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Exploring Advantages and Challenges of Bike-sharing in a Low-Income Resident Area in Houston, TX

A Qualitative, Ethnographic Study of Underserved Communities in Houston

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Abstract

The introduction of bike-share in both our cities and in academic research has introduced a new set of practices, procedures, and questions that planners, social scientists, and communities alike are trying to understand. While car-reliance in the United States comes into question, shared micro-mobility has been posed as a possible solution to issues of accessibility, environmental, and health concerns by governments and researchers. As one part of the shared micro-mobility market, bike-share has been introduced at exponential rates in cities around the world in hopes of providing additional mobility options. However, its use and expansion is not equally felt across all neighborhoods and demographics. Underserved communities typically have a long history of reduced civic power, and in turn services, amenities, and infrastructure. This is especially the case for underserved communities in Houston. However, Houston BCycle, the city's only bike-share provider has installed stations throughout underserved communities as part of their equity mission. Still, bikes and stations are used at far lower rates than in other parts of Houston. The goal of my study is to understand the advantages and challenges of bike-share use in underserved communities in Houston. As part of my methodology and in wanting to keep the community at the forefront of my research, I use an ethnographic style of interviewing rooted in grounded theory to allow participants and experts to truly guide the study. The results include barriers that go beyond bike-share but have implications for planners and bike-share providers to consider before moving forward with infrastructure and bike-share planning. In spirit of ethnography, I change the tone of my study to address the concerns of the community and recommendations for planners and bike-share providers.

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I want to thank so many people for the completion of this thesis. To Houston BCycle, which in many ways has changed and evolved from the start of the study and is a wonderful albeit strained organization. I hope the organization receives the support and recognition it deserves. To the people of the Second, Third, and Fifth Wards who lent me their time, energy, and patience. So many of the interactions I had during my interviews are fondly remembered and I hope I have provided the justice and honesty these communities deserve.

To the Chair of Urban Structure and Transport Planning at TUM, which is not just a Chair or an office, but a *place* full of opportunity. A *place* where Plan4Better was born from, and where I had my first internship that propelled my interest for accessibility planning. A *place* to create meaningful ideas and projects, inspired by the little daily activities that occur just outside the office windows, with only a 150-year old wall to separate us from the heart of Munich. It's a *place* where fun and connection can occur, where I was able to get to know a diverse group of talented experts to whom I had the pleasure of having conversations that were equally warm, riveting, intellectual and playful. I couldn't be more grateful that so much of my time working in Munich was spent here.

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A Small Preface:

This project was challenging for many reasons. To begin, it was painful to learn about Houston, my second hometown, from an angle that clearly positioned me on the other side of history and privilege. This is due to the unique nature of infrastructure inequality in the US and the ways we've used space and resources to give and to withhold. Growing up in The Woodlands, a high-income suburb outside of Houston, the compression of space and time seemed warped: hours spent in the car, never walking except in indoor places, never cycling unless on a stationary bike was all completely normal. And this is no exception for The Woodlands. Ada Louise Huxtable, an architectural critic and writer, provides one of my favorite descriptions of Houston to date:

“Houston is a study in paradoxes. There are pines and palm trees, skyscrapers and sprawl; Tudor townhouses stop abruptly as cows and prairie take over. It deals in incredible extremes of wealth and culture... Houston is all process and no plan... One might say of Houston that one never gets there. It feels as if one is always on the way, always arriving, always looking for the place where everything comes together.” (1976, p. 144)

Houston was what I knew of US cities, the rules and logic of design, or lack thereof, imprinted on me from a young age. That is, until I began traveling, seeing, and feeling the world in a new way -- on my own two feet. And I learned the freedom of what pedestrian and cycling infrastructure can provide residents of any age, background, or condition. For me, that freedom arrives the moment I can go out and explore the world as the playground that it is.

The luxury of that feeling entered my life in my 20s and I've never been able to let go of the idea (the dream really) that many more places can be as grand and splendid as the cozy corners in Paris, the ordered chaos in Palermo, or the purified urban forests in Munich. Every place has the chance. Unfortunately for many cities in the US, Houston being no exception, we see more deforestation, more cement pavement, and more cars than we do the display of excellent planning. Because of that, we lose a lot of the potential of what we could be and what we can have.

Despite the state of the built environment, Houston is a city full of an incredible amount of diversity. As an entry point for many immigrants, it's a place where people integrate and learn about the US beyond the media, and where the responsibility to be hospitable, welcoming, and safe is most needed. I believe we owe it to *all* past, present, and future Houstonians, and Americans for that manner, to see the brilliance and openness who we are

reflected in the built environment; to transition from hostile car-centric environments to something that has more authenticity, humanity, and community at the forefront. My thesis is a tribute to that desire and my work thereafter will encompass the lessons I've learned in writing this.

I. Introduction

A. Background

Mobility primarily relies on car ownership and infrastructure across all socio-economic groups in the US (Pucher & Renne, 2003). Car ownership, costly on its own, is necessary in most of the US, especially in Houston, Texas (Zaninett, 2009). A solution to car ownership can be shared mobility services, such as bike-sharing, which have are documented to have positive effects on health, reduced emissions, and alleviated congestion (Shaheen et al., 2010). Along with other shared micro-mobility solutions, bike sharing has the multi-fold purpose of being both an environmentally friendly alternative to private car use and a cheaper means of travel for residents in Houston (Shaheen et al., 2010). Houston BCycle, a non-profit organization, offers a station-based bike-sharing program with station locations in Houston's underserved communities.¹ However, stations in low-income areas are experiencing the lowest ridership rates across the system.

To understand this, bike-sharing equity and civic participation need understanding. In the US, access to bike facilities such as docking stations and cycle lanes is lower in low-income areas of American cities (Braun et al., 2019). When planning for bike-share systems, the involvement and representation of minority and low-income groups are usually uncommon or rarely done (Braun et al., 2019). Although bicycle lanes are one component of a lack of use of BSS, there are other concerns about the gap. Based on several studies on bike-share users, users tend to be male, white, and have higher education and income, on average, begging the question of what barriers are present in bike-share use for non-users (Fishamn, 2015).

There have been several studies on barriers to bike-share use. For instance, in cities with high car dependency, users report that car use is more convenient, in addition to safety issues from car traffic and a lack of ease in the application (Fishman, 2015). However, this doesn't necessarily go as far as to target the disparities seen in low-income groups. From a survey by the PeopleforBikes and Alliance for Biking and Walking, Blacks and Hispanics, on average, expressed more willingness to bike if they had safer bicycle environments (2015). However, this may be due to a higher rate of bike-related deaths for Blacks and Hispanics in the US (PeopleforBikes & Alliance for Biking and Walking, 2015). When looking at biking practices and preferences for lower-income minority groups, Lusk et. al find bike lanes could be a huge factor in whether residents would use bikes (2017). This is brought up again in Franckle et al.'s study on facilitators and barriers, where traffic safety concerns were also documented in Boston (2020) as well as in Baltimore (Grasso Hull, Barnes, & Chavis, 2020).

¹ Houston BCycle Website. <https://www.houstonbicycle.com/>

One study conducted in Minneapolis, Minnesota documented local government engagement with low-income residents and community leaders before and during installing a bike-share system. Improper marketing or a lack of awareness of discounts for low-income residents could account for a portion of why some users aren't participating in the system (Stewart, Johnson, and Smith, 2011). In Qian and Niemeier's study on bike-share programs in Chicago and Philadelphia, early involvement of low-income communities in the bike-share program process is essential to meet residents' needs, i.e. access to their jobs, services, and stores they need (2019).

With numerous studies done on bike-use behavior in low-income areas, it appears it's both location-based and program-specific. Many of the studies used historical trip data or survey data, leaving many questions unanswered about why user needs are not being met. In Thorne et al.'s study on minority perceptions of new bike lanes in Auckland, extensive interviews were done with community leaders and residents (2020). They mention that minority groups from the Māori ethnicity appreciate the face-to-face conversation, and that kind of engagement is part of their social customs (Thorne et al., 2020). This raises the question if the benefit of interviews could be two-fold: to both obtain qualitative data on bike-share use while respectfully engaging with residents.

Based on Houston BCycle's concern about the low ridership rates in lower-income areas of Houston, it's critical to understand the current needs of residents. I propose conducting a qualitative analysis through ethnographic-style interviews of residents in underserved communities on bike-share perceptions in Houston, TX. In a partnership with Houston BCycle, I would reach out to residents with a series of questions about the advantages and barriers of bike-share travel behavior and how the services can be improved.

B.Objective

My objective for the study is to obtain local perceptions of bike-share in underserved communities in Houston, Texas. I want to do this by actively engaging in conversations and interviews with residents and experts to primarily discuss Houston BCycle's bike-share system and any other associations, advantages, and barriers that may not be present or discussed in the literature. To do this, I will conduct ethnographic-style interviews that allow participants and experts to inform, express, and educate on bike-share and local culture, customs, history, and stories. Given bike-share programs operate differently in every city, this will allow for a more holistic understanding of the current situation in Houston's underserved communities. Ultimately, the goal is to answer the research question:

What are the advantages and challenges of Houston BCycle's

station-based bike sharing system in low-income communities?

Taking from other urban, transport, and ethnography studies, I present a new ethnographic lens for understanding bike-share perceptions in underserved communities. The methodology chosen is created from both a lack of literature and practice in interviewing for bike-share. The result of this work would allow for a comprehensive understanding of emerging themes and concepts associated with bike-share, as well next steps for planners and bike-share providers to engage with underserved communities.

II. Literature Review

A. Bike-Share

1. History and Concept

Bike-sharing systems (BSS) are a relatively new, technology-integrated, on-demand scheme (Parkes et al. 2013). The current system arose in a series of ‘generations,’ contingent on the available technology, government policy and priority, as well as education and cooperation from participants (DeMaio, 2009). Each ‘generation’ of BSS experimented to provide a public good for transportation use, although not necessarily as a replacement for existing services (i.e. public transit, walking) (DeMaio, 2009, Shaheen, Guzman, & Zhang, 2012, Hure & Passalacqua, 2016). Much of the research on the history of bike-sharing has been covered by DeMaio and Shaheen et al., with some distinctions in the evolution of BSS (2009, 2012).

Before understanding the history of bike-sharing, it’s important to the evolution of bike-share, particularly in Europe, the host of initial bike-sharing efforts. Although BSS began in Europe first, it was during a considerable decline in walking and cycling as major transport modes. This was due to the over-reliance on private car use, which at the time was considered a measure of modernity and progress (Hure & Passalacqua, 2016). As a result, Europe saw a 40% drop in bike trips between 1954 and 1973 (Hure & Passalacqua, 2016, Ploeger & Oldenziel, 2020).

The evolution of BSS is, therefore, closely correlated both to policy interests in revitalizing urban centers through traffic calming and pedestrianization, as well as the public discourse on the negative environmental consequences of urban sprawl (Hure & Passalacqua, 2016). At the policy level, changes in urban land use, city, and regional planning had to be adapted to accommodate cycling and pedestrians in cities again. However, this was due in part to social movements which pushed for more sustainable urban mobility options (Ploeger & Oldenziel, 2020).

