waste from Outside Campus: The member working on the Three Zero's Initiative also mentioned that a lot of consumer waste comes from businesses located off of UNC-CH's campus, namely from businesses on Franklin St., the main street of Chapel Hill that runs along the northern border of UNC-CH's campus. Accordingly, a cup-share program limited to UNC-CH's campus would not prevent disposable cup waste from outside coming into UNC-CH's waste stream.

F. Suggestions for Implementing a Cup-Share Program

The following are suggestions for implementing a cup-share program that were gathered through my interviews with customers, beverage location employees, and individuals with experience coordinating a cup-share or similar program. More straightforward suggestions have been summarized in a list at the beginning, while the suggestions that call for more explanation are detailed after.

- Incorporate into dining halls, so coffee can be taken to go in a reusable cup
- Provide a sizing guide on the cups to make it easy for employees
- Make the cup design attractive and "hip" to attract a younger audience
- Provide stainless steel cups
- Make sure bins are placed frequently enough so returning a cup is not a chore

Website/App

Several stakeholders suggested a website or app where they would be able to do the following: follow an interactive map to find the nearest return bin, see the personal impact they have had by using the program, and see their account information and transaction history. One student with a background in computer science mentioned that creating a web app, which is essentially just a website that works very well on mobile devices, would be a lot easier and cheaper than creating an iOS or Android app and would provide a lot of the same features.

Get Student Support

Several individuals who had experience starting or conducting a cup-share or similar program noted that garnering student support for the program can help overcome administrative pushback and issues with corporate beverage locations. Further, one individual suggested a petition, which publically calls out these stakeholders and proves the volume of student interest.

Payment and Checkout Options for a Cup-Share Program

Figures IV-5 and IV-6 demonstrate that the preferred methods for checking-out a cup as well as paying for any cup-share membership and/or late fees are credit cards/debit cards and OneCard/Student Account regardless of whether a free membership option is offered.

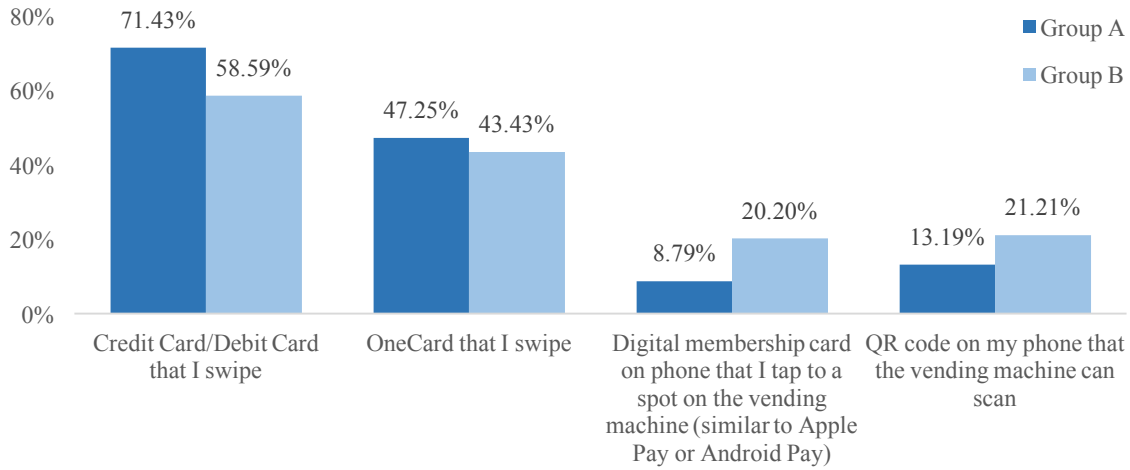


Figure IV-5. Preferred cup checkout options. This figure shows the top checkout options selected by respondents.

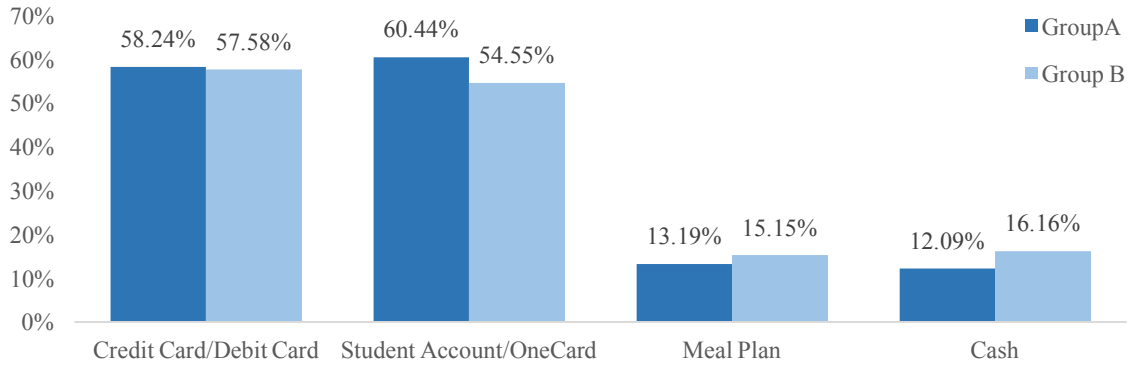


Figure IV-6. Preferred cup payment options. This figure shows the top payment options selected by respondents.

G. Potential Sources to Fund a Cup-Share Program at UNC-CH

The following are the potential revenue and cost-saving streams as well as funding possibilities identified both through the interviews as well as through evidence provided by the questionnaire.

Membership Fees

The most obvious option for funding the program is through generated revenues by charging membership fees to users. Considering that the likelihood of beverage consumers at UNC-CH does not significantly decrease when no free membership option is available, the $1/month base membership option is likely the best choice if the program is to be funded through generated revenues.

Additionally, Figure IV-7 shows that more beverage consumers at UNC-CH are likely to choose higher tiered, and more expensive, membership options when no free option is provided (35.35% vs. 7.69%), which would further increase generated revenues from membership fees.

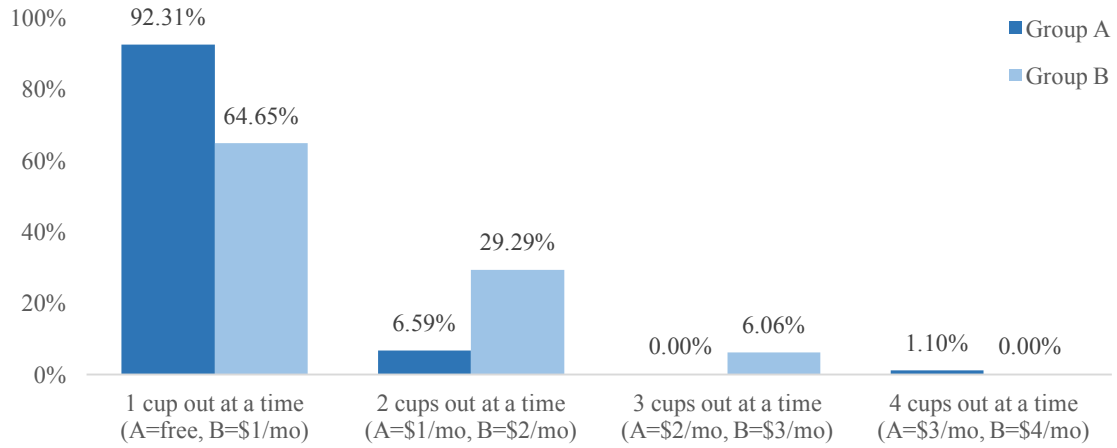


Figure IV-7. Membership option preferences. This figure shows the membership option that respondents would choose if they were to participate in a cup-share program. Group A started with a free option, while Group B started at $1/mo.

Cost-savings from Cups Saved

According to CDS administration, the unit cost of a cup and lid is roughly 10¢. As a result, if half of the beverages sold in disposable cups in 2017 were instead sold in reusable cups provided by a cup-share program, costs savings of roughly $60,000 would have been realized.

Cost-Savings from Waste Removal

According to a member of the Office of Waste Reduction and Recycling, the cost of removal of landfilled waste and composted waste is approximately $130/ton and $80/ton, respectively. Since approximately 11 tons of landfilled waste and 8 tons of compostable waste was produced from disposable cups in 2017, additional cost savings of roughly $1,000 could have been realized had half of the disposable cups produced on campus in 2017 been diverted by a cup-share program. However, this does not account for improper disposal, which means the actual potential cost savings is likely higher.

Student Fees

CDS administration mentioned that student fees are a potential option for funding the program, but due to the fact that student fees cannot increase by more than 3% year to year by law, there are a lot of people fighting for this revenue stream.

CDS Sponsorship

CDS administration also mentioned that if the costs for the first year of the program were in the $40,000-$50,000 range, they might be able to help fund the program. However, as mentioned, they would want to see an ROI after 5 to 7 years.

Corporate Sponsorship

A member of the Office of Sustainability mentioned that the startup costs for the bike-share program at UNC-CH were significantly funded through a corporate sponsorship from Burt's Bees. A similar corporate sponsorship could be explored to fund the cup-share program.

Crowdfunding

A unique funding option that was used by Durham GreenToGo to raise their startup funds is crowdfunding. A cup-share program's positive goals, large target audience (beverage consumers), and ability to offer future memberships as a reward increase the likelihood of successfully funding the program through this option (Hebert, 2016).

Setting Up as Separate Business Unit

Finally, if the startup costs are too high to be funded by any of the other options, setting up the cup-share program as a separate business, similar to Vessel or Cup Club, with a more adaptable business model would allow for the possibility of growth into other communities and the possibility of approaching startup investors as a result. This option would be dependent on finding people willing to take on the commitments necessary to grow the business.

H. Assessing the Perceived Barriers and Benefits to Participating in a Cup-Share Program

In order to select the most effective strategies for increasing the effectiveness of a cup-share program, the barriers and benefits to participating in a cup-share program perceived by the UNC-CH beverage consumer population were assessed.

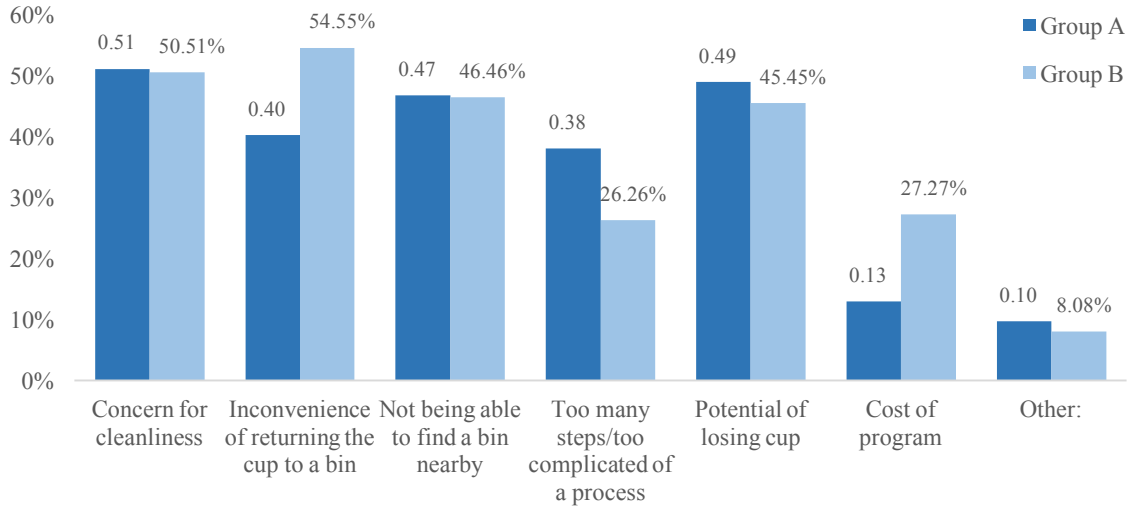


Figure IV-8. Barriers to participating in a cup-share program. This figure shows there are no clear top barriers to participating in a cup-share program as reported by respondents.

The results displayed in Figure IV-8 indicate there are no clear top barriers to joining a reusable cup program reported by either Group A or Group B, which means that all of them should be addressed if possible. Additionally, a significantly higher percentage of respondents in Group B selected "inconvenience of returning the cup to a bin" and "cost of program" as a top barrier to participating in a cup-share program (+14.33%, $p < .05$, and +14.23%, $p < .01$, respectively). These results indicate that addressing the concerns for the cost of the program and the inconvenience of returning a cup should be given a higher priority if no free membership option is offered. However, "cost of program" still ranked low in comparison to most of the barriers indicating that while introducing the base membership does increase the weight of this barrier, it does not introduce a major barrier.

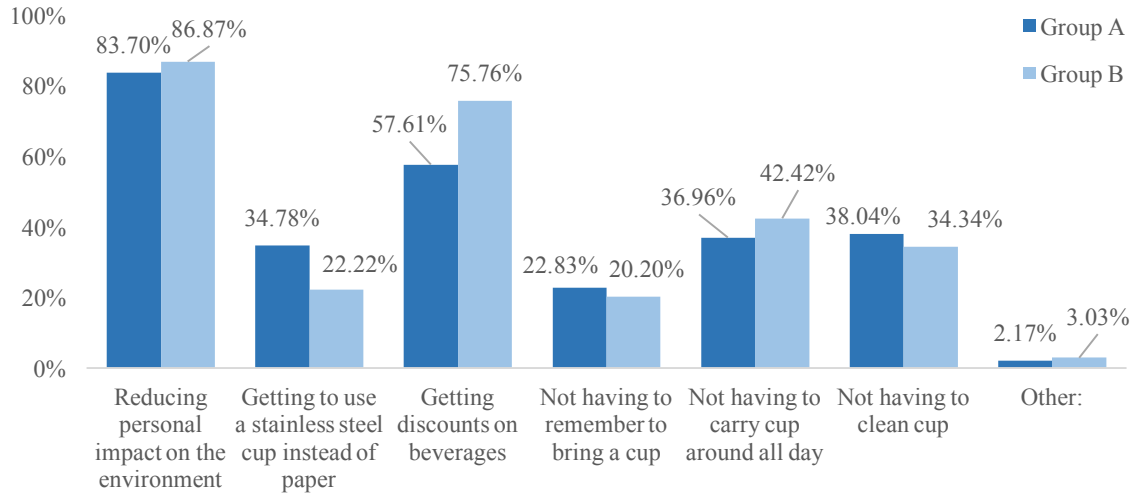


Figure IV-9. Benefits to participating in a cup-share program. This figure shows the top benefits to participating in a cup-share program.

Figure IV-9 illustrates the primary benefit of participating in a cup-share program selected by most respondents in Group A and Group B (83.70% and 86.87%, respectively) was "reducing personal impact on the environment." Additionally, a majority of respondents in both Group A and Group B (57.61% and 75.76%, respectively) selected "getting discounts on beverages" as a top benefit of participating in a cup-share program; however, the proportion was significantly higher for Group B (+19%, $p < .01$), indicating that receiving some sort of financial return is more important to those who are not offered a free membership option.