A part of that social discourse included the Provo movement, a 1960s Dutch anarchist movement that protested against various environmental issues, including car dominance in cities which was destroying neighborhoods to accommodate for new urban highways (Ploeger & Oldenziel, 2020, DeMaio, 2009, Médard de Chardon, 2019). As part of their protest, they created what’s considered the first ‘generation’ of BSS, the Witte Fietsen (the White Bike Plan). The Witte Fietsen was a collection of white-painted bikes distributed around Amsterdam with locks and keys for public use. Although some of the literature has considered the White Bike Plan as the first generation of a BSS, it was not a system in the sense of an organized scheme but a countercultural icon and communication tool of the Provo movement (Ploeger &

Oldenziel, 2020, Hure & Passalacqua, 2016).² Most of the literature has concluded that the White Bike Plan “failed” due to theft and vandalism (DeMaio, 2009, Shaheen et al., 2012). However, I would argue the use of the words ‘system’ and ‘failure’ may not be correct in describing the plan, given the context and original inception.



Fig. 1: John Lennon and Yoko Ono with Provo’s white bicycle during a visit to Amsterdam (1969)³

Hure and Passalacqua argue the bigger reason for the initial failure of the White Bike Plan in Amsterdam was due to a lack of public policy supporting the idea of BSS (2016). As mentioned previously, the policy initiatives at the time concerned themselves with sprawling development and vehicle-use infrastructure, however, social movements began shifting things. Although DeMaio fails to mention it, Shaheen et al. and Médard de Chardon discuss the success of the early system in La Rochelle, France in 1974, a small town of around 75.000 people at the time (2009, 2012, 2019). As part of a series of initiatives in Europe to reverse course on some car-dependent ambitions, La Rochelle began pedestrianizing its urban center and restricting car flow in some parts of the town. Still, vehicle congestion in the city led to the investment in a free BSS, with limitations on areas and hours of service in 1974. In exchange

² Van der Zee, R. (2016, Apr. 26). [Story of cities #30: how this Amsterdam inventor gave bike-sharing to the world](#). The Guardian.

³ In 1969, John Lennon and Yoko Ono spent their honeymoon in bed at the Amsterdam Hilton as a protest against violence. John Lennon was gifted a Provo white bike during this time and did a photoshoot session, distributing the images thereafter. The Beatles, and John Lennon in particular, were one of the most famous music and countercultural groups of the time.

for this service, an identification document was required to penalize users that didn't follow the rules (Hure and Passalacqua, 2016). As far as the literature has gone, this is the earliest and most successful form of a BSS paired with identification data to keep track of theft or vandalism.

The evolution of later generations of BSS' is attributed to the evolution of cycling infrastructure and policy gains in the 1980s and 90s. As cycling groups and users professionalized, either by creating businesses or joining political parties, bike-sharing programs could more readily be supported by public policy and institutions (Hure & Passalacqua, 2016). This is how the second generation of bike-sharing programs was introduced. Denmark took the lead in bike-sharing programs, with systems set up in Farsø, Grenå, Nakskov, and Copenhagen in the 1990s, backed by local governments (DeMaio, 2009). Despite these gains, the second generation also saw issues with theft and vandalism due to a lack of identification tracking (Shaheen et al., 2012).

By the third generation (the early 2000s) of BS programs, the implementation of technology and communication was finally introduced either at the docking station, on the bike, or via phone (DeMaio, 2009). The pace of BSS improved year after year, as more cities began implementing and experimenting with forms of shared designs and applicable technology which can be reflected in the increase in bike trips in Europe over decades (Pucher and Buehler, Shaheen et al., 2012). Shaheen et al. argue for a fourth-generation BSS (the 2010s) with distinctions from the third in more flexible docking options, better bicycle distribution, integration with other transit modes, and greater technological advances (2012, DeMaio, 2009).

The history of bike-sharing leads to its current definable concept. It's meant to be used on a needed, self-service basis, for flexible short-term usage (Shaheen et al., 2012). Its convenience is meant to target customers who either don't own bikes or don't have them readily available when they need them and tourists or people who visit a city short-term (Shaheen et al., 2012). In the next section, I'll discuss different types of bike-sharing that have arisen from past and current evolvments of BSS.

2. Bike-Share Types

Shaheen et al. provide an overview of the different types of BSS currently on the market for users (2020). BSS is currently available for users as one-way or roundtrip travel with choices from three current models; station-based bike-share, dockless, and hybrid forms. There's also the availability of typical bicycles and electric bicycles, as well as closed campus systems offered at universities or office parks. Prices, services, and models available are

dependent on city and region, with countries differing in what they offer customers. Station-based bike systems are unattended stations where bicycles can be rented for a fee either via an app or at the dock, used, and then returned to any station. With a dockless service, users can unlock a bike and park it anywhere within a pre-established region, usually set by the city or bike rental agency (Shaheen et al., 2020). Finally, with hybrid systems, a combination of station-based and dockless is designed.

When it comes to station-based or hybrid systems, there are differences in the location and type of docking kiosks available. Shaheen et al. surveyed bike-sharing operators, finding that three main kiosk designs are available (2014). There is the kiosk next to public transit, within 120 meters of a public transit stop, followed by the sidewalk kiosk and on-street kiosk. Helmet laws, and mandates on whether riders are required to wear a helmet or not, differ by city, state, region, or country and can also impact ridership rates (Shaheen et al., 2014).

There are different business models based on the level of involvement of local governments in funding BSS. Providers of BSS with little to minimal involvement from governments include advertising companies and for-profit (Shaheen, et al., 2010, 2012, 2014) Advertising companies are unique in that they provide bike-sharing services while requiring rights to advertise on city billboards and furniture. Other types of bike-sharing with government involvement include public transit agencies, local governments, and non-profits (Shaheen et al., 2010, 2012, 2014).

Although there is currently no literature on performance differences in service and operation of BSS based on business models, there are some differences between the design models. User experience can differ depending on if the system is station-based, dockless, or hybrid (Kou & Cai, 2021). In station-based systems, the location (although not the quantity) of bikes is more predictable for users. The distribution of bikes in dockless systems is less predictable, while the hybrid system falls somewhere in between (Kou & Cai, 2021). Aside from predictability, the cost of rebalancing or re-distributing bikes in the city comes at a cost to vendors, customers, and ultimately, the environment (Kou & Cai, 2021). This is because vendors must employ drivers to pick up and redistribute bikes, which Kou and Cai argue can be more easily achieved by building a more dense station-based network (2021). This is supported by operator survey data, where greater ridership occurred in areas of “high-density, urban, mixed-use locations co-located with public transit” (Shaheen et al., 2014, p.44).

There is a difference in the performance of ridership rates depending on the kind of bike used. Electric bikes are shown to assist riders with elevation changes while allowing them to travel farther and for different purposes (Lazarus et al., 2019). This is significant for older or less experienced riders (Lazarus et al., 2019). However, the availability of electric bikes does not necessarily take away from private car rides but was more likely to take from public transit

rides (Bielinski et al., 2021). This is part of a greater discussion on the advantages and disadvantages of BSS, which we'll discuss in the next section.

3. Advantages and Disadvantages

BSS has limited research on social and environmental impacts, positive, negative, or otherwise. Shaheen et al. cover the potential positive effects of BSS (2012, 2014). Bike-sharing provides 'emission-free' transportation, as in, there is no carbon dioxide emission from a bike trip compared to a car trip (Shaheen et al., 2010, 2012, 2014, DeMaio, 2009). However, It may be difficult to argue whether a bike trip has entirely replaced a car trip. Based on CO₂ reduction data, modal share changes and reduced automobile use were not documented for US-based BSS (Shaheen et al., 2014). Most modal split shifts towards more bike use have occurred predominantly in European cities, primarily because cycling infrastructure is better established and expanded (Shaheen, et al., 2012).

Further, bike-sharing seems to be used more for bridging the first mile/last mile gap between transportation links, especially in more rural and suburban areas of the US (Martin & Shaheen, 2014). Martin and Shaheen conclude that bike-sharing may substitute if urban environments are denser and provide good public transit links (2014). However, new bike-sharing links can likely be established in more rural and suburban areas with less public transit access.

Other potential bike-sharing benefits include lower transportation costs, reduced congestion and fuel, increased public transit, and improved health and environmental conditions (Shaheen et al., 2014, DeMaio, 2009). While there's evidence that the location of bike-sharing stations close to central business districts, retail locations, restaurants, or recreation facilities can perform better, the effect of bike-share presence on these locations is not measured (Buehler & Hamre, 2015). Still, there has been an attempt to measure the economic benefits of bike-share in cities. Bullock et al. and Ricci find that bike-share can allow "cities to function more efficiently" by reducing trip time and gaining productivity for other economic activities (2017, p.84). Bullock et al. also acknowledge that the health benefits of bike-share use on individuals are difficult to measure and quantify but may exist (2017, 2015). Overall, it can be complicated to measure the majority of the effects. However, from survey responses on the perception of cycling and BSS in Paris, D.C., and Montreal, Canada, more positive attitude toward cycling and BSS has grown (Shaheen et al., 2010). Given the little concrete evidence, more studies on the social and environmental effects of BSS are needed.

The disadvantages of bike share systems are discussed in Médard de Chardon's studies (2017, 2019). The main argument Médard de Chardon brings up repeatedly in his studies is BSS' lack of success metrics, not only making evaluations of BSS difficult to measure but also

possibly preventing program goals to be achieved (Médard de Chardon et al., 2015, 2017, 2019). For instance, the sustainability component of BSS is widely advertised. However, the bicycle redistribution vehicles which pick up and drop off bikes across cities can increase CO₂ emissions (Fishman et al., 2015, Ricci, 2015). In general, advertising the positive effects of BSS is done more for political and public gains as a way of placating residents on their social, economic, and environmental concerns, termed a “status symbol” (pg. 411, Médard de Chardon, 2019). Médard de Chardon argues the focus on CO₂ reductions through trips done is not a representative enough figure, but instead, bike redistribution and a lack of modal share changes reduces the benefit of bike trips (2019, Ricci, 2015). Further, the health benefits that have been promoted have found contrary evidence. Although cycling is a healthier activity than sedentary movement when walking is replaced by a bike trip instead, less physical activity is performed which decreases net health benefits (Fishman et al., 2014).

Si et al. summarize the state of the literature on BSS and the research gaps that continue to exist (2019). The study analyzed publications between 2010 and 2018, summarizing bike-share research based on occurrences of different variables. These variables include country, institution, keyword, and citation. It is one of the most comprehensive articles discussing bike-share *research*. They found that most of the research comes from the US despite arriving “late” on the bike-share scene; meanwhile, China has more bike-share programs and less research coverage (p. 6, 8). Additionally, research topics covering “Benefit,” “Attitude,” and “Factors & Barriers” have only come up in the last decade (beginning in 2013). The study concludes by discussing how the “barriers and constraints” of BSS, if unaddressed, can continue to hamper the argument of BSS as a sustainable solution (pg. 16, Si et al, 2019). Upon analyzing the literature criticizing BSS systems, a large barrier has to do with equity (or lack thereof) (Médard de Chardon, 2019, Fishman et al., 2014).

We'll explore this deeper in the next section.

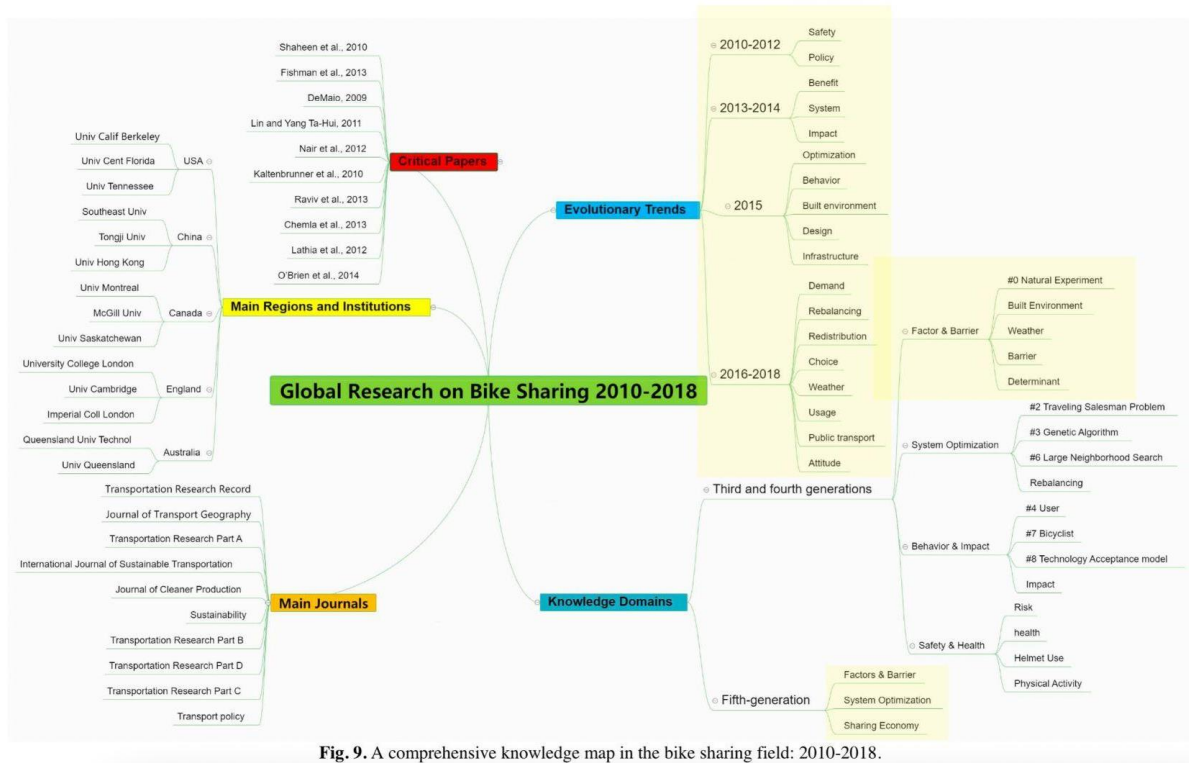


Fig. 9. A comprehensive knowledge map in the bike sharing field: 2010-2018.

Fig. 2: Screenshot of of Figure 9 from Si et al. 2019's study; Added yellow highlights on right side under "Evolutionary Trends" and "Knowledge Domains"

B. BSS and Equity

1. BSS Station Location

There have been several prominent issues regarding equity and ethics in BSS planning and implementation. Most BSS stations are located in dense, central areas of cities which tend to have higher rates of accessibility (Fishman et al., 2015, Médard de Chardon, 2019). In turn, the user profile leans towards higher socio-economic groups, predominantly white, males with higher income and education (Mooney et al., 2019, Médard de Chardon, 2019, Fishman et al., 2015).

There is a notable case where advertising BSS companies in public-private partnerships clashed in station allocation. Due to the nature of advertising BSS, most profits come from advertising at the bike-share station locations. In the case of Luxembourg, the desire to expand locations into residential areas was pushed back by JCDecaux, a BSS advertising company stationed in many cities across Europe (Médard de Chardon, 2019). The municipality, in turn, had to pay high fees to get new stations set up there, given they were in less-trafficked locations than the more lucrative stations in the city center. If BSS is meant to

be an inclusive system, the location of stations in exclusively higher-income areas essentially negates that.

Equitable bike station planning is a subject of BSS research, explored in various studies analyzing fairness (Duran-Rodas et al., 2020), accessibility (Chen et al, 2019, Beirsto et al., 2021, Desjardins, Higgins, & Páez 2022), and spatial equity (Babagoli et al., 2019). In almost all studies, some amount of station location imbalance was present, favoring primarily higher-income areas. Some studies have even posed that dockless systems reduced equity imbalances compared to docked systems (Mooney et al., 2019, Meng & Brown, 2021).

Even when controlling for the location of stations, minority and lower socioeconomic groups have a lower participation rate in BSS (McNeil et al, 2017). There are several explanations for this. Required access to credit/debit cards, having a smartphone, or having consistent access to the internet for BSS rental could be one explanation for the limitations (Shaheen et al, 2014, McNeil et al., 2017). Affordability may be another explanation as the BSS in London priced out lower-income users when the system implemented a price increase in 2013 (Goodman and Cheshire, 2014). Time-cost constraints are another issue when taking into account the additional time required to rent and pick up a shared bike. Although BSS provides a cheaper mode of travel, factors such as technology, affordability, and time constraints are not considered, impacting primarily lower-income residents (Wang et al., 2020).

2. Inequalities in Safety and Infrastructure

At an infrastructural level, bike lanes and bike paths are crucial. There is considerable evidence of the importance of safe, designated (separate from car lanes) cycling infrastructure that connects residential areas with points of interest to increase ridership (Buck & Buehler, 2011, Buck et al., 2012, Shaheen et al, 2014, The League of American Cyclists, 2014, Braun et al., 2019, Hull Grasso et al., 2020, Franckle et al., 2020). However, cycling infrastructure is not evenly distributed throughout American cities. Cycling networks primarily serve areas where residents are wealthier and have higher education, with lower reported networks in the minority and lower-income neighborhoods (Braun et al., 2019). This can also be another significant reason for lower ridership in underserved communities.

There's also the matter of social and cultural elements preventing lower-income users from engaging in BSS. Although these are more difficult to quantify, there are a few key figures to consider. Biking fatality rates disproportionately affect people of color (POC) due to unsafe or poor cycling networks (The League of American Cyclists, 2014, PeopleforBikes and Alliance for Biking and Walking, 2015). This can create a poor perspective of cycling and discourage potential riders, especially more vulnerable groups such as women, children, and the elderly

(McNeil et al., 2017). The League of American Cyclists has also found that POC are more likely to ride if workshops can teach safer riding skills or if a riding club is established in their community (2014). Relationship-building activities, such as workshops and community engagements between BSS and underserved communities, seem crucial in increasing participation in BSS (Hannig, 2015). An exploration into BSS engagement with underserved communities should therefore be explored.

3. Case Studies of Engagement between BSS and Underserved Communities

Evidence of engagements between BSS and underserved communities is limited to surveys and interviews on direct effects. In Qian & Niemeier's study on bike-share programs in Chicago and Philadelphia, early involvement of low-income communities in the bike-share program process is important to meet residents' needs, i.e. access to their jobs, services, and stores they need (2019). Additionally, a survey analysis by Grasso Hull, Barnes, and Chavis revealed an underrepresentation in membership from lower-income groups in Baltimore, Maryland, with personal safety as a great concern across all income groups (2020).

One of the most comprehensive low-income-focused bike-share planning processes was done in Minneapolis, Minnesota in 2011. The local government engaged low-income residents and community leaders before and during installing a bike-share system. They concluded that improper marketing or a lack of awareness of discounts for low-income residents could account for a portion of why some users aren't participating in the system (Stewart et al., 2011).

Franckle et al. is one of the first to conduct surveys on the barriers and facilitators of bike-share for non-users, focusing on lower-income groups in Boston (2020). Frequent barriers for users and non-users were bad weather and traffic safety concerns, while frequent facilitators included convenience and easy bike-share access. The perceptions of bike-share in Boston seem to be overall positive, even for non-users. Low-income residents also did know about membership programs with lower fees, with a lack of marketing and community engagement as the missing link, a similar finding in Stewart et al.'s study (2011). Finally, the study concluded that identifying perceptions and beliefs may be vital to understanding how to intervene early on for non-users.

There have been other notable studies on BSS barriers and facilitators. Bateman et al. surveyed Birmingham, Alabama, on the local BSS using the PRECEDE model, a first for using a health behavior framework for assessing the BSS program (2021). Although the findings were interesting in the kinds of themes (intrapersonal, interpersonal, and structural), most respondents were white, affluent, and with a college degree (77.78%). This is not

representative of the population of Birmingham, Alabama, which is primarily black or African-American (at around 68% of the population).⁴

It's then essential to target underserved groups when engaging them on topics of BSS. The most significant barriers seem to be placed higher with underserved groups when considering station locations, pricing, and safety. However, the need may be greater in these areas. So, how can these groups be targeted? What are the best methods to both engage communities and educate at the same time? In the next section, I will continue my research analysis on qualitative interview methods and their application in lower-income and minority communities.

C. BSS and Qualitative Methods

Qualitative research methods have the objective of understanding a pattern, not reducing people or communities to its results (Lune and Berg, 2017). Using qualitative methods over quantitative aims to provide an understanding of on-site conditions, and emotions, and encapsulate elements beyond what quantitative results can provide (Lune and Berg, 2017). The use of qualitative methods for bike-share studies generally uses either one or a combination of these methods: surveys, interviews, and focus groups. They range in targeting different groups and outcomes. An overview is provided in Table I.

Articles	Surveys	Interviews	Focus Groups	Advantages/Barriers	Underserved Communities	In-Person	US Case Study
Webster and Cunningham (2010)	x		x			x	x
Stewart et al. (2011)			x	x	x	x	x
Fishman et al. (2012)			x	x		x	
Fishman et al. (2014)	x			x			
Fishman et al. (2015)	x						
Afzalan and Sanchez (2017)							x
Hess and Schubert (2019)	x						
Bakogiannis et al. (2019)	x						
MacArthur et al. (2020)	x			x	x		x
Franckle et al. (2020)	x			x	x		x
Duran-Rodas et al. (2020)		x					
Grasso et al. (2020)	x			x	x		x
Podgorniak-Krzykacz and Trippner-Hrabi (2021)	x						
Lyu et al. (2021)		x				x	
Patel and Patel (2022)			x	x		x	
Mora and Moran (2022)			x			x	

⁴ Own observation. Data from [Census.gov](https://www.census.gov).

Table 1: Literature Overview of Bike-Share and User/Non-User Feedback

There are a few studies that took place during the initial installments of BSS implementation, attempting to capture reactions from residents before, during, or after the process. For instance, in Webster and Cunningham's study, focus groups and surveys were conducted to understand how the future implementation of a BSS would succeed in Chattanooga, Tennessee (2010). This is similar to Stewart et al.'s study in Minneapolis, Minnesota with some key differences (2011). BSS already existed in Minneapolis and the expansion of stations into low-income communities with lower pricing was meant to bring awareness to the program (Stewart et al., 2011). The study was done before and during the installment process, with a possible follow-up on behalf of other researchers or the city on the success of implementation. In Bakogiannis et al.'s study, Rethymno on the island of Crete in Greece was the first to adopt a dockless BSS and a mixed-methods approach to surveying trips and perceptions of the service was conducted (2019). Based on the findings, there appear to be similarities between some American cities and Rethymno in that they are in the first stages of active transport phases.