Additionally, while none of the benefits related to the lack of inconvenience of using a personal reusable cup (i.e. remembering, carrying, and cleaning it) ranked higher than reducing impact and getting discounts, 73.03% and 80.81% of respondents in Group A and Group B, respectively, selected at least one of these benefits. This result indicates that if all three can be addressed at the same time into a single strategy, this strategy would influence a majority of beverage consumers. Further, this result confirms that a cup-share program does indeed remove at least one external barrier to using a reusable cup for a majority of beverage consumers.

I. Assessing the Perceived Barriers and Benefits to Using a Paper Cup

In addition to addressing the barriers and benefits to participating in a cup-share program, strategies to improve a cup-share program's effectiveness should also address the barriers and benefits to the undesirable behavior, which in this case is the use of a disposable, and most commonly paper, cup (McKenzie-Mohr, 2011). The following results delineate the barriers and benefits to using a paper cup that are perceived by the UNC-CH beverage consumer population.

Figure IV-10 shows that "it creates waste" is the clear primary barrier (85%) to using a paper cup with "it gets soggy" and "it doesn't keep my drink hot/cold" as roughly equal secondary barriers, selected by 38.33% and 35.56% of respondents, respectively.

The results illustrated in Figure IV-11 also clearly indicate a primary choice, which is the benefit of "it's convenient" selected by 83.33% of respondents. "It doesn't affect the taste of my drink," selected by 22.78% of respondents, could be considered a secondary benefit; however, since reducing this benefit would entail affecting the taste of customers drinks to something presumably less pleasant, which would never be supported by beverage locations, I did not include it in my final results.

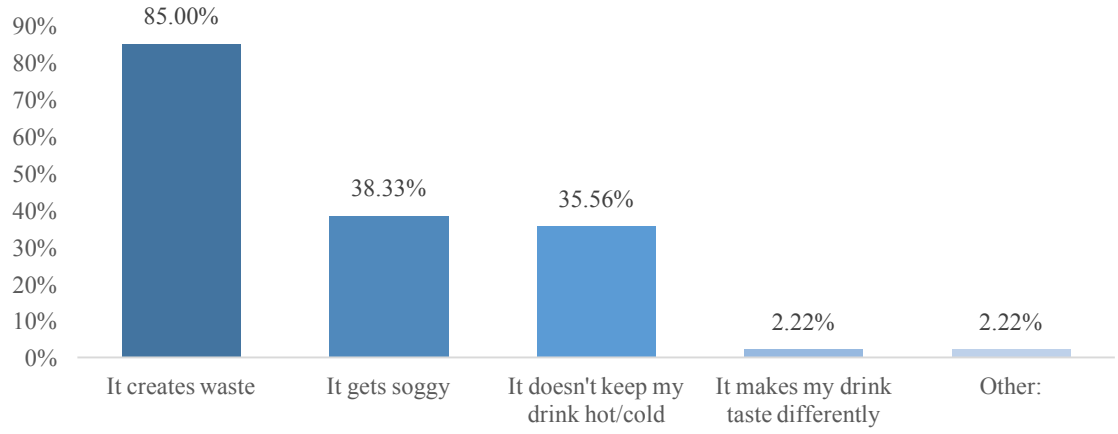


Figure IV-10. Barriers to using a paper cup. This figure shows the top barriers to using a paper cup.

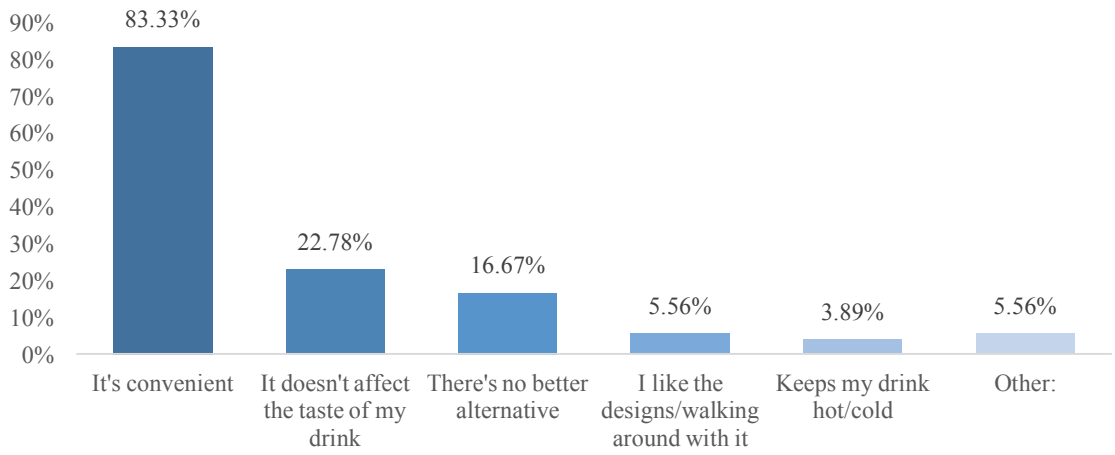


Figure IV-11. Benefits to using a paper cup. This figure shows the top benefit to using a paper cup.

V. DISCUSSION AND RECOMMENDATIONS

The results of this study indicate that the current initiatives to reduce disposable cup waste at UNC-CH are not sufficient and that a cup-share program paired with other strategies may be a more effective strategy for significantly reducing disposable cup waste at UNC-CH. Specifically, the large volume and improper disposal of disposable cups consumed on campus make disposable cup waste a significant issue at UNC-CH. Further, even the most successful implementations of the current discount initiatives are only diverting approximately one-third of beverages from being served in disposable cups through the use of personal reusable cups. In comparison, at least half of beverage consumers at UNC-CH are likely to participate in a cup-share program, even if there is no free membership option. As a result, a cup-share program has a higher potential to reduce disposable cup waste at UNC-CH than the current initiatives. However, since these initiatives are not mutually exclusive, the addition of a cup-share program at UNC-CH is likely to considerably compound the success of current initiatives.

Having established that there is a need for a cup-share program at UNC-CH, in the rest of this section I will discuss the different solutions that were explored and their viability; a broad summary of the concerns for implementing a cup-share program held by the different stakeholders at UNC-CH; a few recommendations to address some these concerns based off of other results, including funding options; and a summary of the barriers and benefits that should be referenced when developing further strategies for increasing the effectiveness of a cup-share program. Finally, my thesis ends with of a list of my recommendations for further research.

A. Reviewing the Potential Solutions That Were Explored

Cup-share Program

Based on the results of the survey, a cup-share program seems not only viable, but also able to generate revenues. Several concerns regarding key stakeholders will still need to be addressed before the program can be implemented, however.

Offering Consistent and Larger Discounts

The most obvious solution to implement alongside a cup-share program is the one already being implemented: beverage discounts. However, the evidence provided by the success of discount programs at Law Bar, Einstein's, and Blue Ram Café indicates that discounts should be framed as a flat refill price that is roughly $1 less than the price of a regular beverage. Specifically, setting a $1.19 price for any drip coffee, tea, or soda purchased on campus in a reusable cup would likely be the most successful. Further, McKenzie-Mohr (2011) recommends that incentives should be straightforward and easy to understand. Accordingly, the discount offered at each location should be changed to be consistent across campus.

Disposable Cup Fee/Ban

As noted in the results of the interviews, most individuals would not be opposed to a disposable cup fee as long as an adequate alternative was in place. Consequently, a disposable cup fee could be implemented at any of the participating locations. Further research should be done as to the size of the fee in order to align with McKenzie-Mohr's (2011) suggestion that incentives need to be large enough to be taken seriously. Further, most people felt positively towards the idea of a ban on disposable cups after three years of having first implemented a cup-share program. This option would likely have the most impactful as it eliminates disposable cup waste altogether.

Verbal and Visual Prompts

Lack of awareness of the program resulting in a low adoption rate was identified as one of the biggest potential challenges of a cup-share program through my interview with the student coordinator from the UBC cup-share program as well as the results of Ruskey *et al.* (2016). Additionally, one potential challenge noted by the coordinator of the Durham GreenToGo program was that users will forget to use the program. Prompts are one method of simultaneously increasing awareness and utilization by reminding users of the program as well as its benefits at the points when the desirable behavior or undesirable behavior occurs (McKenzie-Mohr, 2011). Most stakeholders believed that verbal prompts would not be an issue to implement; however, in-store prompts may be difficult to implement in stores that have corporate management.

B. Addressing the Concerns of Management and University Administration

The most limiting factor to adoption of a cup-share program is whether the program is available at the locations where users purchase their beverages. In order to maximize the number of participating locations, the concerns raised by beverage location managers and university administration, including CDS, need to be addressed as these stakeholders will likely be the ones who ultimately decide whether the program is implemented at a given location. Specifically, the concerns raised by these parties were:

1. Space for stocking cups
2. Running out of cups
3. Increased checkout/ordering lines
4. Space for cleaning cups
5. Increased water consumption
6. Cups not being returned

7. Getting cooperation from big brands on campus
8. Cup waste from outside campus
9. Cost and funding of the program

In addition to the suggestions provided in the results section, below is a non-exhaustive list of possible recommendations to address these concerns.

Stackable Cups: By using cups that stack efficiently, less space would be needed to stock the cups. Additionally, this would allow for a larger stock of cups to be kept at each location reducing the risk of running out of cups.

Stock-out Alerts: To further reduce the risk of running out of cups, a backend web service to alert the program coordinators that a particular location is running low on cups could be incorporated into the system. According to one student with a background in computer science, machine learning might also help alert coordinators predict how many days remain before a location is likely to need a fresh stock of cups.

Placing the Check-out Process Before the Payment Process: In order to decrease the risk of the checkout process holding up the checkout/ordering line at a beverage location, the cups and checkout device could be placed right before the ordering or payment point so a customer can check out their cup while the person in front of them places or pays for an order.

Dispensing Machines: Another option to simultaneously address the concerns for space to stock the cups and increased lines is developing an autonomous dispensing machine that allows users to check out a cup on their own and could be placed away from the ordering or payment points; however, this would likely be a very expensive system to develop.

Cleaning Facilities: Separate cleaning facilities would likely be needed for the program to reach a sizable capacity. Vacant or under-utilized spaces on campus should be explored for renovation into cleaning facilities. Spaces will need to be able to meet health code standards and have vehicle access for loading/unloading cups into the transport vehicles. Renovating and/or renting facility space will likely be a large expense.

High-efficiency Dishwashers: High-efficiency industrial dishwashers should be purchased to reduce the impact the program has on water consumption. These will also likely be a large expense. Research should be done to determine the minimum number of dishwashers needed to meet demand.

Late/Lost Cup Fees: Customers generally felt that a late fee of 50¢ per day late after seven days and a lost cup fee of $12 was reasonable given a stainless steel cup. These fees would likely reduce the amount of lost or missing cups and would mitigate the cost of replacing them. Additionally, because these were the fees included in the details of the hypothetical cup-share program described on the questionnaire, implementing these would not affect the likelihood of participation amongst UNC-CH beverage consumers that was found in the results.

Petition for Cup-Share Support: The current media coverage of the disposable cup waste problem should be used as a basis to create a petition pressuring the big-brands to cooperate with the cup-share program. Specifically, the argument should be made that if these brands were really concerned about the problem, as they say they are, they would be willing to cooperate in testing out a potential solution. The petition would also help spread awareness about the program as well as pressure any resistant university administration into cooperating.

Incorporating onto Franklin Street: To address concerns of disposable cup waste coming from outside of campus, the possibility of incorporating the cup-share program onto Franklin Street, where a majority of food service businesses in Chapel Hill are located, should be explored. This would require cooperation with these businesses and the Town of Chapel Hill in order to place return bins along the sidewalks. This would likely add significant costs to the program; however, it would also bring in significantly more revenue by increasing the user base beyond the UNC-CH community.

Funding Options: There are a variety of options to fund a cup-share program at UNC-CH. The most obvious option is to implement self-generated revenue in the form of membership fees starting at $1/month. Further, cost-savings that result from the program can be used to convince CDS to fund the startup costs of the program; however, this amount would likely max out at $50,000 of startup costs. Further funding options include a corporate sponsorship, a crowdfunding campaign, and setting up the program as a separate business unit in order to elicit investor funding.

C. Barriers and Benefits to Participating in a Cup-Share Program and Using a Paper Cup

In order to address concerns for adoption/utilization, further strategies that will increase participation in a cup-share program need to be developed before implementation of the program. To assist in identifying the best strategies, the barriers and benefits to both participating in a cup-share program as well as using a paper cup are summarized in Table V-1 on the next page.

Behavior	Barrier / Benefit		Primary / Secondary
Participate in a cup-share program	**Barriers** (Reduce):	1) Concern for cleanliness	Primary
		2) Inconvenience of returning the cup to a bin	
		3) Not being able to find a bin	
		4) Potential of losing the cup	
		5) Too many steps	Secondary
		6) Cost of program	
	Benefits (Increase):	1) Reducing personal impact	Primary
		2) Getting discounts	
		3) Not having to remember, clean, or carry a reusable cup	
		4) Using Stainless Steel	Secondary
Using a paper cup	**Barrier** (Increase):	1) Creates waste	Primary
		2) Doesn't keep drink cold/hot	Secondary
		3) Gets soggy	
	Benefits (Reduce):	1) Convenience	Primary

Table V-1. Summary of barriers and benefits to using participating in a cup-share program as well as using a paper cup.

D. Recommendations for Further Research

The following is a list of my recommendations for further research.

Cup-share Program Cost-Benefit Analysis: A significant concern held by stakeholders is that the costs of a cup-share program are too high. A detailed analysis of the costs of a program at UNC-CH would allow for a cost-best analysis to be performed and would further establish the feasibility of a cup-share program. This would include determining several implementation

details such as the specific cup to be used and what the bins will be made out of. These details may need their own customer surveys to understand the best options.

Disposable Cup Waste Audit: A waste audit of UNC-CH to find the specific amount of the UNC-CH waste stream that disposable cups take up would address the concerns of those working on the Three Zeros Initiative and would provide further evidence for the need of a cup-share program and other solutions at UNC-CH. Additionally, this waste audit could provide more accurate data on the significance of improper disposal on campus.

Target Market Analysis: According McKenzie-Mohr (2011), strategies should be targeted at the individuals who are most likely to be receptive to them. As a result, an analysis of the demographics and market groups most likely to be receptive to particular appeals and strategies would greatly increase the effectiveness of a cup-share program.

Survey of All Beverage Locations: A survey to understand the specific concerns and needs of all the beverage locations on campus should be done in order to tailor the program effectively to each location.

Reusable Cup Use Tracking System: Research should be done to find a way to track an accurate reusable cup use rate at each beverage location. Implementing this system would also provide evidence for the effectiveness of a cup-share program once implemented.

Customer Purchasing Habits: A study to understand where most beverage consumers on campus purchase their beverages would help inform which locations to include during a pilot or staggered rollout.

Barrier and Benefit Analysis Off-campus: If the cup-share program is going to include Franklin Street businesses then a survey of beverage customers that patron these businesses should be conducted to see which strategies should be used to increase their adoption of the program.

Disposable Cup Fee Amount: Research should be done to assess the size of a disposable cup fee that would be able to influence most beverage consumers on campus to change their behavior.

Future Cup-share Program Employees Survey: A survey of potential candidates to be on the cup-share program coordinating team should be done to understand any concerns or suggestions they may have regarding the implementation of the program.

Bin Placement: A study factoring in the cost of bins and where people most frequently throw away their disposable cups should be done to determine where the best and most cost-effective placement of return bins would be.

User Attrition from Lost Cup Fee: A survey should be conducted to understand if a $12 lost cup fee is too high and might cause participants to no longer participate in the program.

Pilot Program: Lastly, a pilot program would be important for solidifying conclusions drawn from research and would specifically inform the actual adoption and utilization rates as well as the rate of cup attrition. The pilot program should have a control so the effects of particular strategies can be tested.

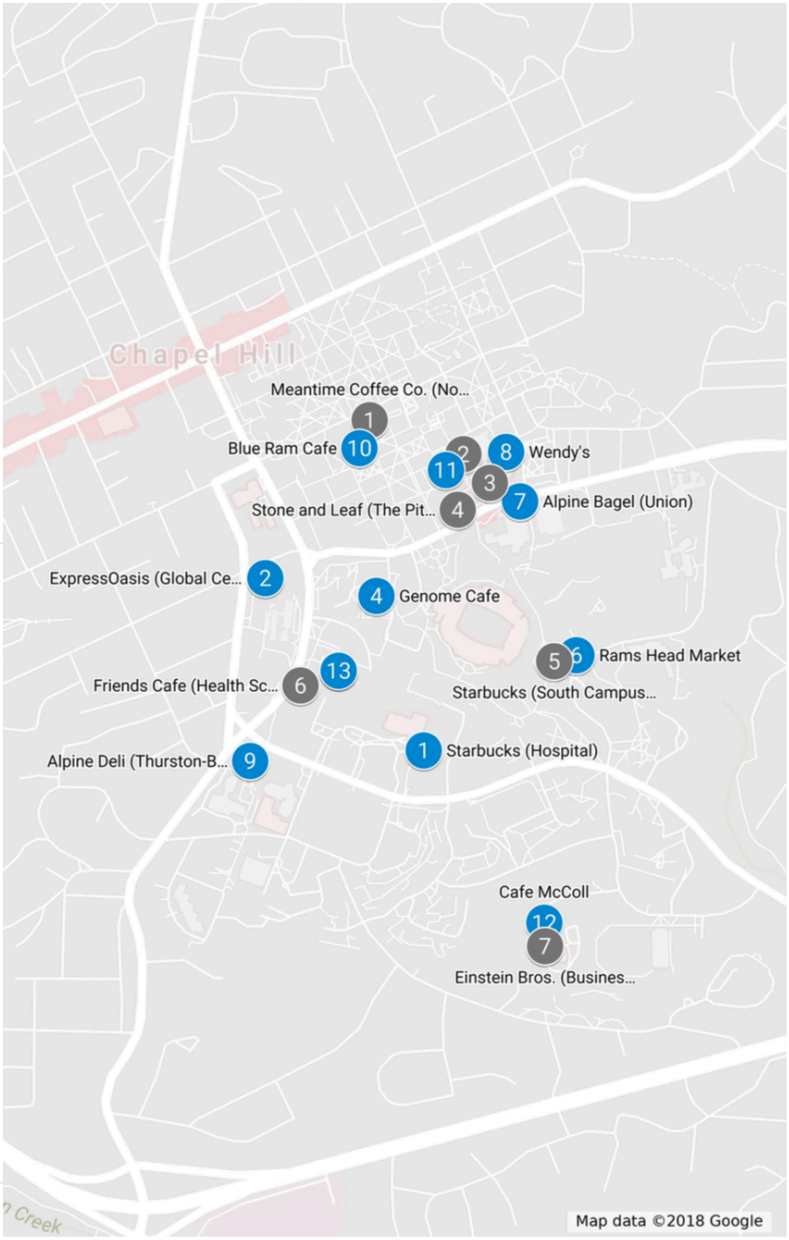
APPENDIX A: Map of Beverage Locations on Campus

Hot-Beverage Locations for Interviews and Questionnaire

1. Meantime Coffee Co. (North Campus)
2. Bottom of Lenoir (The Pit)
3. Student Union (The Pit)
4. Stone and Leaf (The Pit)
5. Starbucks (South Campus)
6. Friends Cafe (Health Science Area)
7. Einstein Bros. (Business School)

Other Beverage Locations

1. Starbucks (Hospital)
2. ExpressOasis (Global Center)
3. ExpressOasis (Beach Cafe)
4. Genome Cafe
5. Law Bar
6. Rams Head Market
7. Alpine Bagel (Union)
8. Wendy's
9. Alpine Deli (Thurston-Bowles)
10. Blue Ram Cafe
11. Healthy Bowl
12. Cafe McColl
13. ExpressOasis (Beach)



APPENDIX B: Number of Cups Sold, Refill Rate, and Discount Offered at Each Beverage Location on UNC-CH's Campus

Location	Number of beverages sold in paper cups sold in 2017	Number of beverages sold in plastic cups sold in 2017	Total cups sold in 2017	# of refills	Refills as a % of all beverages served	Discounted offered for using reusable cup
Law Bar	6,375	0	6,375	3,290	34.04%	Charge for refill at $1.19
Einstein's	23,778	1,756	25,534	11,868	31.73%	$1.09 for drip refills, $2.50 for espresso drinks ($3.59-$4.09 regularly)
Blue Ram Cafe	20,727	0	20,727	6,183	22.98%	Any coffee or tea for $1.19
Alpine Deli	21,672	947	22,619	5,895	20.67%	20% off beverage
Atrium	15,105	0	15,105	1,141	7.02%	Charge for small ($1.99) regardless of size. Refills are $1.19
AOB	2,289	0	2,289	165	6.72%	n/a
ExpressOasis (Beach)	108,985	15,864	124,849	6,426	4.90%	15¢ off beverage
Dental	21,596	0	21,596	928	4.12%	n/a
Genome Cafe	14,284	0	14,284	564	3.80%	Charge for small ($1.99) regardless of size.
Stone & Leaf	75,310	31,122	106,432	3,227	2.94%	10% off beverage
Alpine Bagel (Union)	134,686	0	134,686	336	0.25%	20% off beverage
Friend's Cafe	76,170	4,317	80,487	89	0.11%	25¢ off any drink
Starbucks	81,861	27,569	109,430	31	0.03%	10¢ off any drink

Healthy Bowl	9,470	0	9,470	0	0.00%	20% off beverage
Rams Head Market	31,757	0	31,757	n/a	n/a	20% off beverage
Wendy's	141,597	41,050	182,647	0	0.00%	None
Cafe McColl	3,786	0	3,786	0	0.00%	20% off beverage
Meantime Coffee Co	n/a	n/a	n/a	n/a	n/a	Charge for small ($1.99) regardless of size.
ExpressOasis (Global)	20,965	9,344	30,309	n/a	n/a	15¢ off beverage
Beach Cafe	37,590	0	37,590	n/a	n/a	20% off beverage
Main Street	221,038	0	221,038	n/a	n/a	20% off beverage

APPENDIX C: Questionnaire Questions and Results

Scenario A:

A new program comes to UNC-Chapel Hill that allows you to check out a stainless steel reusable cup from a vending machine for use when purchasing a beverage (e.g. coffee, tea, soda, etc.) instead of using a disposable cup. The university places return bins around campus so returning the cup is simple. The university takes care of cleaning and returning the cups back to the vending machines.

This program is free if you only want to be able to check out one cup at a time.

If you want to be able to check out more than one cup at a time, it will cost $1/month for each additional cup, up to four cups. For example, to be able to check out 4 cups at a time, you would pay $3/month. (These fees would be charged to your account once a semester)

Additionally, if you don't return a cup after 7 days, you will be charged a late fee of 50¢ per day that the cup is late, or until the $12 cost of the cup has been paid off.

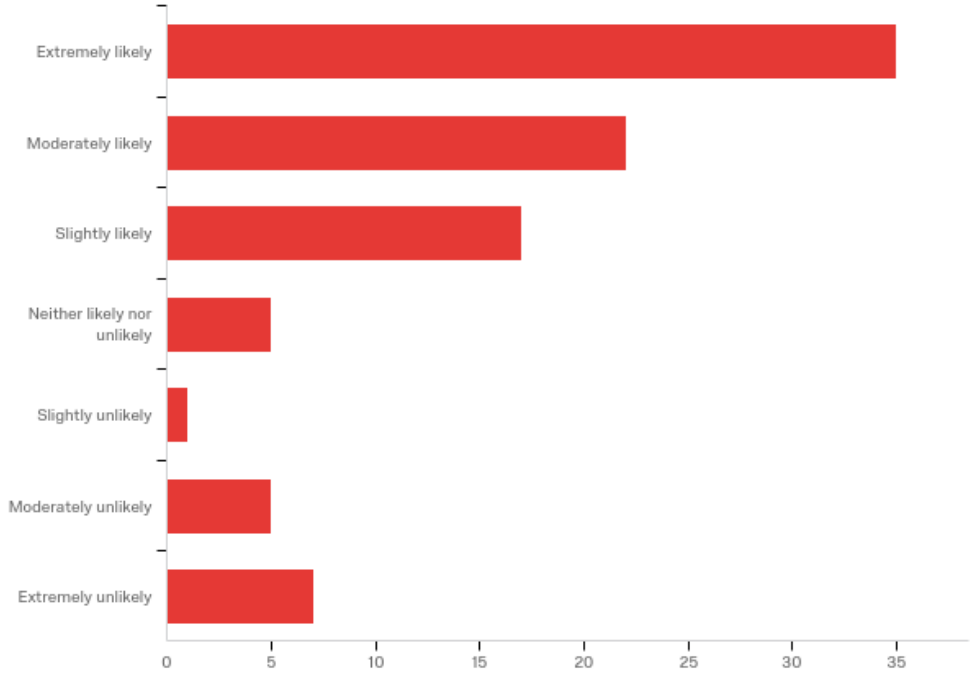
Scenario B:

A new program comes to UNC-Chapel Hill that allows you to check out a stainless steel reusable cup from a vending machine for use when purchasing a beverage (e.g. coffee, tea, soda, etc.) instead of using a disposable cup. The university places return bins around campus so returning the cup is simple. The university takes care of cleaning and returning the cups back to the vending machines.

This program costs $1/month per number of cups you want to be able to check out at one time, up to four cups. For example, to be able to check out 3 cups at a time, you would pay $3/month. (These fees would be charged to your account once a semester)

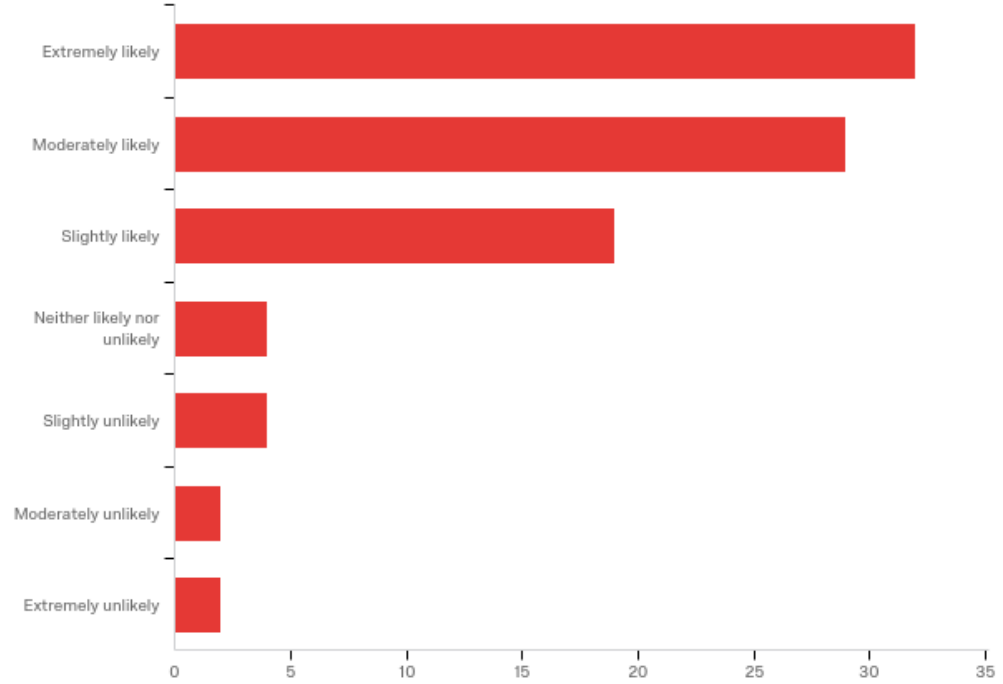
Additionally, if you don't return a cup after 7 days, you will be charged a late fee of 50¢ per day that the cup is late, or until the $12 cost of the cup has been paid off.

Q1.A - How likely would you be to participate in this program if it were available today?



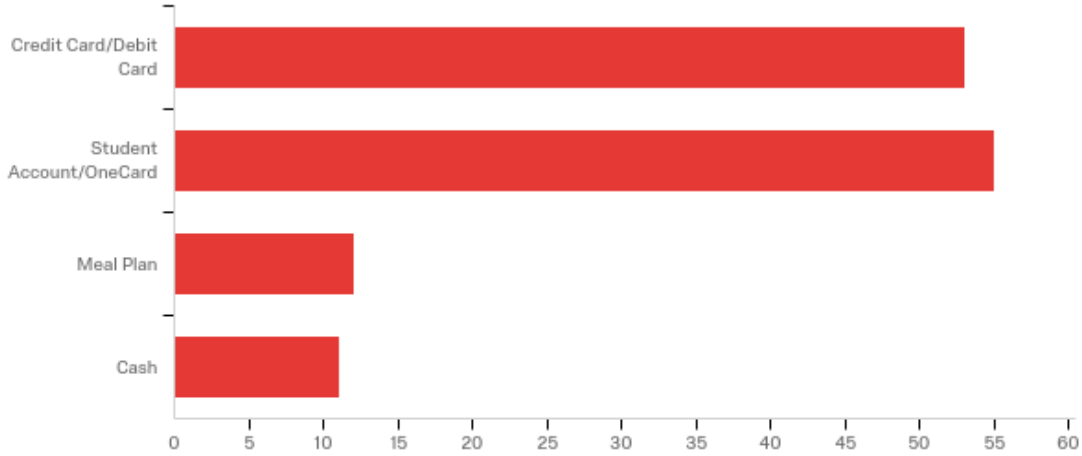
#	Answer	%	Count
1	Extremely likely	38.04%	35
2	Moderately likely	23.91%	22
3	Slightly likely	18.48%	17
4	Neither likely nor unlikely	5.43%	5
5	Slightly unlikely	1.09%	1
6	Moderately unlikely	5.43%	5
7	Extremely unlikely	7.61%	7
	Total	100%	92

Q2.A - How likely would you be to recommend this program to a friend or colleague if it were available today?