Fishman et al. performed several studies in major Australian cities, focusing on the advantages and barriers to bike-share membership and use (2012, 2014, 2015). Many of the findings are specific to the BSS in these cities and in Australia in general, albeit there was a strong focus on understanding how the sign-up and membership process to the system works (Fishman et al., 2012, 2015). The BSS' installed at the time were limited in how easily people could interact with them via smartphone. Within the past decade, the same systems have been reduced since the introduction of e-scooter services and overall poor BSS performance.⁵ Patel and Patel ranked BSS barriers across BSS literature, with poor cycling infrastructure and traffic rules for cyclists as the highest-ranked barriers (2021).

Afzalan and Sanchez used a mixed-methods approach by conducting spatial analysis' and online crowdsourcing to understand public preferences in the local BSS in Cincinnati (2017). Duran-Rodas et al. performed a similar mixed-methods analysis clustering Twitter posts based on certain words which indicated negative or positive emotion (2020b). Most of the posts were made more by scientists and practitioners in the field rather than the general public, and the authors indicate that this methodology would not replace focus groups, interviewing, or survey methods. Hess and Schubert also conducted a mixed-methods approach but with e-cargo BSS, which intend to provide people with the opportunity to move larger and heavier objects (2019). Not surprisingly, the service is more likely to attract able-bodied, younger men already familiar with cycling.

⁵ Bland, M., Leung, A., Kaufman, B. (2021, Feb. 1). [Why e-bikes can succeed where earlier bike-share schemes failed](#). The Conversation.

There are some notable qualitative studies done outside of the US. While Mora and Moran found links between bike-share access and income levels in different neighborhoods in Santiago, Chile, Lyu et al. looked at the success of the bike-share scheme in Shanghai, China based on the perceptions residents had (2022, 2021). Podgorniak-Krzykacz and Trippner-Hrabi investigated bike-share motivations by both user and non-user groups in Lodz, Poland (2021). With a similar focus on equity and accessibility that Mora and Moran had, Duran-Rodas et al. provide a mixed-methods framework for a spatial fairness assessment, with interviews conducted in Strasbourg, France, and the quantitative analysis conducted in Munich, Germany (2022, 2020). While these cases are interesting in highlighting BSS perception and equity, they don't have a target on underserved communities and encounter different motivations and barriers than US cities.

MacArthur et al. and Franckle et al. more directly target underserved communities in their studies in Portland and Boston (2020, 2020). Both conducted surveys, although MacArthur et al. had more of a focus on the elderly and disabled, whereas Franckle et al. focused on users and non-users (2020, 2020). Both studies have provided greater insight into the experiences of low-income communities in the US with existing and established BSS in respective cities for several years already. However, because only surveys were conducted, a gap is present in interview results to further understand the challenges and advantages of BSS use for underserved communities. Additionally, most studies in the US on these topics have been done in the North (generally, east and west). The US has major regional differences, with cities developing at different periods, different governments, and different BSS' altogether. This is where I would like to fill in the literature gap by providing deeper insights into Houston, Texas' BSS, and the experiences of underserved communities.

III. Methodology

D. Case Study: Houston, Texas, U.S.A.

Houston is one of the biggest cities in Texas, with a population of roughly 2.3 million within the urban core and a metropolitan population of over 7 million.⁶ It consists of a young and diverse population, with a median age of 33 years old and whites, Hispanics, and African-Americans sharing a relatively even split of the city. Almost 29% of residents are foreign-born, primarily from Mexico, India, and El Salvador. The poverty rate falls just under 20%.



Fig. 3: Location of Houston within the Continental U.S., data obtained from [City of Houston GIS Data Hub](#), own work

⁶ Data obtained from [Datausa.io](#).

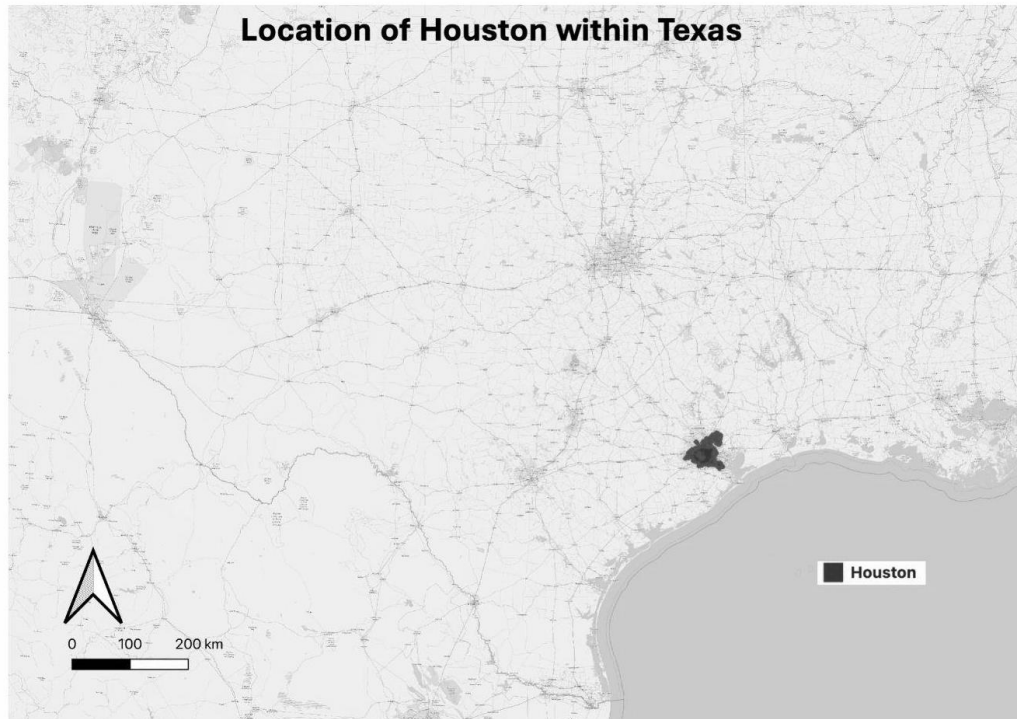


Fig. 4: Location of Houston in Texas, data obtained from [City of Houston GIS Data Hub](#), own work

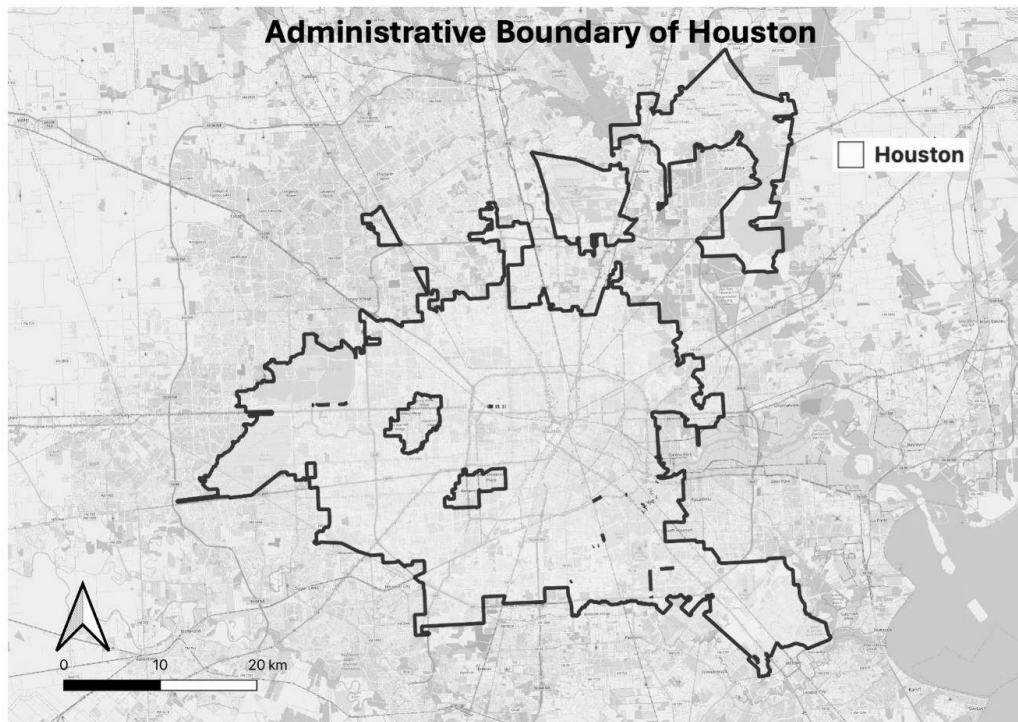


Fig. 5: Administrative Boundary of Houston, data obtained from [City of Houston GIS Data Hub](#), own work

Houston has many urban, transport, and environmental issues. This includes unrestricted suburban sprawl, high car dependency, and frequent hazards from hurricanes,

flooding, and extreme weather patterns (Korver-Glenn et al., 2017, Vojnovic, 2003, Zaninetti, 2009, Kim and Newman, 2019). Among many of these issues, the dominance of single-family housing had resulted in massive, sprawling developments around the city, codified into law up until 1998 when the city repealed the law to allow for mixed-use zoning (Zaninetti, 2009). Only in the last two decades has more significant densification occurred, however slowly. This is due to a lack of centralized urban planning in the city, which enables suburban growth policies to sustain infrastructure investments and elite interests (Vojnovic, 2003). This has led to sprawled development patterns supported by car-dependent mobility throughout the Houston area.

Aside from the sprawl of urban infrastructure, there are numerous issues when it comes to social and economic equity, with historically deep roots in racial and income segregation. Houston, like many other cities in the US, had “redlined” maps created by the Home Owners Loan Corporation (HOLC) (1933) and the Federal Housing Administration (FHA) (1934) of which areas of the city were considered best and worst for insurance coverage, home loans, and general investment (Fishback et al., 2022). Redlined maps designated areas where minority groups lived as “hazardous,” with red shading on the maps to indicate where areas were unfit for insurance and investment.⁷ Local, state, and federal governments, along with financial institutions, limited, excluded, and discriminated against low-income and minority communities, preventing them from obtaining insurance and loans until The Civil Rights Act of 1968 (Fishback et al., 2022).

Further, due to low investments, particularly in East Houston and comprised primarily of Black and Hispanic/Latinx communities, low levels of investment and few infrastructure upgrades were made.⁸ Less investment led to generally lower property values, an easy target for industrial zoning, which placed numerous industrial polluting and waste sites within minority and low-income communities.⁹ As a result, Houston’s high emission of hazardous fumes and lack of zoning have negatively impacted minority and low-income groups (Vojnovic, 2003, Zaninetti, 2009).

⁷ Nelson, R., Ayers, E. Digital Scholarship Lab, [“Mapping Inequality,”](#) American Panorama.

⁸ N.a. (2021, Feb. 10). [Exploring the Legacy of Redlining in Houston.](#) Understanding Houston.

⁹ Kanu, H. (2022, July 28). [Toxic racism confronted by DOJ's environmental discrimination probes.](#) Reuters.