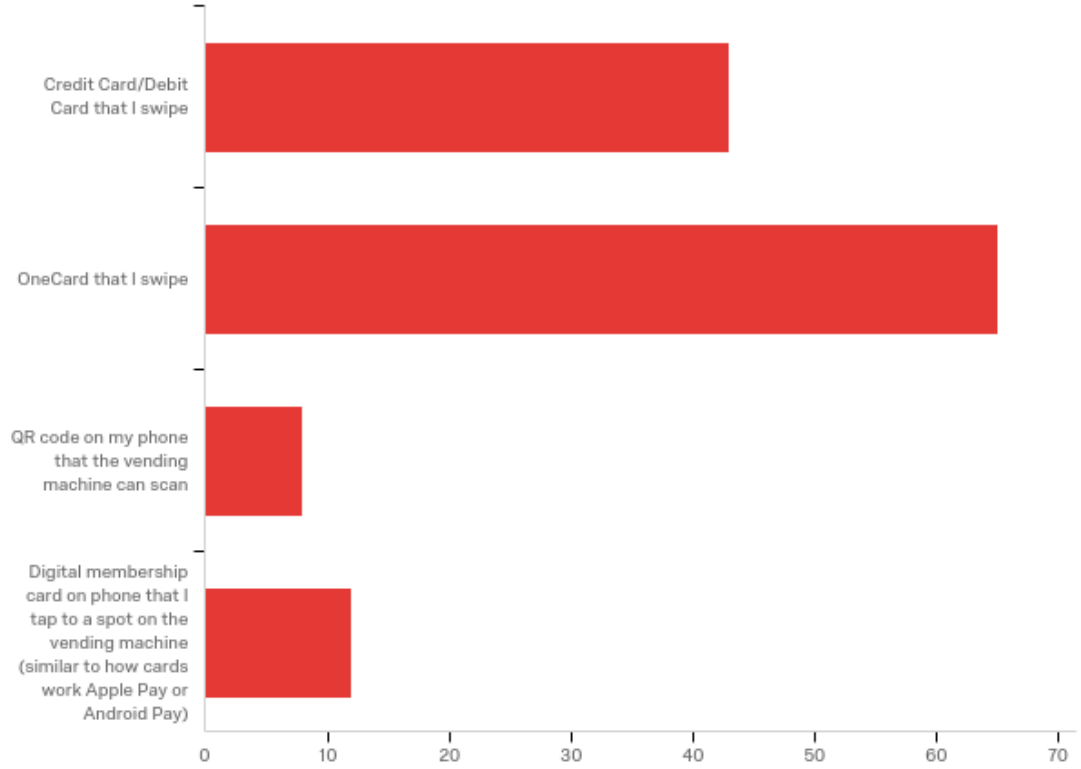
#	Answer	%	Count
1	Extremely likely	34.78%	32
2	Moderately likely	31.52%	29
3	Slightly likely	20.65%	19
4	Neither likely nor unlikely	4.35%	4
5	Slightly unlikely	4.35%	4
6	Moderately unlikely	2.17%	2
7	Extremely unlikely	2.17%	2
	Total	100%	92

Q3.A - If you participated in this program, what payment option(s) would you prefer to use for the membership/late fees?



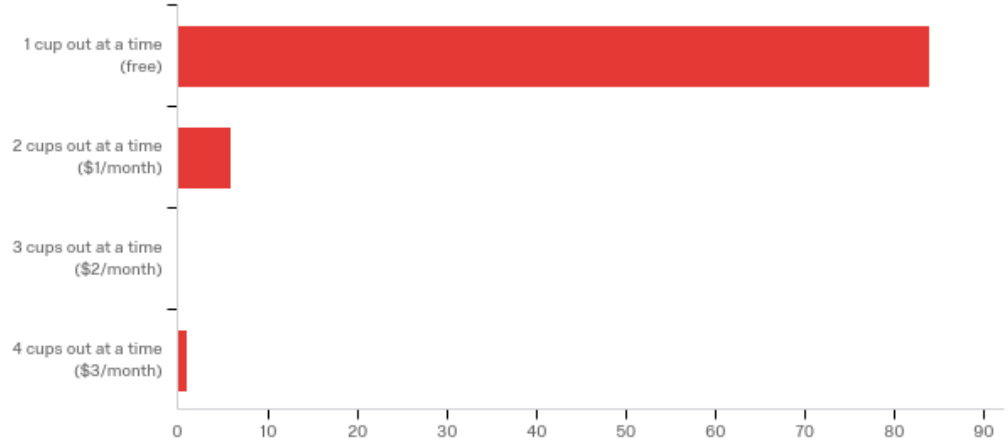
#	Answer	%	Count
1	Credit Card/Debit Card	40.46%	53
2	Student Account/OneCard	41.98%	55
3	Meal Plan	9.16%	12
4	Cash	8.40%	11
	Total	100%	131

Q4.A - Which method(s) would you prefer to use to check out one of these cups at a vending machine?



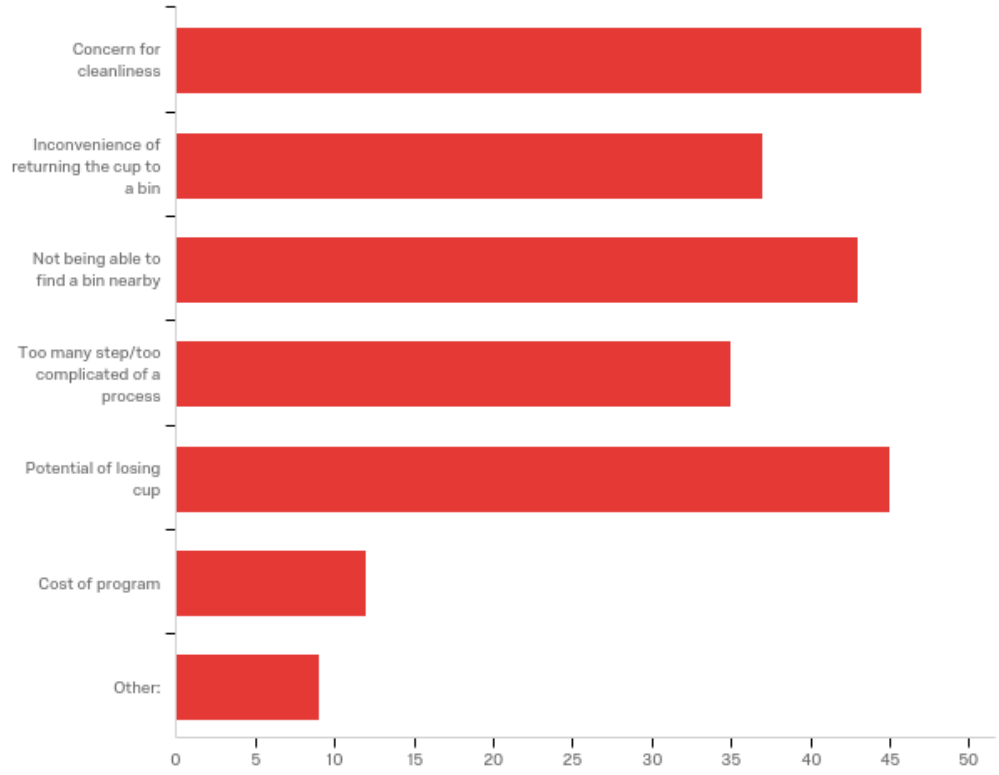
#	Answer	%	Count
1	Credit Card/Debit Card that I swipe	47.25%	43
2	OneCard that I swipe	71.43%	65
3	QR code on my phone that the vending machine can scan	8.79%	8
4	Digital membership card on phone that I tap to a spot on the vending machine (similar to how cards work Apple Pay or Android Pay)	13.19%	12
	Total	100%	91

Q5.A - If you did sign up for this program, think carefully about how you would use it. How many cups would you want to be able to check out at one time?



#	Answer	%	Count
1	1 cup out at a time (free)	92.31%	84
2	2 cups out at a time ($1/month)	6.59%	6
3	3 cups out at a time ($2/month)	0.00%	0
4	4 cups out at a time ($3/month)	1.10%	1
	Total	100%	91

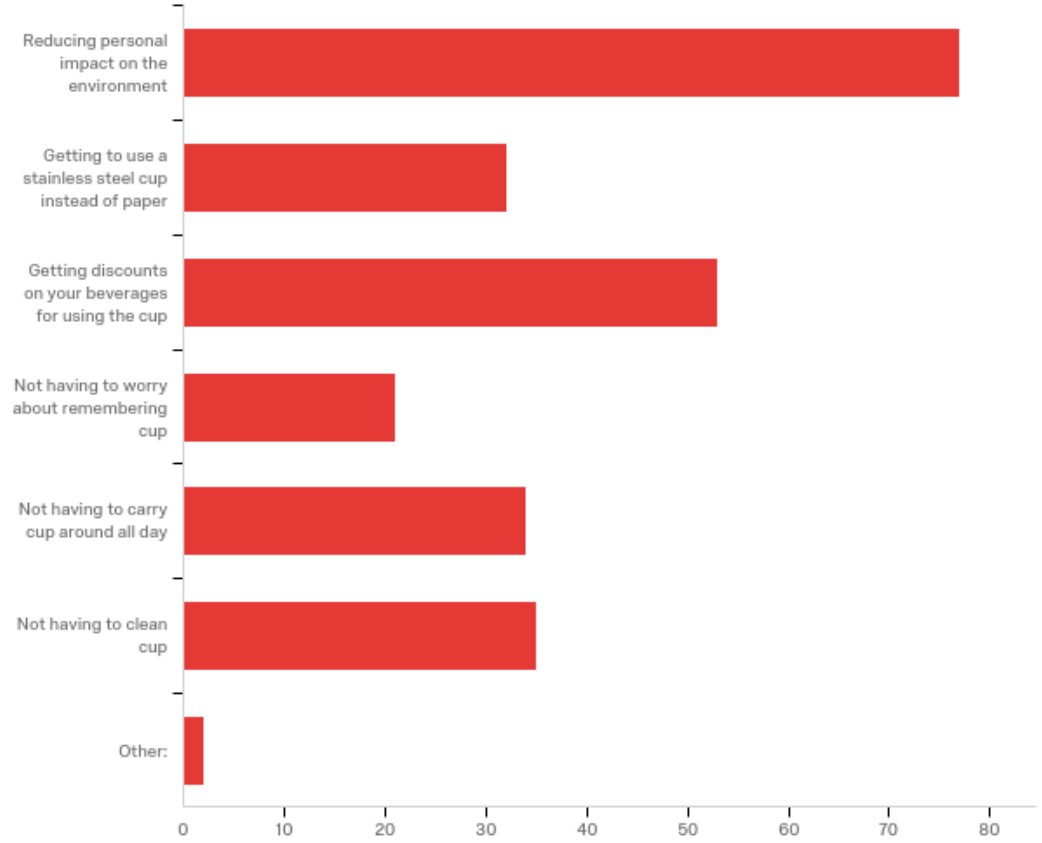
Q6.A - What're the top three factors that would discourage your participation in this program?



#	Answer	%	Count
1	Concern for cleanliness	20.61%	47
2	Inconvenience of returning the cup to a bin	16.23%	37
3	Not being able to find a bin nearby	18.86%	43
4	Too many step/too complicated of a process	15.35%	35
5	Potential of losing cup	19.74%	45
6	Cost of program	5.26%	12
7	Other:	3.95%	9
	Total	100%	228

Other: - Text
I already have a lot of reusable mugs/cups and bring them to class
Already use reusable bottles
None
No system to check how many / how long have I checked out cups
Forgetting about the Cup
Bringing my own cup
I can easily bring a cup from home
Forgetting to return cup
I don't drink soda

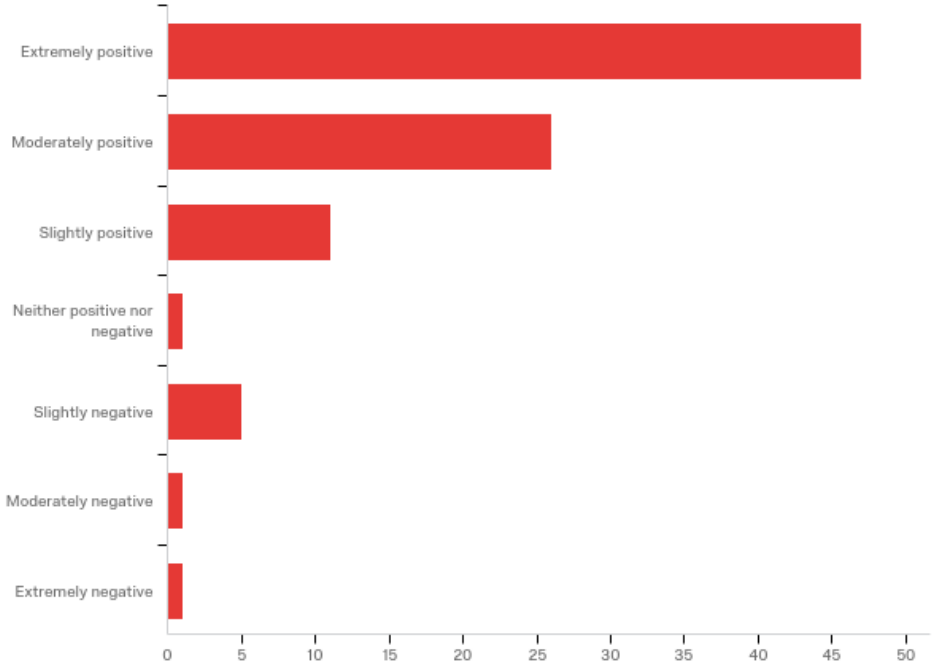
Q7.A - What're the top three factors that would encourage your participation in this program?