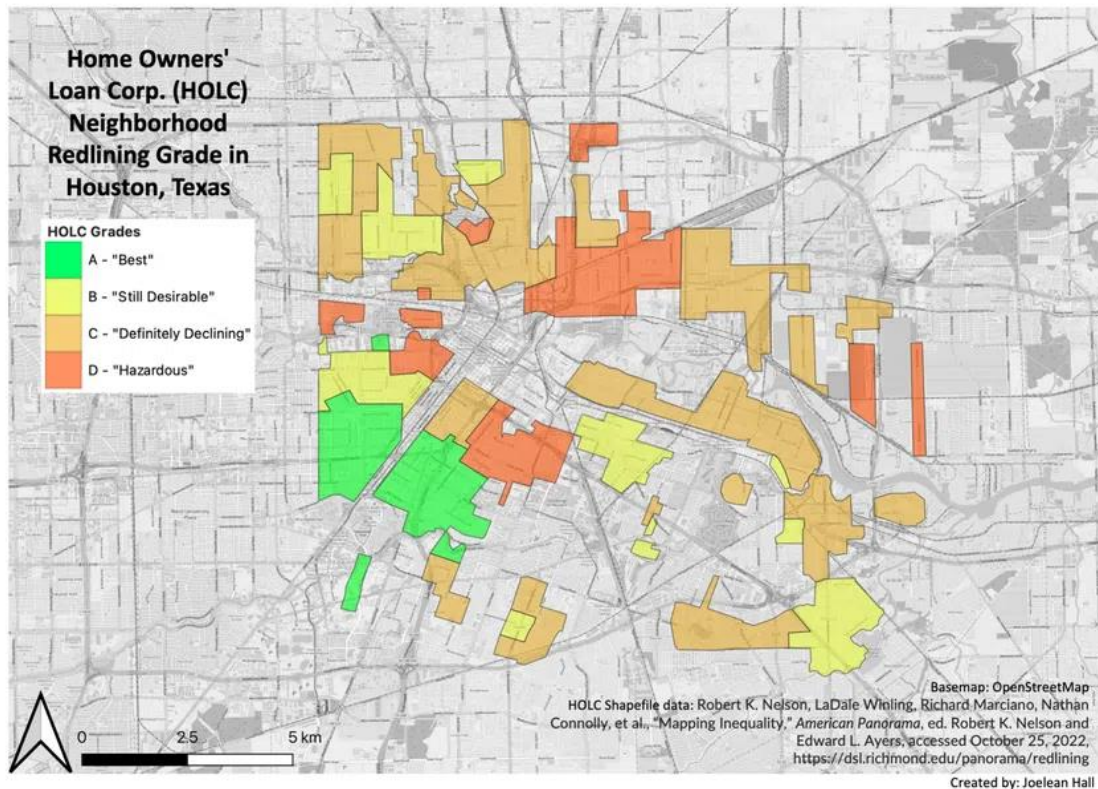


Fig. 6: HOLC Neighborhood Redlining Grade in Houston, Texas (1930s) *Size of Houston in the 1930s

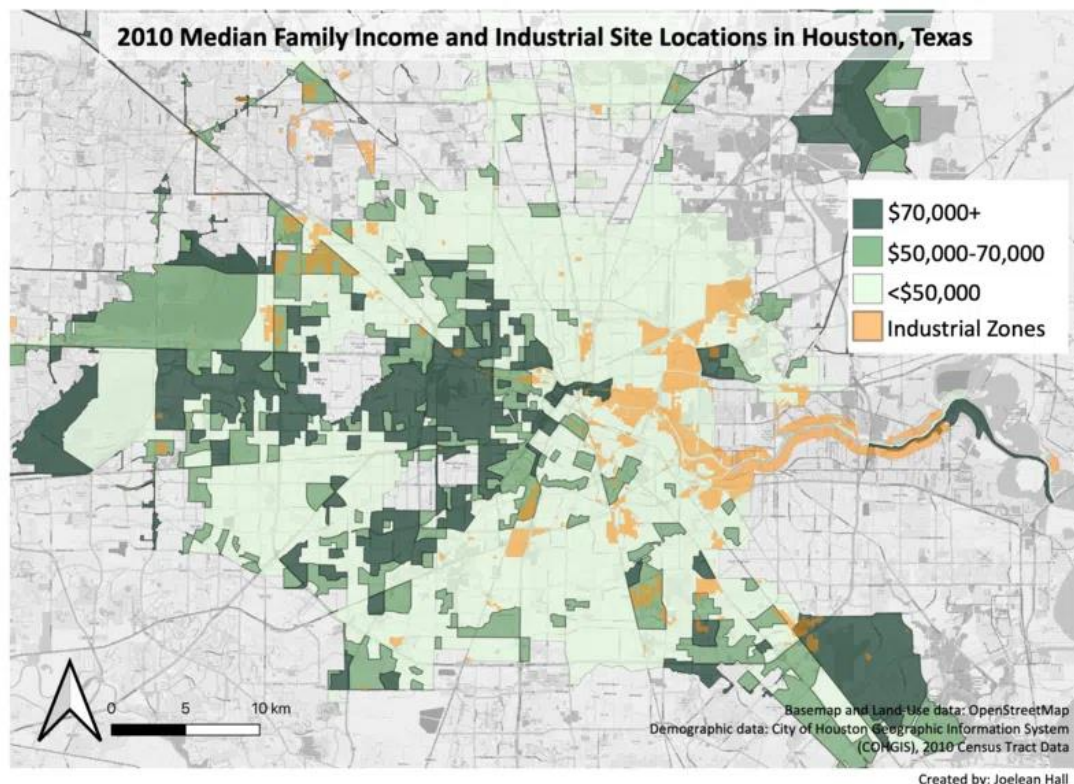


Fig. 7: 2010 Median Family Income and Industrial Site Locations in Houston, Texas

Given the high car dependency in the city, accessibility is also reduced for most low-income groups. Due to the high costs of private car ownership, lower-income and minority

groups are less likely to own a car and instead depend on public transit (Akhavan et al., 2019). Even when controlling for white and affluent public transit use, lower-income and minority groups take significantly longer to access locations (Akhavan et al., 2019). This can be due to the location of public transit locations and walking and waiting times.

Aside from the urban history, Houston lies along the hurricane-prone Gulf Coast region which has experienced climatic damage from both Hurricane Ike and Hurricane Harvey, amounting to several billion US dollars in the last two decades.¹⁰ In the most recent extreme weather history, the Deep Freeze of 2021 resulted in billions of dollars in damage from street and business closures, and at least 200 reported fatalities.¹¹ Minority and low-income groups were far less likely to receive federal aid than white and affluent neighbors.¹² This is partly due to not understanding the language, forms, and technology needed to apply for aid. Further, minority and low-income groups are less likely to have an emergency savings fund. Given natural disasters, such as hurricanes or extreme weather events, are likely to continue to occur due to climate change, the City of Houston and other organizations and institutions have begun to explore new sustainable avenues.



Fig. 8: Aftermath from Hurricane Harvey (2017)¹³

¹⁰ Greshko & Nasa. (2017, Dec.13). [Climate Change Likely Supercharged Hurricane Harvey](#). National Geographic.

¹¹ Golding, G., Kumar, A., & Merten, K..(2021, April 15). [Cost of Texas' 2021 Deep Freeze Justifies Weatherization](#). Federal Reserve Bank of Dallas.

¹² Brannen, J. (2022, Sep. 22). [Federal report calls out civil rights inequities in Hurricane Harvey's aftermath](#). Kinder Institute for Urban Research.

¹³ Gallagher, J. J. (2017, Sep. 1). [Hurricane Harvey wreaks historic devastation: By the numbers](#). ABC News.



Fig. 9: Texas Deep Freeze of 2021¹⁴; Natural disasters affect major highway arteries which if obstructed, prevents people from day-to-day tasks such as grocery store trips, which due to greater distances between destinations, can only comfortably be reached by car

1. Cycling and Bike-Share

Houston, and Texas in general, does not have a historical or current political acceptance and understanding of cycling as a primary travel option (Alcorn and Jiao, 2019). This is evident in headlines and biases against cyclists in both the news and the law. Take the case of Chase Delarios, an 8-year-old who was cycling in his suburban neighborhood in Kingwood and crossing a three-way intersection, was struck by a woman driving an SUV in September of 2022. Despite street designs of wide lanes, slow speeds, and stop signs, police officers considered the area “unsafe to walk and cycle,” placing the blame for the child’s death on the victim himself.¹⁵ There are many conflicting narratives that police and city officials place about who’s responsible for cyclists’ safety. For instance, since 2013, drivers must give cyclists at least 0.9 (3 feet) to 1.9 meters (6 feet) of space in a shared lane.¹⁶ However, very few citations have been distributed due to the “educational” intention of the law that police officers would instead interpret. Concrete measures to remove car lanes and create truly protected cycling lanes are also further met with local resistance. Despite these opposing forces, cycling

¹⁴ Dexheimer, E., Blackman, J., Bureau, A. (2022, Feb. 11). [How devastating was 2021's deadly Texas freeze, exactly? Here's what the numbers say.](#) Houston Chronicle.

¹⁵ Kois, D. (2022, Sep. 29). [Why Is a Neighborhood Street “Unsafe for Pedestrians or People Riding Bikes”?](#) Slate.

¹⁶ Begley, D. (2022, Oct. 10). [In a deadly year for Houston bicyclists, here's why a safety rule isn't being enforced.](#) Houston Chronicle.

infrastructure has been invested in more recent years. Alcorn and Jiao find that because of the poor cycling infrastructure across the city, recreational and other purposes may contribute to most bike-share trips rather than for work or school (2019).

This is the bleaker side of cycling in Houston. Cycling behaviors in Houston have not been well documented in scientific literature. However, there is a consensus that a shift in attitudes and behaviors toward cycling has arrived in Houston. There are notable upticks of community and cycling events, notably Houston’s World Naked Bike Ride, Moonlight Ramble, Clutch City, Pride Ride, and Critical Mass Houston. These events are known to increase cycling advocacy and accessibility through massive community cycling and engagement every week.

Aside from the social and political aspects, the environmental benefit of replacing car trips with bike trips is of increasing concern to most cities dealing with congestion and pollution. As part of a series of measures by federal, state, and local governments to deal with issues of energy and lowering emissions, the “Energy Resources for State, Local, and Tribal Governments” grant was created by the Environmental Protection Agency, an executive agency of the federal government.¹⁷ In 2012, Houston BCycle, a 501(c)(3) nonprofit, obtained its first grant through this program to build 3 bike stations and distribute 18 bikes around major parks and government buildings in Houston.¹⁸ Houston BCycle is unique in that, in its mission, it wants to provide “equitable access to bike share that fosters recreation, mobility, and personal wellness.”¹⁹ Further, Houston BCycle hosts major community rides, guiding local residents through their neighborhoods on bikes -- sometimes for the very first time.²⁰ It hosts other unique opportunities, such as partnering with local clinics for patients to be ‘prescribed’ a ride on a bike-share bicycle and *GO Pass* (discontinued), a lower-cost membership for monthly riders, lowering the cost from \$13 to \$3 a month.²¹ Over time, Houston BCycle has received support and funding from the Harris County Precinct One and the Texas Department of Transportation, enough to expand to over 100 stations and distribute over 700 bikes.

2. Houston BCycle Proposal

For my thesis project, I approached Houston BCycle to assist them in their work. After meetings with directors Bryan Reed (inactive) and Mary DeBauche (inactive), they presented key issues with their bike-share program in East Houston neighborhoods, namely, Greater

¹⁷ United States Environmental Protection Agency. [Energy Resources for State, Local, and Tribal Governments.](#)

¹⁸ City of Houston. Planning & Development. [Houston BCycle Program Expansion.](#)

¹⁹ Houston BCycle. [Team Mission.](#)

²⁰ Houston BCycle. (2022, July 21). [Houston BCycle Celebrates 10 Years With Five Community Rides.](#)

²¹ Allyn, W. (2019, Aug. 29). [Houston BCycle aims to expand accessibility with discounted rates for lower-income users.](#) Houston BCycle.