#	Answer	%	Count
1	Reducing personal impact on the environment	30.31%	77
2	Getting to use a stainless steel cup instead of paper	12.60%	32
3	Getting discounts on your beverages for using the cup	20.87%	53
4	Not having to worry about remembering cup	8.27%	21
5	Not having to carry cup around all day	13.39%	34
6	Not having to clean cup	13.78%	35
7	Other:	0.79%	2
	Total	100%	254

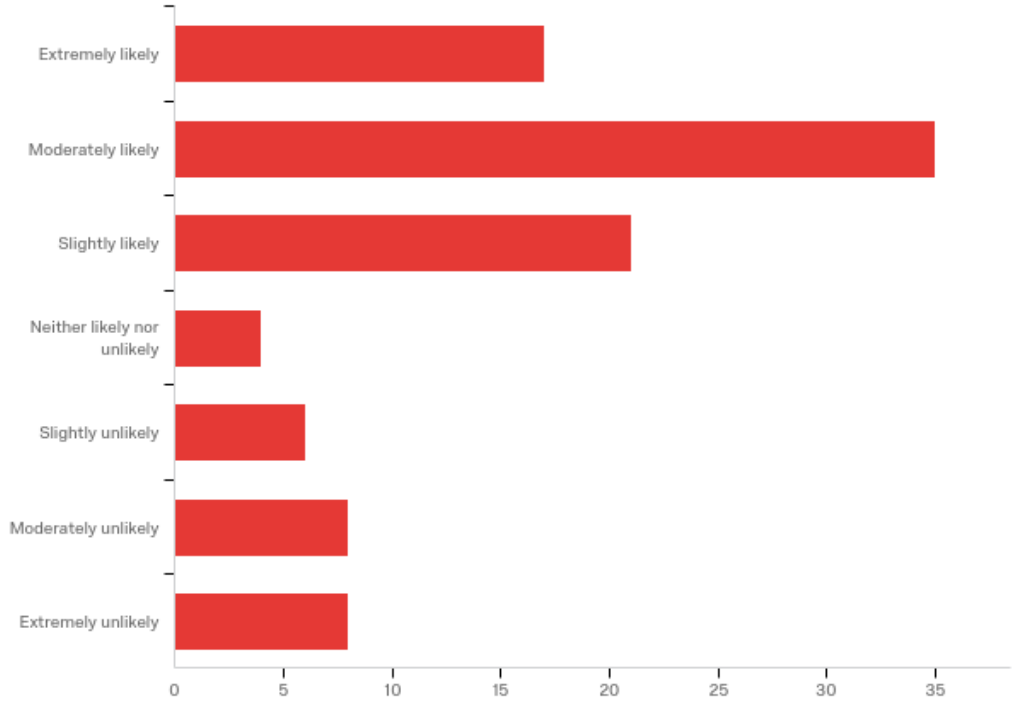
Other: - Text
Contributing to a student lead initiative
Cup Vending Machine in Dorm

Q8.A - Imagine that UNC-Chapel Hill is implementing this program as an alternative to paper cups so they can phase out paper cups completely within three years (i.e. ban them from cafés and dining locations). What would be your attitude towards this decision? (Assume you will still be a part of the UNC-Chapel Hill community when this policy takes effect)



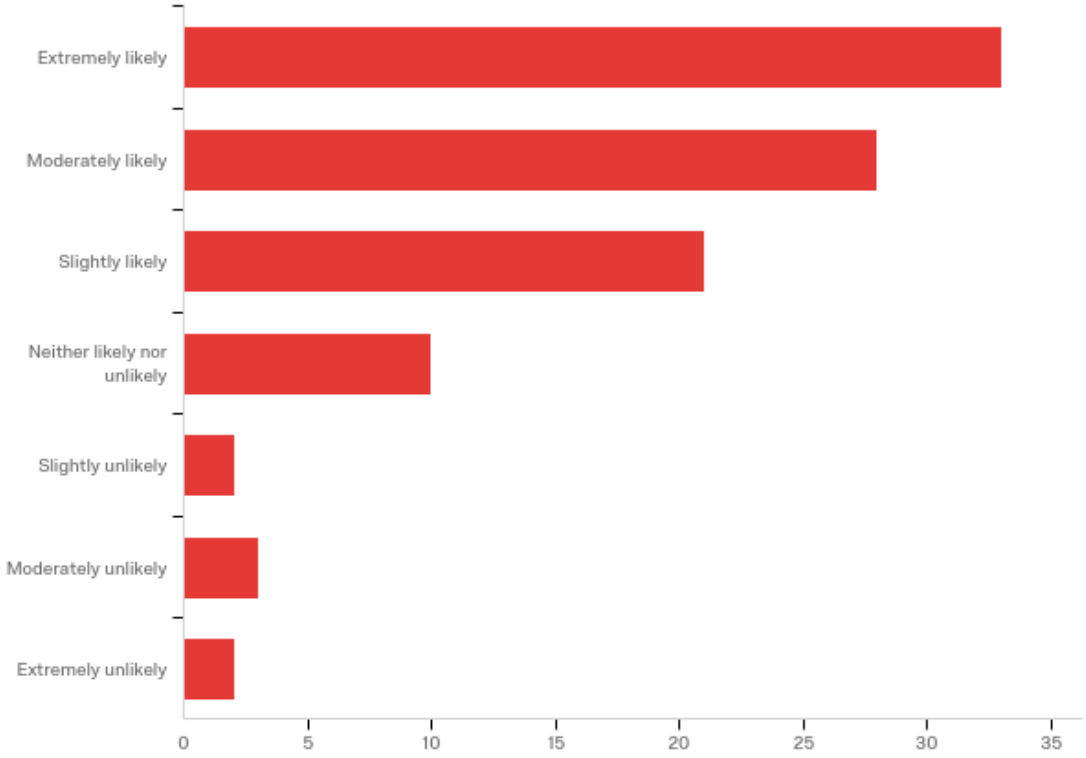
#	Answer	%	Count
11	Extremely positive	51.09%	47
12	Moderately positive	28.26%	26
13	Slightly positive	11.96%	11
14	Neither positive nor negative	1.09%	1
15	Slightly negative	5.43%	5
16	Moderately negative	1.09%	1
17	Extremely negative	1.09%	1
	Total	100%	92

Q1.B - How likely would you be to participate in this program if it were available today?



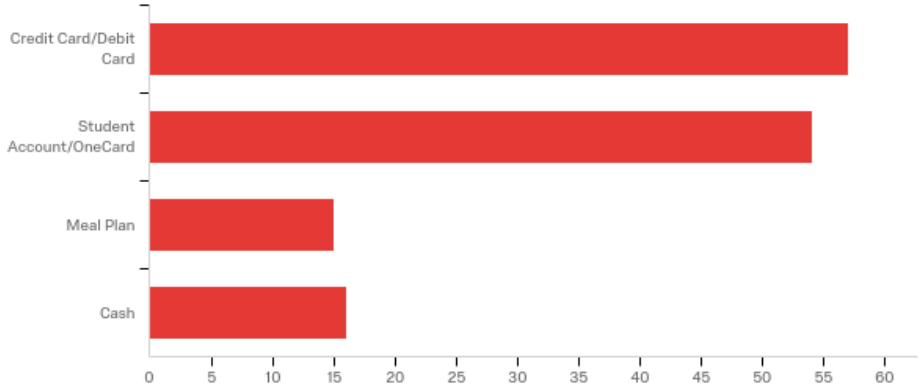
#	Answer	%	Count
1	Extremely likely	17.17%	17
2	Moderately likely	35.35%	35
3	Slightly likely	21.21%	21
4	Neither likely nor unlikely	4.04%	4
5	Slightly unlikely	6.06%	6
6	Moderately unlikely	8.08%	8
7	Extremely unlikely	8.08%	8
	Total	100%	99

Q2.B - How likely would you be to recommend this program to a friend or colleague if it were available today?



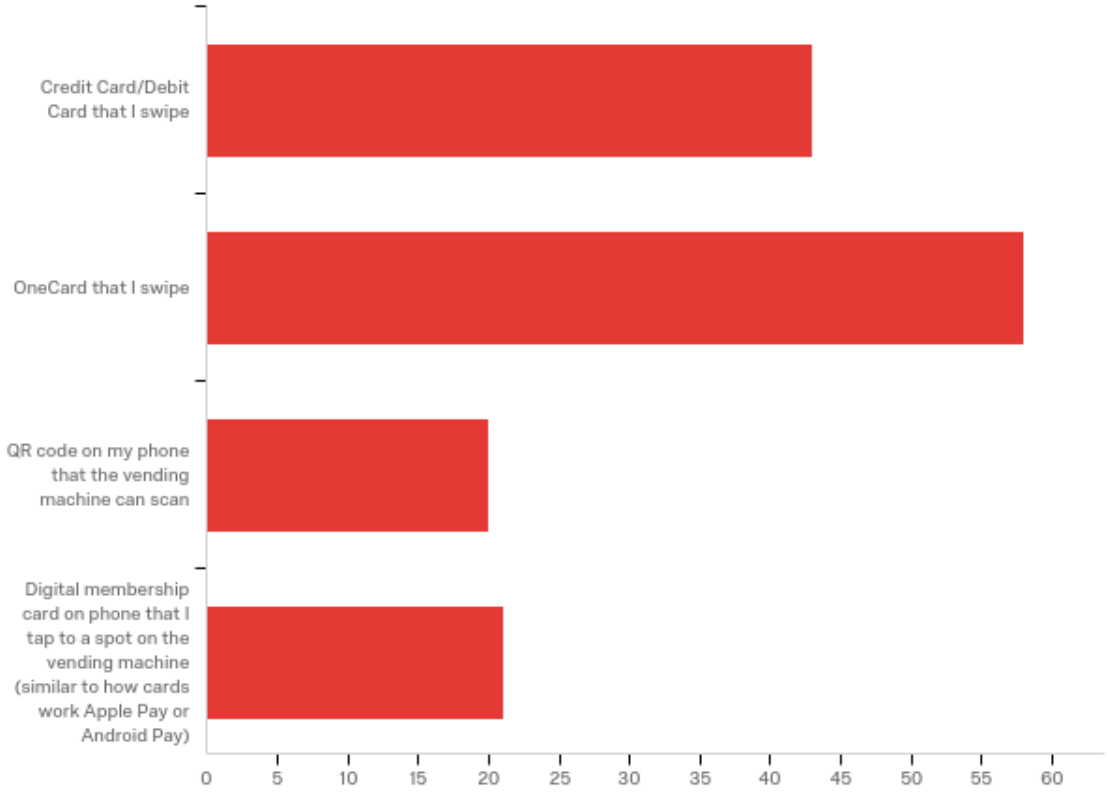
#	Answer	%	Count
1	Extremely likely	33.33%	33
2	Moderately likely	28.28%	28
3	Slightly likely	21.21%	21
4	Neither likely nor unlikely	10.10%	10
5	Slightly unlikely	2.02%	2
6	Moderately unlikely	3.03%	3
7	Extremely unlikely	2.02%	2
	Total	100%	99

Q3.B - If you participated in this program, what payment option(s) would you prefer to use for the membership/late fees?



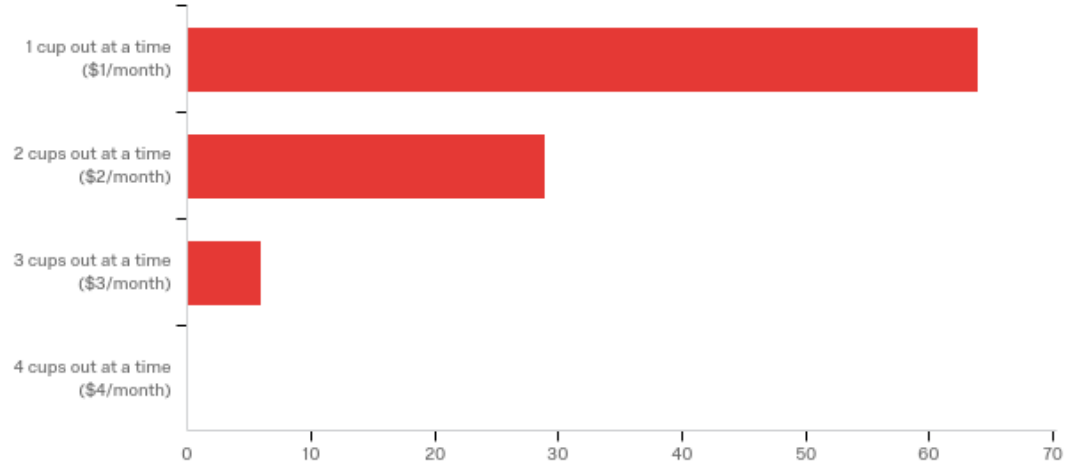
#	Answer	%	Count
1	Credit Card/Debit Card	40.14%	57
2	Student Account/OneCard	38.03%	54
3	Meal Plan	10.56%	15
4	Cash	11.27%	16
	Total	100%	142

Q4.B - Which method(s) would you prefer to use to check out one of these cups at a vending machine?



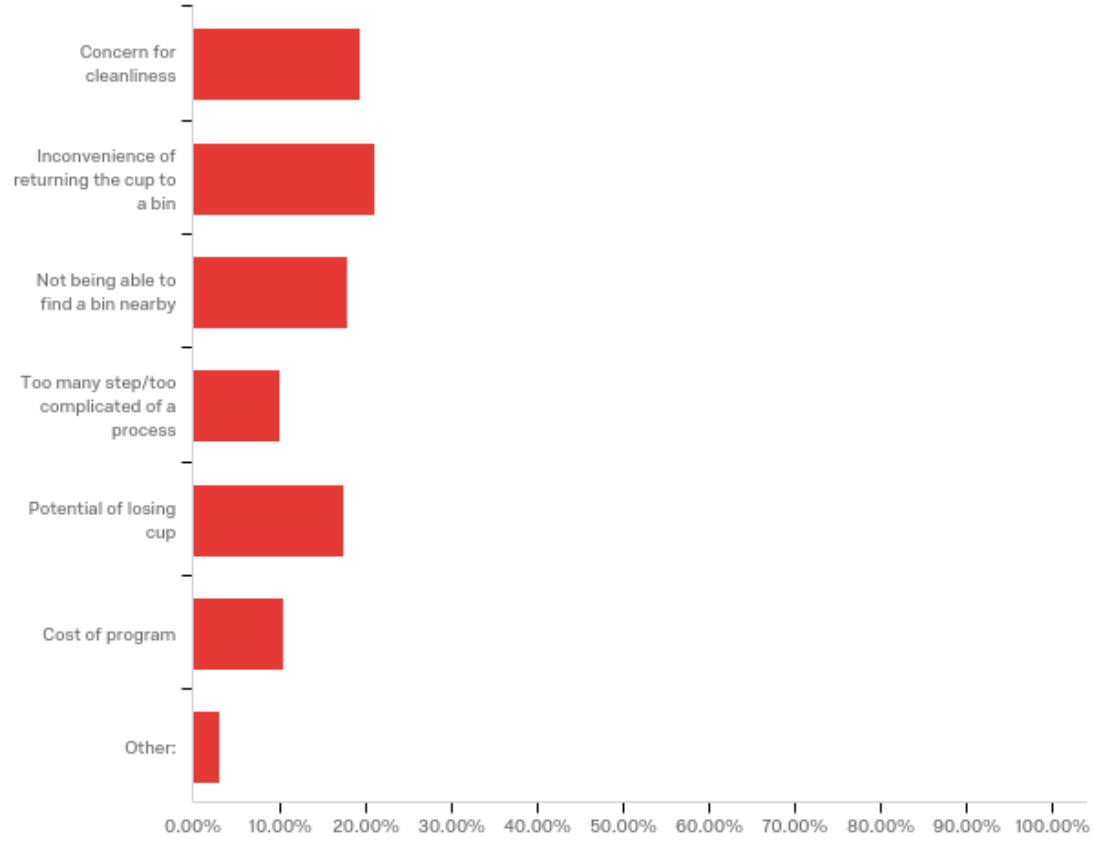
#	Answer	%	Count
1	Credit Card/Debit Card that I swipe	43.43%	43
2	OneCard that I swipe	58.59%	58
3	QR code on my phone that the vending machine can scan	20.20%	20
4	Digital membership card on phone that I tap to a spot on the vending machine (similar to how cards work Apple Pay or Android Pay)	21.21%	21
	Total	100%	99

Q5.B - If you did sign up for this program, think carefully about how you would use it. How many cups would you want to be able to check out at one time?



#	Answer	%	Count
1	1 cup out at a time ($1/month)	64.65%	64
2	2 cups out at a time ($2/month)	29.29%	29
3	3 cups out at a time ($3/month)	6.06%	6
4	4 cups out at a time ($4/month)	0.00%	0
	Total	100%	99

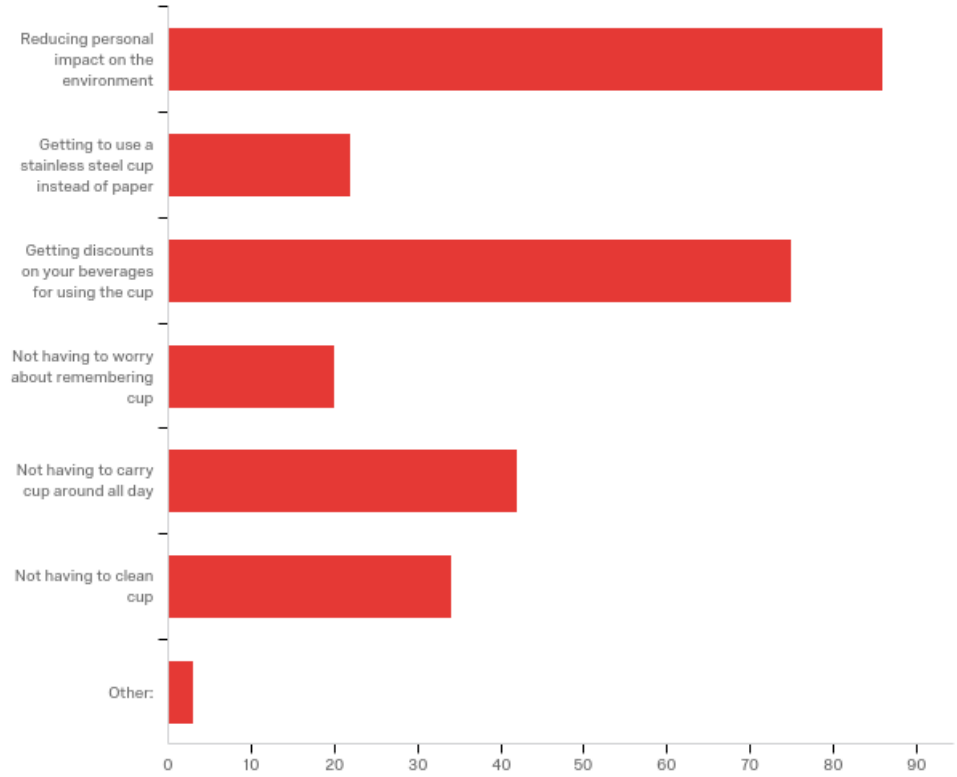
Q6.B - What're the top three factors that would discourage your participation in this program?



#	Answer	%	Count
1	Concern for cleanliness	19.53%	50
2	Inconvenience of returning the cup to a bin	21.09%	54
3	Not being able to find a bin nearby	17.97%	46
4	Too many step/too complicated of a process	10.16%	26
5	Potential of losing cup	17.58%	45
6	Cost of program	10.55%	27
7	Other:	3.13%	8
	Total	100%	256

Other: - Text
I carry a water bottle.
Potentially breaking the cup
I carry my own cup approximately 99.9% of the time
Businesses like Wendy's accepting the cups
I hate metal cups
Have my own reusable containers
Don't drink soda
Not many other concerns! Only question is whether the cups would be good for hot and cold drinks and if i could use them around campus.

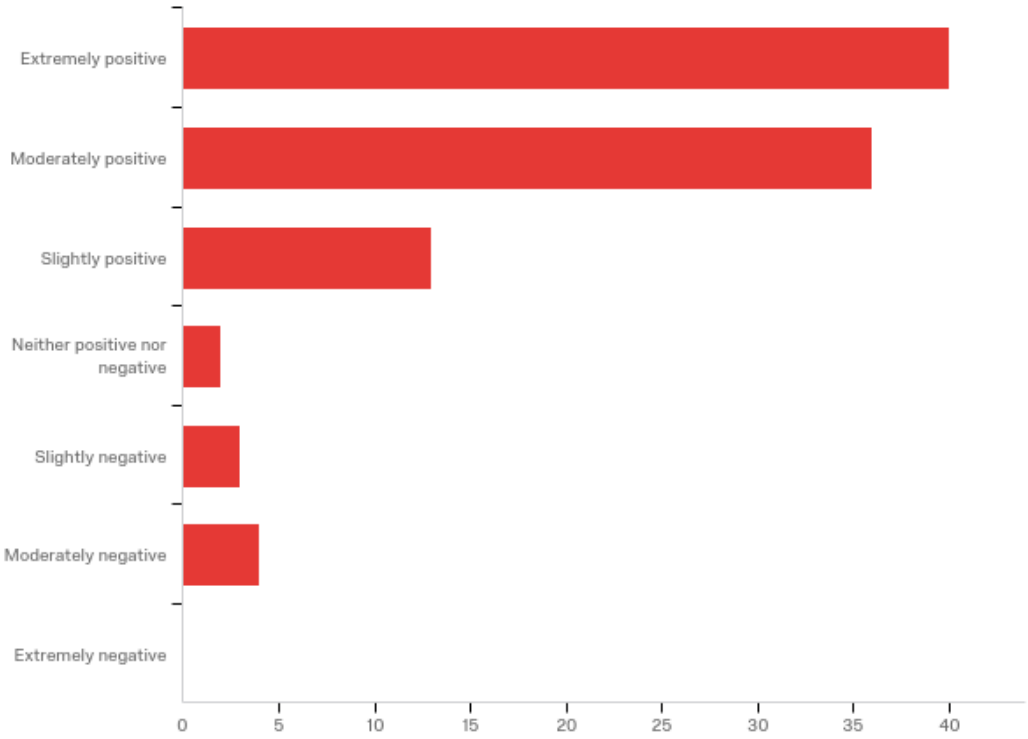
Q7.B - What're the top three factors that would encourage your participation in this program?



#	Answer	%	Count
1	Reducing personal impact on the environment	30.50%	86
2	Getting to use a stainless steel cup instead of paper	7.80%	22
3	Getting discounts on your beverages for using the cup	26.60%	75
4	Not having to worry about remembering cup	7.09%	20
5	Not having to carry cup around all day	14.89%	42
6	Not having to clean cup	12.06%	34
7	Other:	1.06%	3
	Total	100%	282

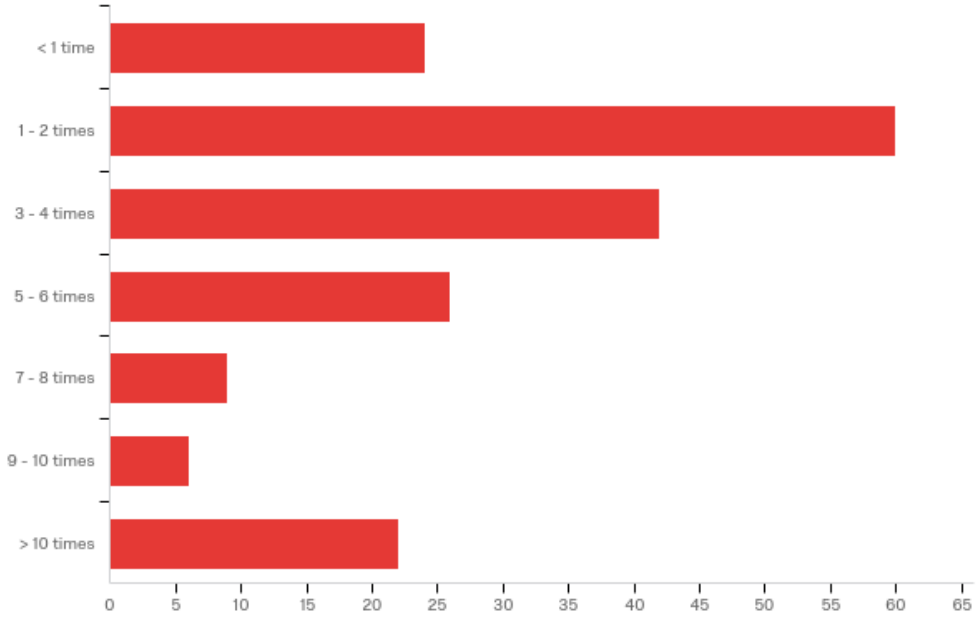
Other: - Text
supporting UNC intiative
New cool thing on campus
If the cups had pretty pictures on them

Q8.B - Imagine that UNC-Chapel Hill is implementing this program as an alternative to paper cups so they can phase out paper cups completely within three years (i.e. ban them from cafés and dining locations). What would be your attitude towards this decision? (Assume you will still be a part of the UNC-Chapel Hill community when this policy takes effect)



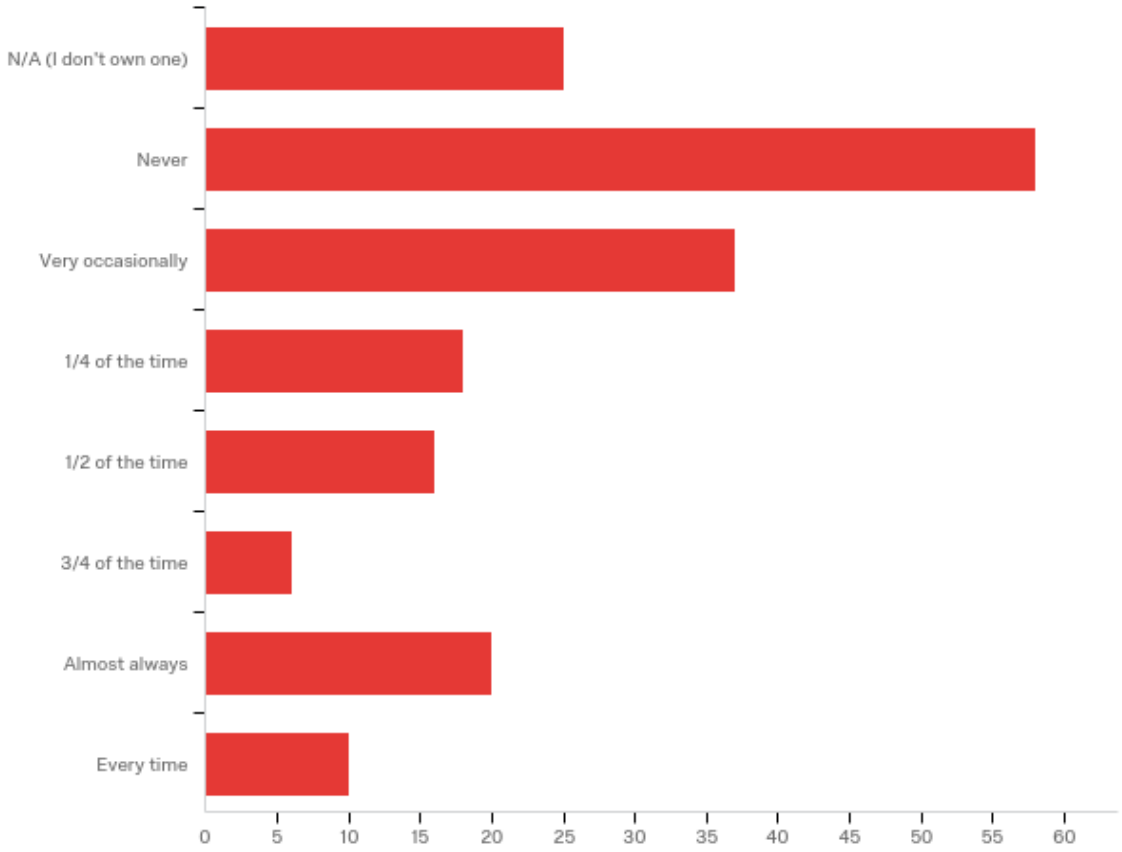
#	Answer	%	Count
11	Extremely positive	40.82%	40
12	Moderately positive	36.73%	36
13	Slightly positive	13.27%	13
14	Neither positive nor negative	2.04%	2
15	Slightly negative	3.06%	3
16	Moderately negative	4.08%	4
17	Extremely negative	0.00%	0
	Total	100%	98

Q9 - In the last 3 months, on average, how many times a week did you get a beverage (e.g. coffee, tea, soda, etc.) to go from an on-campus café, restaurant, or dining hall?