Fifth Ward, Second Ward, Greater Eastwood, and Third Ward. Current problems include low ridership rates, little community outreach, and a general misunderstanding of local perceptions of bike-share. As part of my thesis project, I assisted Houston BCycle with understanding local perceptions, cycling behaviors, barriers, and advantages of using BSS in Houston's historically underserved communities. Specifically, I'm answering the research question:

What are the advantages and challenges of Houston BCycle's station-based bike sharing system in low-income communities?

As far as I was informed on the recent history of station planning in East Houston, the various stations in these neighborhoods were installed between 2017 and 2021. There was little prior consultation with the communities before installation and no preliminary interviews or surveys were carried out to assess BSS needs and wants.

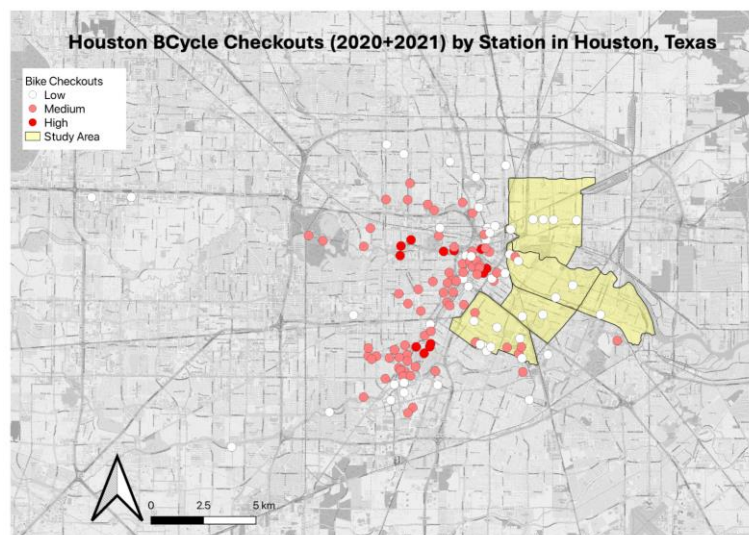


Fig. 10: Houston BCycle Checkouts by Station in Houston, Texas, data obtained from [City of Houston GIS Data Hub](#), and Houston BCycle internal data, own work

3. Study Area

**Second Ward, Magnolia Park, and Greater Eastwood:
2511 Navigation Blvd. and 6948 Harribsurg Blvd.
BCycle Stations**

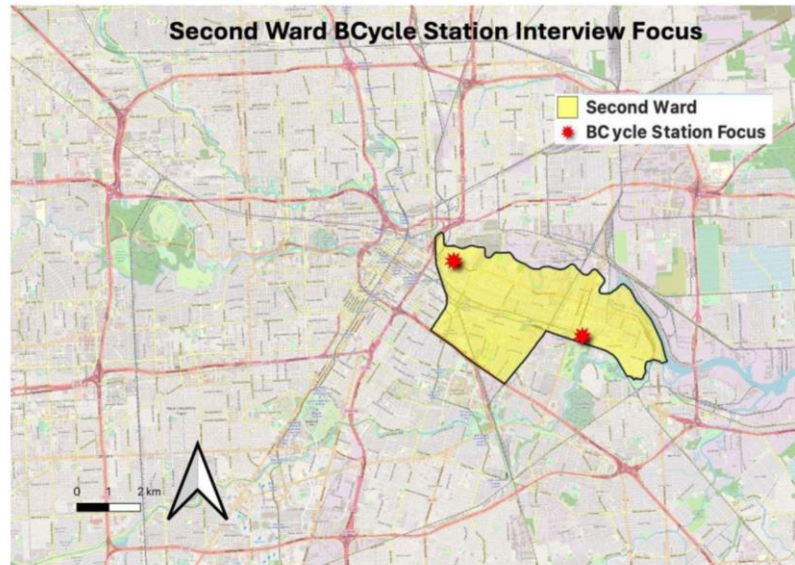


Fig. 11: Second Ward BCycle Station Interview Focus, data obtained from [City of Houston GIS Data Hub](#), and Houston BCycle internal data, own work



Fig. 12: 2511 Navigation Blvd. BCycle Station, Google Maps ©

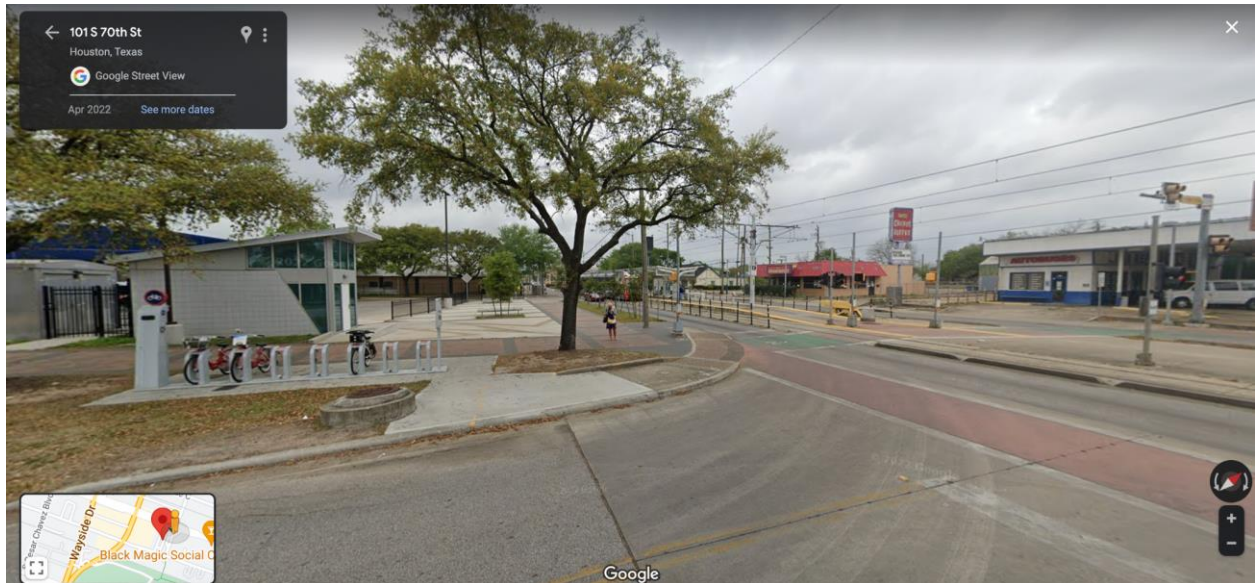


Fig. 13: 6948 Harriburg Blvd. BCycle Station, Google Maps ©

Second Ward, Magnolia Park, and Greater Eastwood are all neighborhoods adjoining each other on the east side of Houston. The reason I designate them all as Second Ward is for the similarities in neighborhood composition and demographics, as well as their shared history as Mexican American barrios (Lin, 1995). These districts are comprised of over 70% Hispanic residents, with a median household income of \$32,200-40,000.²² Main industries include construction, manufacturing, retail, and administrative, namely occupations in the secondary and tertiary sectors. This is also primarily due to a high amount of factory locations within the Second Ward. The combined population for the area is approximately 42,400.

Third Ward: Project Row House/Holdman Live Oak (2521 Holman Str.)

²² Statistical Atlas. [Household Income in Second Ward, Houston, Texas.](#)

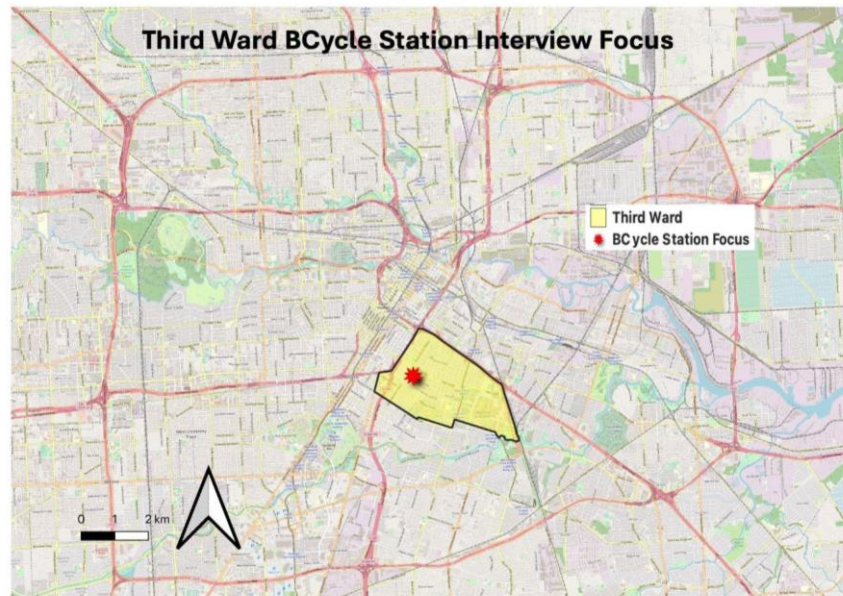


Fig. 14: Third Ward BCycle Station Interview Focus, data obtained from [City of Houston GIS Data Hub](#), and Houston BCycle internal data, own work

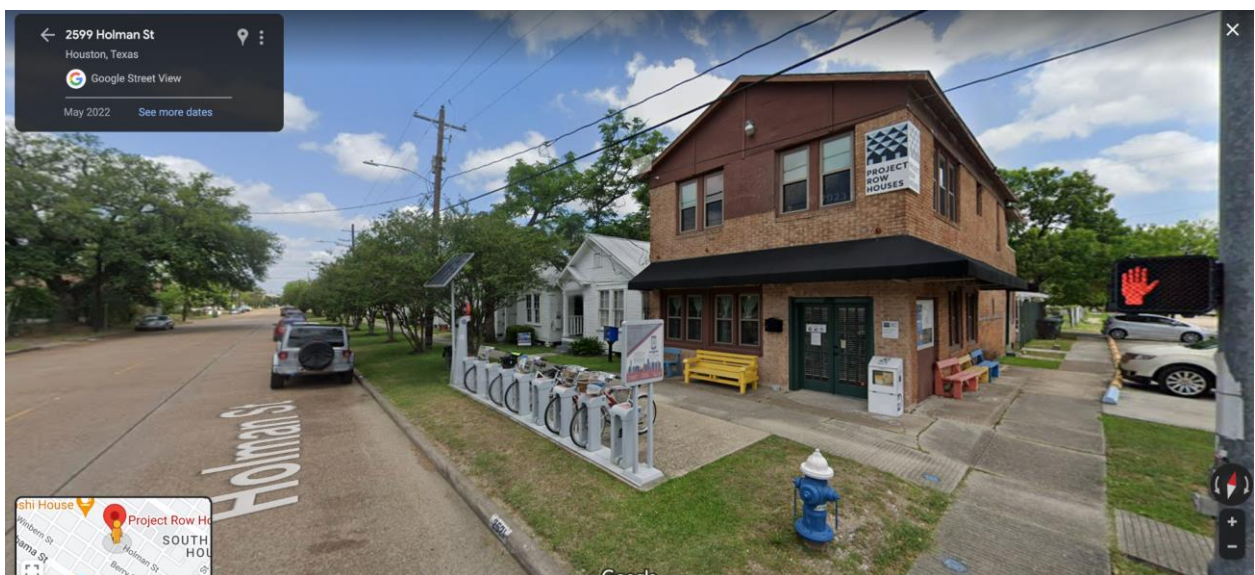


Fig. 15: 2521 Holman Str. BCycle Station and Project Row House Main Office, Google Maps ©

Third Ward is comprised of over 60% Black residents, with a median household income of \$30,700.²³ Main industries include healthcare, education, hospitality, and retail namely occupations in the tertiary sectors. The population is approximately 13,300.