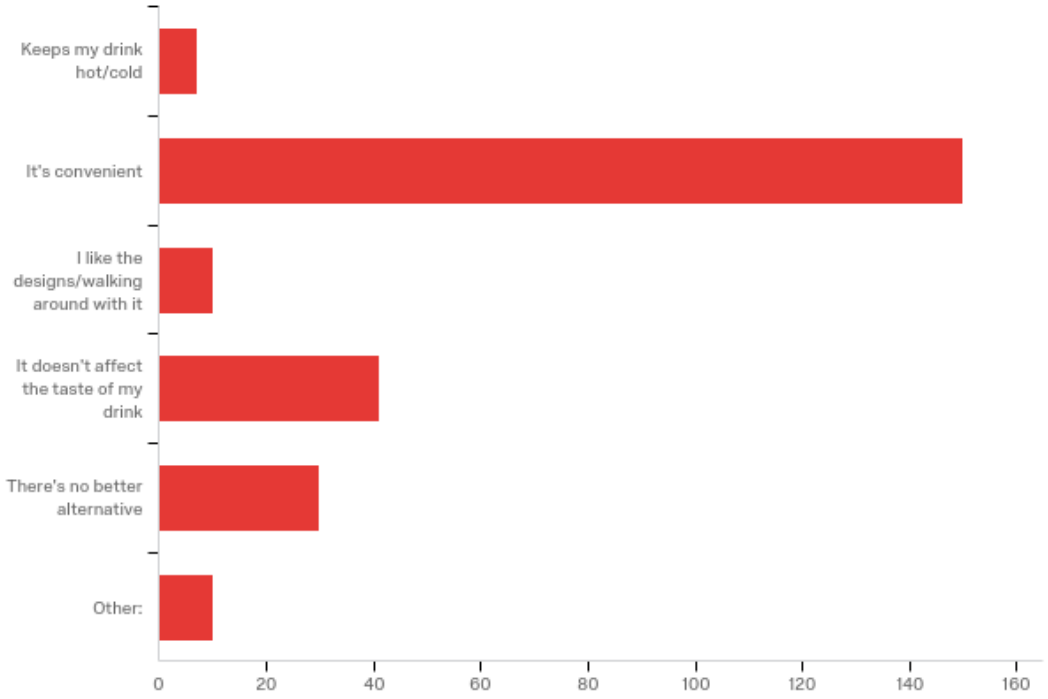
#	Answer	%	Count
1	< 1 time	12.70%	24
2	1 - 2 times	31.75%	60
3	3 - 4 times	22.22%	42
4	5 - 6 times	13.76%	26
5	7 - 8 times	4.76%	9
6	9 - 10 times	3.17%	6
7	> 10 times	11.64%	22
	Total	100%	189

Q10 - In the last 3 months, on average, how often did you get your beverage (e.g. coffee, tea, soda, etc.) to go from an on-campus café, restaurant, or dining hall in a reusable cup or travel mug?



#	Answer	%	Count
1	N/A (I don't own one)	13.16%	25
2	Never	30.53%	58
3	Very occasionally	19.47%	37
4	1/4 of the time	9.47%	18
5	1/2 of the time	8.42%	16
6	3/4 of the time	3.16%	6
7	Almost always	10.53%	20
8	Every time	5.26%	10
	Total	100%	190

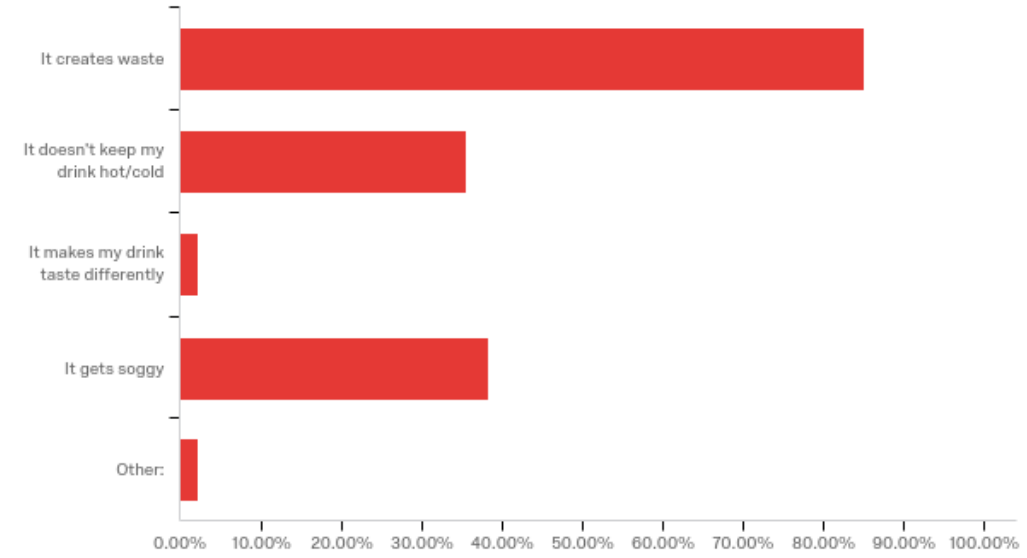
Q11 - What, in your opinion, makes a paper cup so great? (Pick up to 2 reasons)



#	Answer	%	Count
1	Keeps my drink hot/cold	2.82%	7
2	It's convenient	60.48%	150
3	I like the designs/walking around with it	4.03%	10
4	It doesn't affect the taste of my drink	16.53%	41
5	There's no better alternative	12.10%	30
6	Other:	4.03%	10
	Total	100%	248

Other: - Text
I only use a paper cup Im required to put my beverage in it when I buy it (EX: buying a sweet tea at cafe mccoll)
Throw it away when you're done
I can just throw it away when im done
It comes with the drink
Only use it if I don’t have reusable cup with me
I don’t think the paper option is great.
biodegradable
It is disposable
convenient
no additional costs

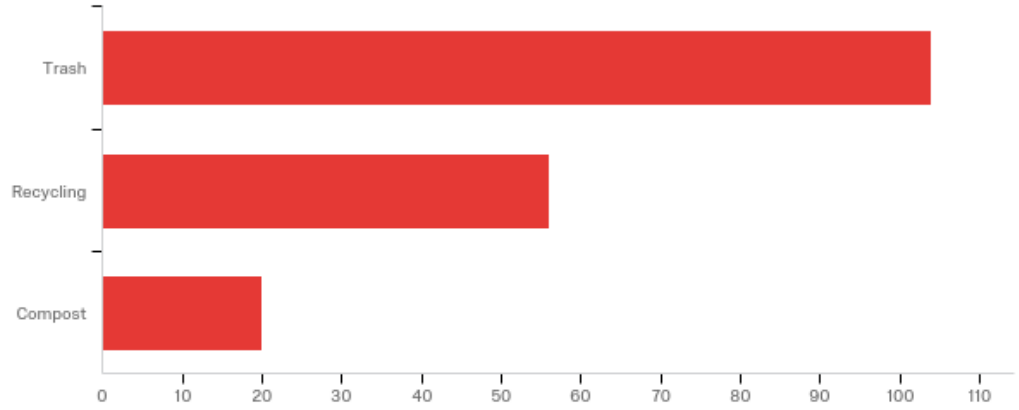
Q12 - On the other hand, what is/are the worst thing(s) about a paper cup? (Pick up to 2 reasons)



#	Answer	%	Count
1	It creates waste	85.00%	153
2	It doesn't keep my drink hot/cold	35.56%	64
3	It makes my drink taste differently	2.22%	4
4	It gets soggy	38.33%	69
5	Other:	2.22%	4
	Total	100%	180

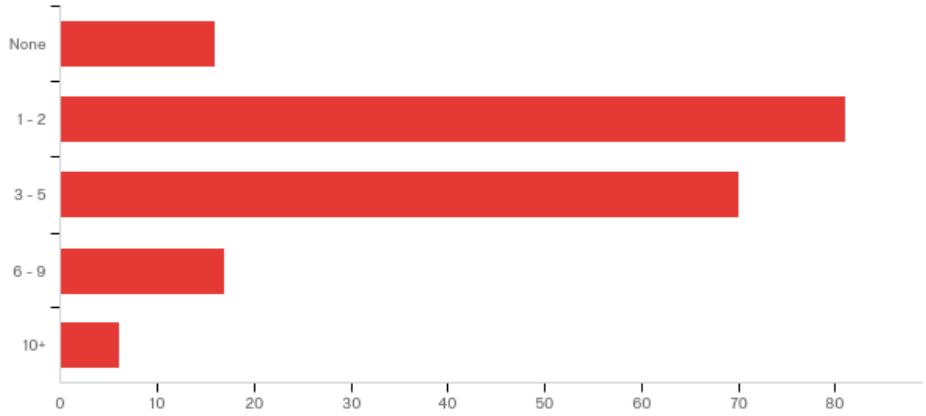
Other: - Text
it sweats if cold drink
Costs more than using the reusable Einstein's mug
They leak through the lid
hot to hold

Q13 - In the last 3 months, where have you usually thrown away your paper cups?



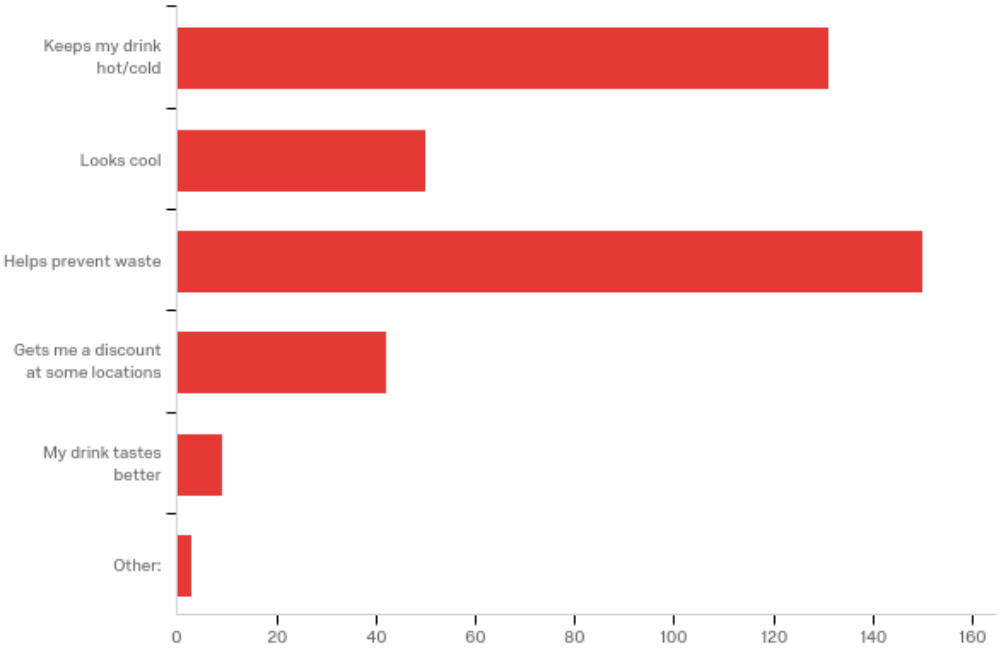
#	Answer	%	Count
1	Trash	57.78%	104
2	Recycling	31.11%	56
3	Compost	11.11%	20
	Total	100%	180

Q14 - How many reusable cups (e.g. travel tumblers/travel mugs; not water bottles) do you own?



#	Answer	%	Count
1	None	8.42%	16
2	1 - 2	42.63%	81
3	3 - 5	36.84%	70
4	6 - 9	8.95%	17
5	10+	3.16%	6
	Total	100%	190

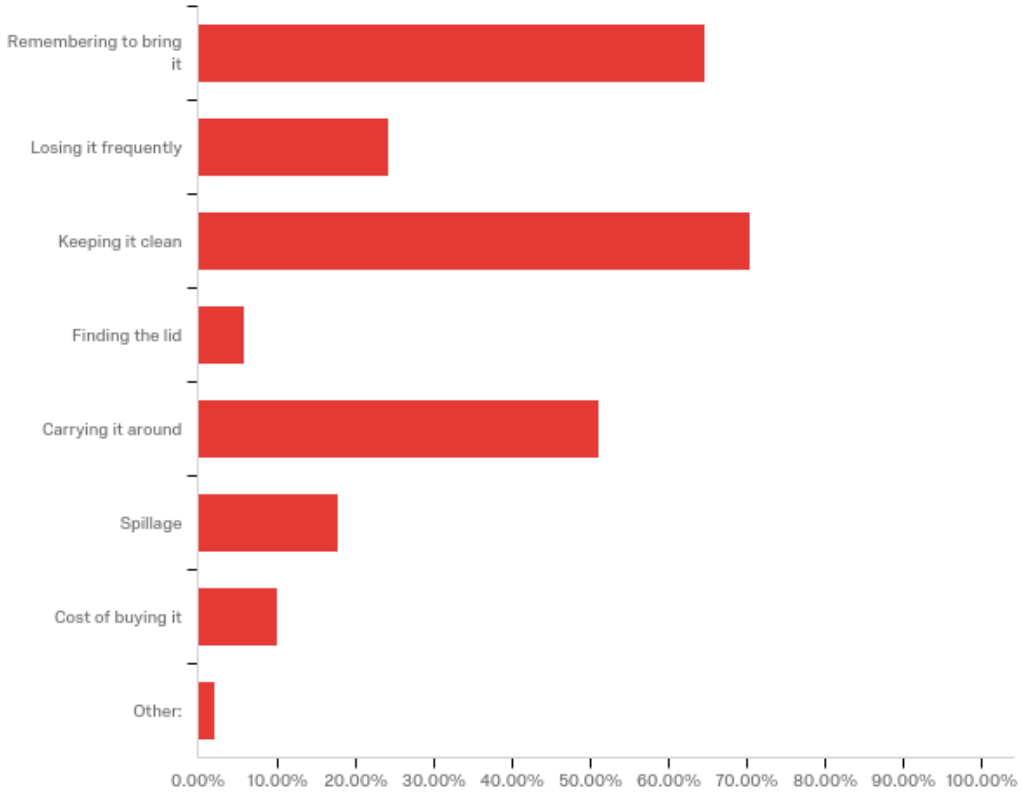
Q15 - What is/are the best aspect(s) of using a reusable cup or travel mug? (Pick up to 3)



#	Answer	%	Count
1	Keeps my drink hot/cold	34.03%	131
2	Looks cool	12.99%	50
3	Helps prevent waste	38.96%	150
4	Gets me a discount at some locations	10.91%	42
5	My drink tastes better	2.34%	9
6	Other:	0.78%	3
	Total	100%	385

Other: - Text
Keeps me hydrated
Cheaper for having my own beverages
Convenient

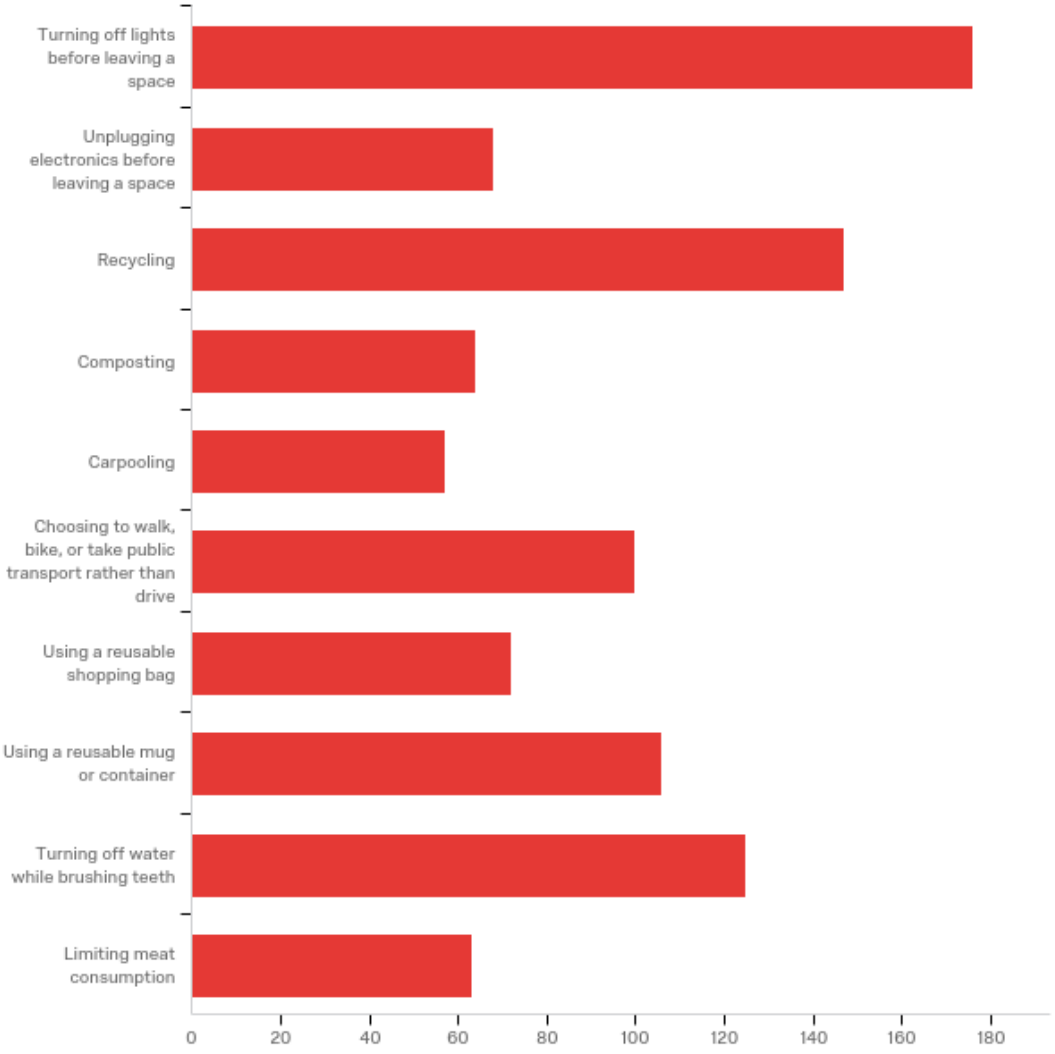
Q16 - What is/are the worst aspect(s) of using a reusable cup or travel mug? (Pick up to 3)



#	Answer	%	Count
1	Remembering to bring it	64.74%	123
2	Losing it frequently	24.21%	46
3	Keeping it clean	70.53%	134
4	Finding the lid	5.79%	11
5	Carrying it around	51.05%	97
6	Spillage	17.89%	34
7	Cost of buying it	10.00%	19
8	Other:	2.11%	4
	Total	100%	190

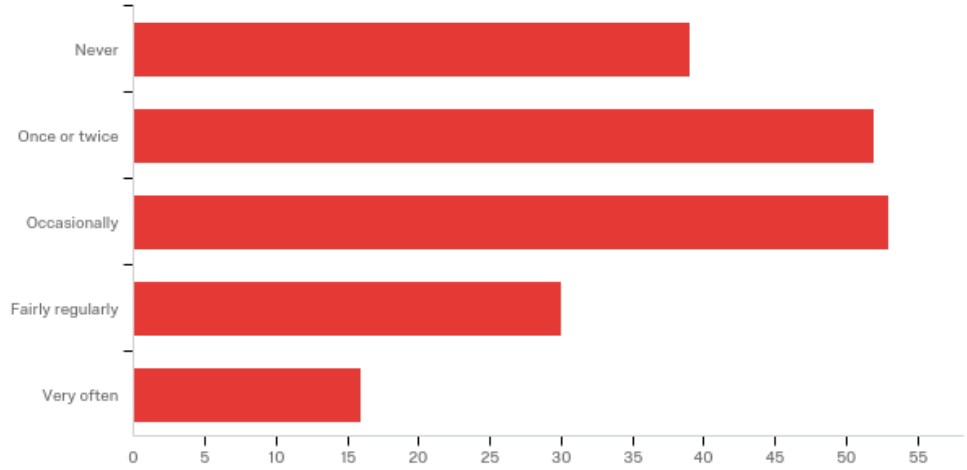
Other: - Text
none
Affects taste
Option to let hot liquids cool a bit if thermos
Heavy

Q17 - Most people don't find the time to participate in that many environmentally friendly activities, which of these practices have you participated in within the last two week?



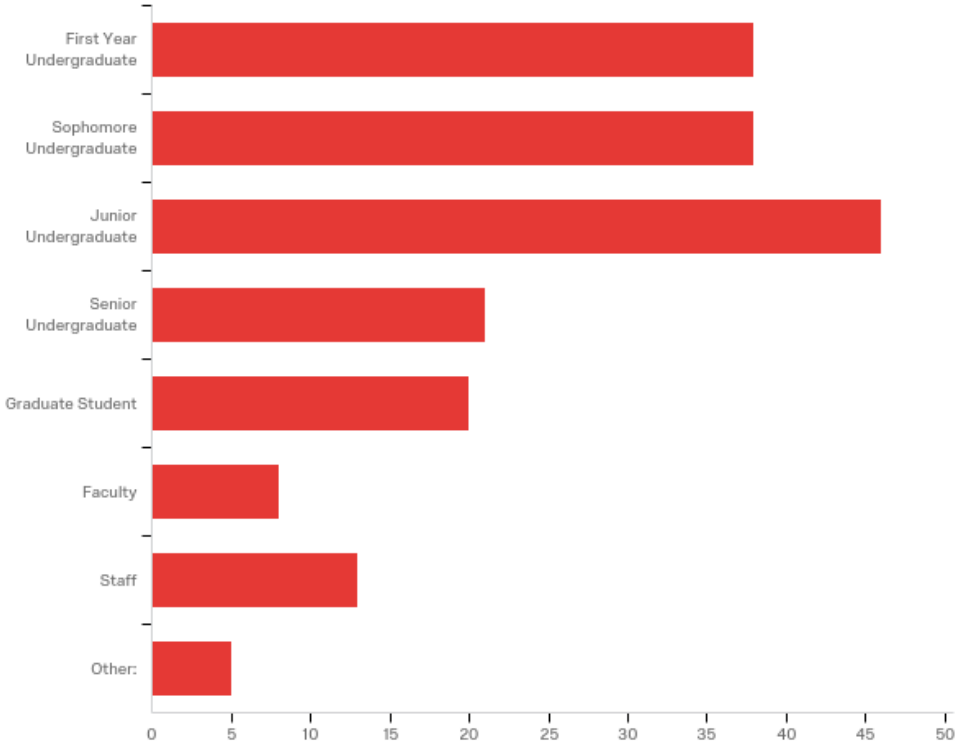
#	Answer	%	Count
1	Turning off lights before leaving a space	18.00%	176
2	Unplugging electronics before leaving a space	6.95%	68
3	Recycling	15.03%	147
4	Composting	6.54%	64
5	Carpooling	5.83%	57
6	Choosing to walk, bike, or take public transport rather than drive	10.22%	100
7	Using a reusable shopping bag	7.36%	72
8	Using a reusable mug or container	10.84%	106
9	Turning off water while brushing teeth	12.78%	125
10	Limiting meat consumption	6.44%	63
	Total	100%	978

Q18 - In the last 3 months before taking this survey, how often had you thought about the waste generated from paper cups as an environmental concern?



#	Answer	%	Count
5	Never	20.53%	39
4	Once or twice	27.37%	52
3	Occasionally	27.89%	53
2	Fairly regularly	15.79%	30
1	Very often	8.42%	16
	Total	100%	190

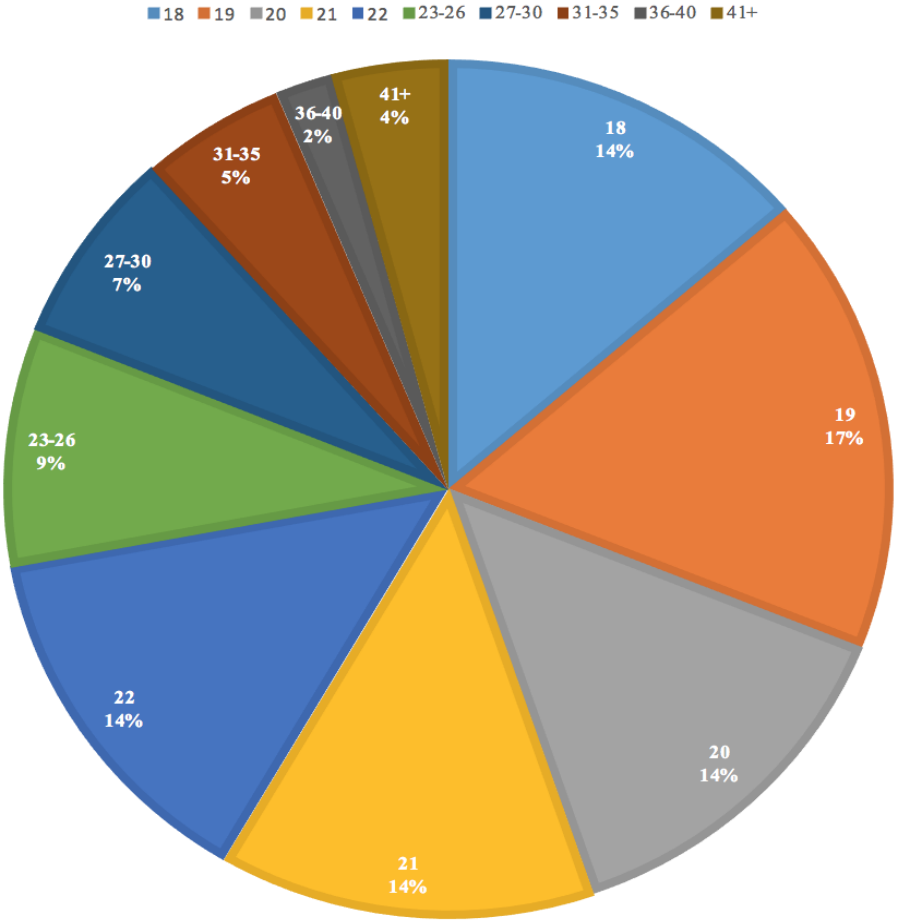
Q19 - Which best describes your current affiliation with UNC-CH?



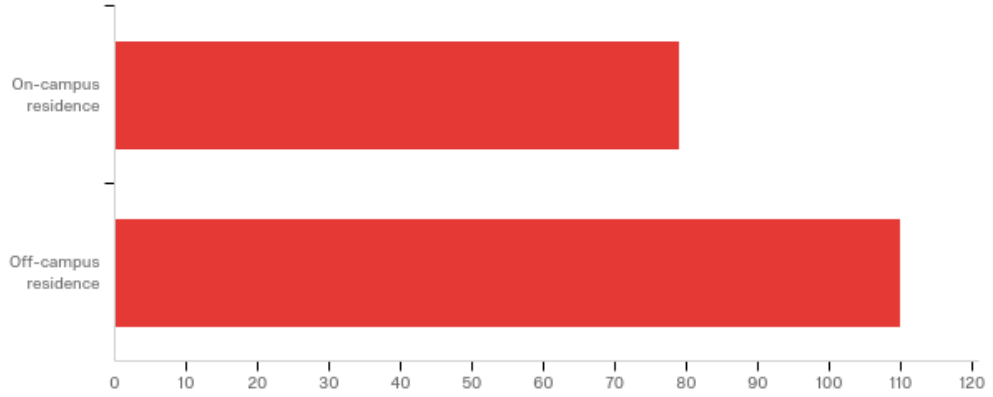
#	Answer	%	Count
1	First Year Undergraduate	20.11%	38
2	Sophomore Undergraduate	20.11%	38
3	Junior Undergraduate	24.34%	46
4	Senior Undergraduate	11.11%	21
5	Graduate Student	10.58%	20
6	Faculty	4.23%	8
7	Staff	6.88%	13
8	Other:	2.65%	5
	Total	100%	189

Other: - Text
Scholar
UNC Fellow
Exchange student
Campus Affilate
Junior exchange student

Q20 - How old are you?

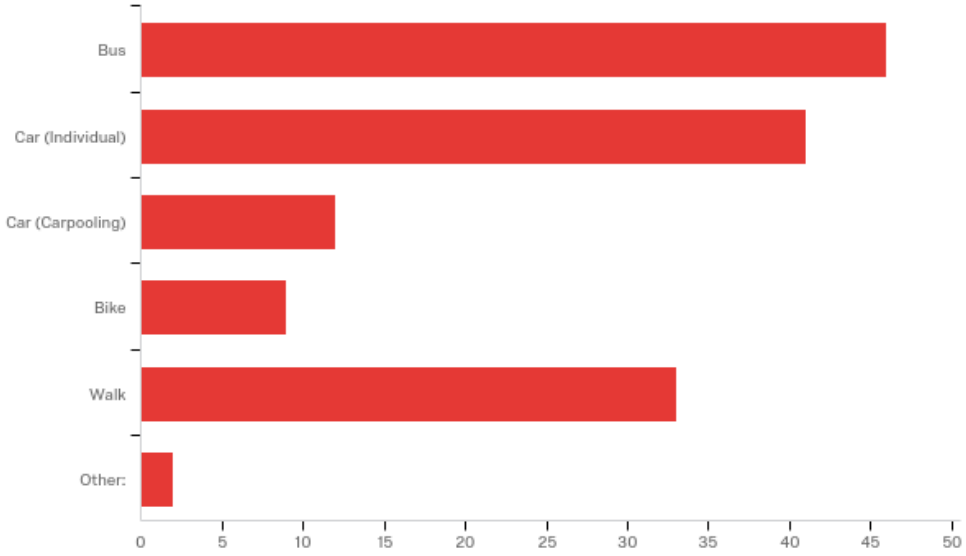


Q21 - Do you live on-campus or off-campus?



#	Answer	%	Count
1	On-campus residence	41.80%	79
2	Off-campus residence	58.20%	110
	Total	100%	189

Q22 - In the last six months, how have you usually commuted to UNC-CH's campus?



#	Answer	%	Count
1	Bus	32.17%	46
2	Car (Individual)	28.67%	41
3	Car (Carpooling)	8.39%	12
4	Bike	6.29%	9
5	Walk	23.08%	33
6	Other:	1.40%	2
	Total	100%	143

Other: - Text
apartment shuttle / uber
Car and bus from park and ride

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