²³ Statistical Atlas. [Household Income in Greater Third Ward, Houston, Texas.](#)

Fifth Ward: 4300 Lyons Ave BCycle Station

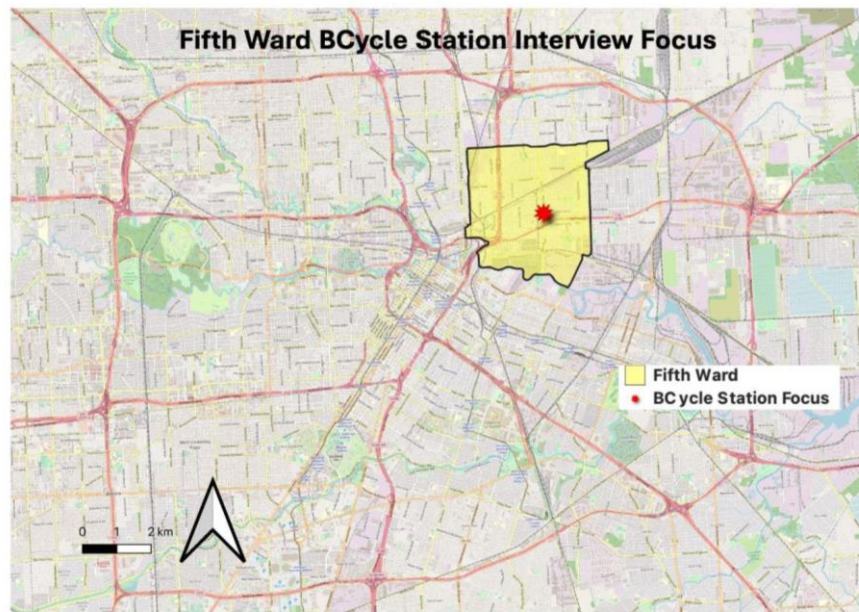


Fig. 16: Fifth Ward BCycle Station Interview Focus, data obtained from [City of Houston GIS Data Hub](#), and Houston BCycle internal data, own work

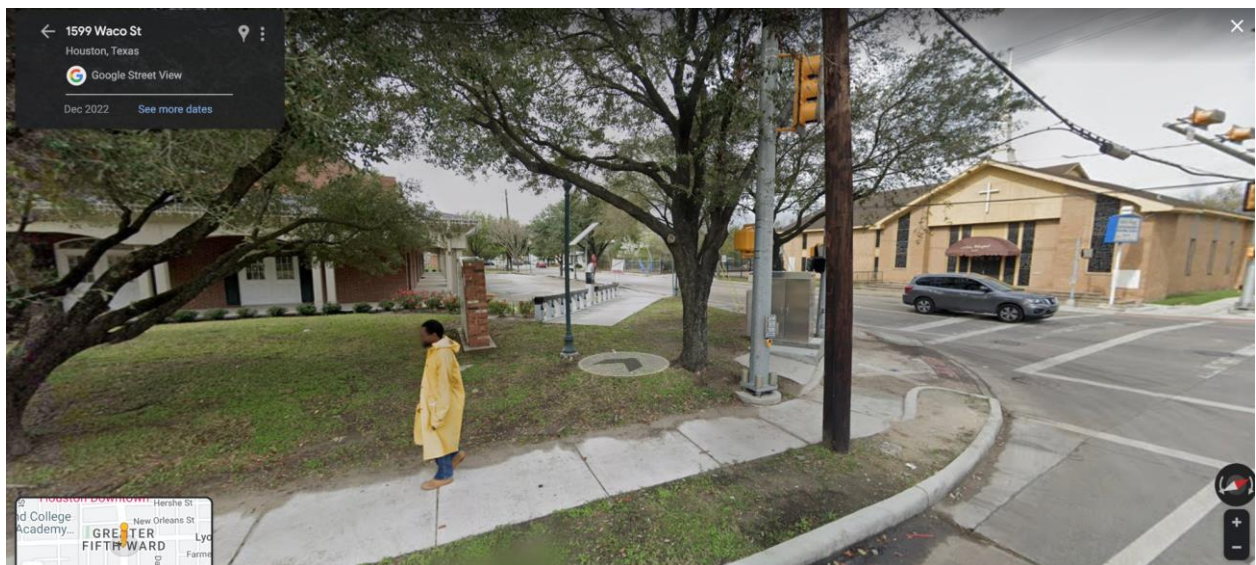


Fig. 17: 4300 Lyons Ave BCycle Station, Google Maps ©

Fifth Ward is comprised of over 45% Black residents and over 45% Hispanic residents, with a median household income of \$25,900.²⁴ Main industries include construction, healthcare, administration, and retail namely occupations in the secondary and tertiary sectors. The population is approximately 19,800.

²⁴ Statistical Atlas. [Household Income in Greater Fifth Ward, Houston, Texas.](#)

E. Ethnography Lens

Given the little academic research guidance on conducting interviews in relation to bike-share, I decided to utilize ethnographic strategies. This is for several reasons. The nature of qualitative research demands a closer examination of events, usually through a series of fieldwork and in-person studies (Thelwall & Nevill, 2021). Given I want to explore local perceptions about bike-share in underserved communities, I have to admit the limitations of my knowledge and understanding of these communities. The benefit of utilizing an ethnographic lens in my approach is that it allows the communities and their responses to explain conditions and perceptions rather than bringing in preconceived concepts or expectations from previous literature (Hammersley & Atkinson, 2019). This can be done through the use of grounded theory, which uses participant perspective to generate theory rather than for theory to generation perspective (Urquhart, 2013, Glaser & Barney, 1967). Per the nature of university research, I had to conduct a literature review analysis first on previous studies and results, which undermines much of grounded theory (Bytheway, 2018). This is because conducting a literature review before coding results can hamper efforts to fully embrace grounded theory in its objectivity. However, Bytheway mentions many authors have conducted early literature reviews to understand the gap in the research and justify the study, as I have done (2018).

1. Informal & Semi-Structured Interviews and Field Notes

Given the little research on interviews and bike-share, I use the interview methodology in Yeo et al.'s study (2013). I conducted semi-structured, in-person, and telephone interviews following the stages Yeo et al. outlined (2013). First, I introduced myself and the thesis project, providing questions on behalf of Houston BCycle. In the second stage, I gave a bit more background information on why I'm conducting the research in simple terms and that I wanted to obtain perspectives and opinions on bike-share. In stage three, I began my interview with my questions:

- What is your experience with Houston BCycle?
- (If they have experience) What motivates you to use bike-share (or cycling)?
- (If they don't have experience) What would motivate you to use bike-share (or cycling)?
- What are the barriers to using bike-share (or cycling)?

The first question is to assess whether the participants are users or not. Given the low checkout figures for stations in these areas, it's likely many participants will not be users. The

second question addresses the advantages of bike-share. At the start of my interviews, I noticed using “advantage” was difficult to understand in terms of bike-share and used “motivation” as a comparable synonym. I also noticed the term “bike-share” was another difficult term to use, where at times, I would have to explain what it was or point to the station in proximity. Additionally, many answered the questions in regards to cycling, conflating the two concepts. This may be due to a lack of exposure to both cycling and bike-share, in which I would default to asking questions on cycling. The last question is meant to answer the barriers to bike-share. Finally, I would wind down the interview and thank the participant for their time. I would note that for expert interviews, other questions were usually posed. This is because of the breadth of knowledge experts had on the communities or on bike-share which provided a greater context in missing gaps for some of the perceptions from participants or in providing more context about the community and history.

There is literature from healthcare journals and topics that recorded interviews are dependent on the local population that are being interviewed (Rutakumwa et al., 2020). While this is relevant to healthcare topics and patients’ personal histories, there is little evidence within the transit and urban planning fields when it comes to a requirement for how to document interviews. I approached local residents dressed casually with a clipboard and a pen. I received numerous comments and apprehensive attitudes toward the clipboard I held. I believe this is because of negative associations and experiences between the city and local residents in these areas. The clipboard may have appeared as a symbol of authority and information collection that led to issues of distrust. I later resorted to a simple notebook. Given this issue alone, I didn’t attempt to record conversations or pull out a cell phone or other device that could interfere with the conversations I had. Additionally, while I wrote down first names, I did not inquire about the personal details of the participants. This is due to a number of reasons. The location and times of when I met with participants, which given recent re-identification models, raised alarms on whether the demographic collected could truly be anonymized (Rocher, Hendrickx, de Montjoye, 2019). Most participants are either living in these communities or working in them and would be able to identify one another simply by name. Van den Hoonaard argues this is a greater issue in qualitative studies in that anonymity isn’t guaranteed in the data-gathering process, particularly in ethnographic-style community interviews (2003). His suggestions indicate a hope that there won’t be an interest in the data, otherwise known as an underuse of the data by the researcher and scientific community. I also further questioned whether there was any community benefit to the collection of this data. Aside from the usefulness in the research field, I could not find evidence of its direct use for

the communities I visited²⁵. Like Lyu et al.'s study, I assigned each participant a number and mentioned where and when I met them (2020).

I used an ethnographic style of interviewing, otherwise understood as interviewing within a specific, geographic location (Rinaldo & Guhin, 2019). I approached and interviewed local participants in the form of “go-along” street phenomenology in order to best capture their opinion and understanding “in situ” (Kusenbach, 2003, p. 455). Other urban and transport studies have also used this methodology. For instance, in Lauwers et al.'s study on urban environmental influences on mental health, they performed “walking interviews” which allowed them to collect additional themes and concepts (2021). Another unique strategy in Ghekiere et al.'s study was the “bike-along” process to better understand environmental factors affecting children's cycling behavior (2014). They also explain that greater context and environmental factors can be captured using this strategy.

Taking field notes of the surroundings, my own thoughts, and participants' answers was a way to capture the present environment, creating a so-called snapshot effect of the moment around the BCycle station. Kusenbach argues the use of a go-along interview provides an opportunity to observe “naturally unfolding events” and “volunteered” interpretations (Kusenbach, 2003, p. 461). Instead of removing participants from their environments, I would usually begin by approaching people closest to the bike-share station and then walking around streets neighboring within a 250-400 meter radius to find others to speak to. At times, they would direct me to speak to others, adding to the natural flow of interviewing and conversation. In only two cases did I schedule interviews in advance (in the case of E4 (phone) and E5 (in person)). Additionally, as I was alone and unfamiliar with the area, I only approached residents in the daylight when I felt comfortable and upon understanding the area and the people around me.

2. Interview Coding

In order to analyze results, I coded results in MAXQDA using grounded theory. Grounded theory in coding is the use of “coding cycles” on qualitative data in order to reach a theory (Saldaña, 2013, p.55). I did this by several rounds of coding laid out by Saldaña (2013). The first cycle included a “holistic coding” method in order to capture the basic themes discussed in the interviews (Saldaña, 2013, p. 142). Holistic coding was chosen to understand the overall topics and concerns discussed in each conversation, for instance, whether more barriers or advantages were discussed or whether they were “experts” in the community in order to understand how to categorize the responses. In the second cycle of coding, I used

²⁵ Health Commons Solution Lab. [Engaging Communities in your Data Collection Initiative.](#)

“focused coding” to create categorical themes which each code could be applied to (Saldaña, 2013, p. 213). Thereafter, I use the “codeweaving” approach to discuss the results in a way that creates a narrative (Saldaña, 2013, p. 248). In addition to the interview codes, I bring in maps and documents produced by the city and local non-profits, as well as previous literature to provide context to some of the themes and events participants and experts brought up. Additionally, MAXQDA is chosen as the coding platform, particularly because of the ethnographic nature of the study (Jacques, 2021).

IV. Results

I interviewed a total of 19 participants and 5 experts ranging from 5 to 60 minutes in length and a total of 128 codes between November 8th, 2022 and January 24th, 2023. Of the coded interviews, 25% of what was discussed were advantages, while 75% of what was discussed were barriers. Of the expert interviews, advantages comprised 20% (n=11) of the discussion while barriers were discussed 80% (n=44) of the time. Of the participants, advantages were discussed 33% (n=21) of the time, while barriers were discussed 67% (n=42) of the time.

Categories and Sub-Categories	Frequency
	128
Experts	0
Experts > Barrier	0
Experts > Barrier > Ownership	1
Experts > Barrier > Environment	2
Experts > Barrier > Gentrification	1
Experts > Barrier > Accessibility	0
Experts > Barrier > Accessibility > Trip Planning	1
Experts > Barrier > Accessibility > Information	4
Experts > Barrier > Accessibility > Station-Based	3
Experts > Barrier > Accessibility > Technology (incl. bikes)	6
Experts > Barrier > Houston BCycle	4
Experts > Barrier > Perception	5
Experts > Barrier > Safety	0
Experts > Barrier > Safety > Car Drivers	3
Experts > Barrier > Safety > Neighborhood	3
Experts > Barrier > Infrastructure	5
Experts > Barrier > Infrastructure > City of Houston	6
Experts > Advantage	0
Experts > Advantage > Infrastructure	2
Experts > Advantage > Perception	2
Experts > Advantage > Motivation	1
Experts > Advantage > Motivation > Leisure	1
Experts > Advantage > Community	5
Participants	0
Participants > Advantage	0
Participants > Advantage > Infrastructure	0
Participants > Advantage > Environment	1
Participants > Advantage > Perception	1
Participants > Advantage > Perception > Leisure	4
Participants > Advantage > Safety	1
Participants > Advantage > Motivation	11
Participants > Barrier	0
Participants > Barrier > Ownership	1
Participants > Barrier > Public Transit	3
Participants > Barrier > Perception	4
Participants > Barrier > Houston BCycle	1
Participants > Barrier > Social	0
Participants > Barrier > Social > Trip Planning	3
Participants > Barrier > Social > Health	2
Participants > Barrier > Social > Gentrification	3
Participants > Barrier > Environment	3
Participants > Barrier > Accessibility	0
Participants > Barrier > Accessibility > Station-Based	2
Participants > Barrier > Accessibility > No Access	4
Participants > Barrier > Accessibility > Information	2
Participants > Barrier > Accessibility > Technology (incl. bikes)	3
Participants > Barrier > Safety	0
Participants > Barrier > Safety > Neighborhood	1
Participants > Barrier > Safety > Drivers	2
Participants > Barrier > Infrastructure	8
Participants > User	1
Participants > Non-User	0
Participants > Non-User > Other	4
Participants > Non-User > Non-Cyclist	4
Participants > Non-User > Cyclist	4

Table 2: MAXQDA Interview Coding Results

A. Advantages

1. Recreation and Leisure

To start, many participants conflated bike-share and cycling. I believe this is due to the low levels of cycling in the city and little information on bike-share systems in general. Therefore, it's difficult to discern at times when participants were discussing cycling and when they were discussing bike-share. However, given the associations between the two, I will analyze answers in the same way.

Participants communicated interest and motivation in using bike-share, as many were non-users. However, most participants mentioned it as purely for leisure, usually mentioning "exercise" (P5, P6) "leisure," (P13, P14, P15), and riding with friends and family in a group setting (P5, P6, P15). In trying to understand why leisure and exercise were primarily discussed, E4 mentioned that the Houston BSS is set up best for short, recreational trips and is successfully being used around the downtown core and Rice University area. The downtown area benefits from having the greatest density and grid design, making it the easiest for leisure trips. Upon looking closer at the bike lane infrastructure and BCycle station options, the downtown core also benefits from having more on-street dedicated bike lanes and more BCycle stations. The Rice University area which includes Hermann Park has many off-street lanes (along the park trails) and a greater density of BCycle stations. The presence and success of these stations in these areas may be a contributing factor to why participants believe it's just for leisure trips. Positive perceptions centered around more cyclists and bike lanes being present which may also contribute to the motivation in using bike-share (P1, E5). This may be due to the City of Houston's bike plan expansion, which I'll discuss in B.2.2.

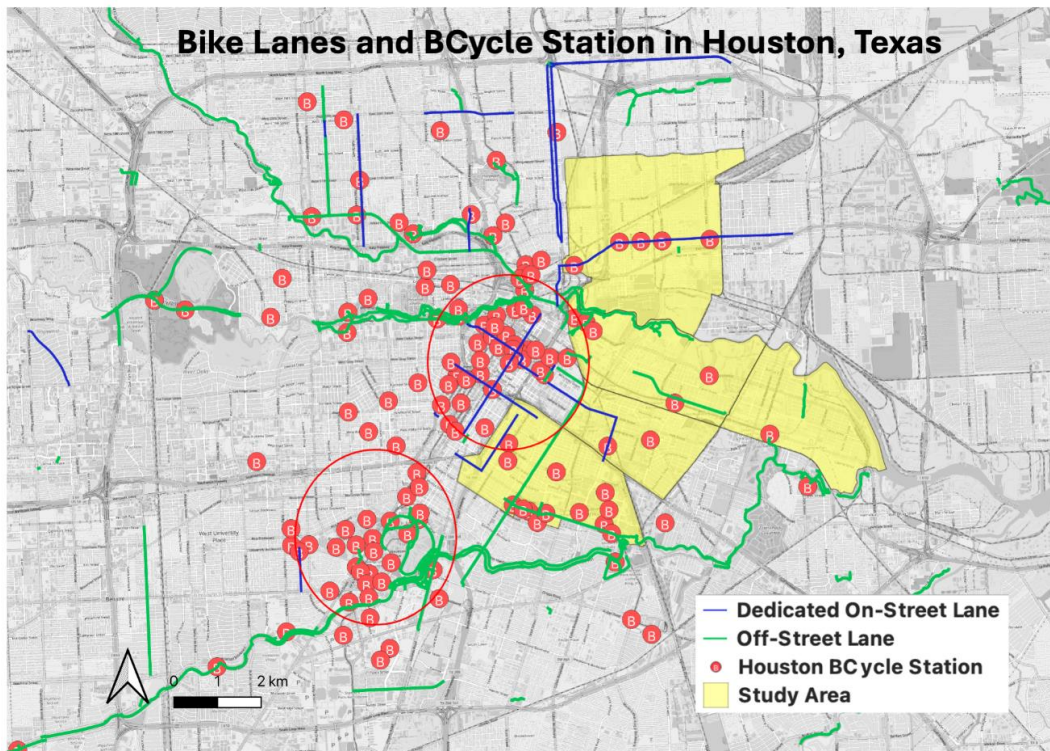


Fig. 18: Bike Lane Types and BCycle Stations in Houston, Texas, data obtained from [City of Houston GIS Data Hub](#), [Houston Bikeways](#), and Houston BCycle internal data; Red circled areas refer to the downtown and Rice University areas E4 referred to

2. As a possible avenue for community development

A major part of my discussions with E1 and E2 was on community development. While they didn't mention bike-share or cycling as a major component of the community, there's a strong sense of engagement and outreach within communities. This was especially evident in my conversation at Project Row House, a local non-profit in the Third Ward centered around creating projects such as after-school programs, grocery delivery for the elderly, and local startup incubation programs for locals. E1 and E2 described it as a "seek-and-respond organization" by seeking out projects in the community and delivering on community needs. I believe that this is a significant advantage as there are positive sources of leadership and information available.

There is literature on community readiness as an essential aspect to implementing projects and interventions. Community readiness is the preparedness of a community for the initiation of a program (Edwards et al., 2000). As a theoretical model, there are a series of steps for intervention depending on where the community may be. Unfortunately, E1 and E2 informed me that bike-share is not an expressive concern for the community and isn't focused on assisting in the expansion. Given this information, it seems the community may need a

community readiness assessment before moving forward with bike-share. Still, there's evidence of successful community-driven bicycle program initiatives, in the case of a community-based participatory action team in Milwaukee, Wisconsin, where families rode together in groups (Dressel, Steinborn & Holt, 2014). E5 mentioned there was an increase in "cycling groups" and mass rides that are taking place every week. These events have brought more exposure to cycling in general, with possible benefits for bike-share as well.

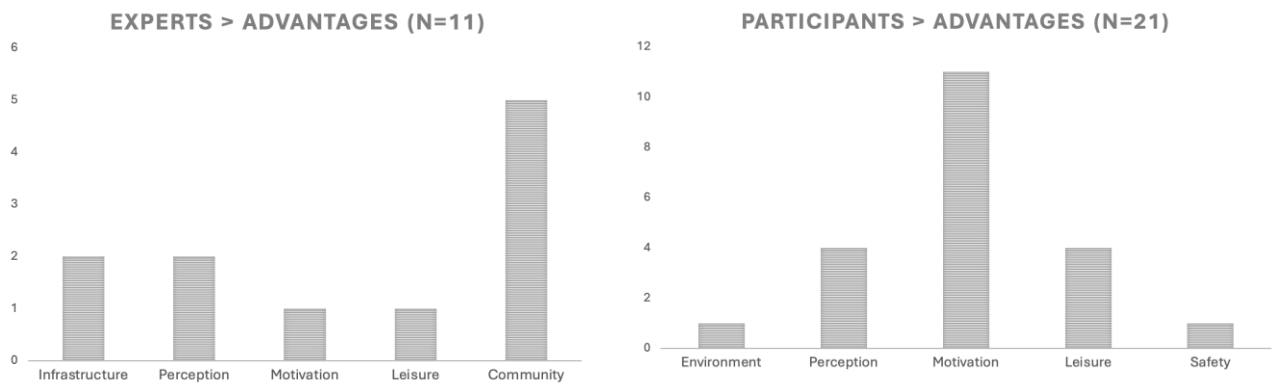


Fig 19 and 20: Coded Advantages from Experts and Participants

B. Barriers

1. Social Factors

1.1. Neighborhood Crime and Road Safety

Participants expressed poor perceptions of bike-share for several reasons. P11 explained it isn't "popular among locals," while P13 explained that it's not perceived as a "community resource." There are some explanations for this by E4, who mentioned that Houston is not "bike friendly." This is due to safety issues regarding roads and drivers in that most drivers aren't educated on how to drive on the road with cyclists (E5). In turn, this makes it "terrifying" to ride around (E4). Cycling deaths from car collisions are a genuine concern in Houston. Since the start of this year alone, there have been multiple deaths from car and motorcycle collisions with cyclists and one person on a scooter.²⁶ The city has mandated that bikes and scooters stay clear of the sidewalk and share the road. However, drivers are unaware of how to "share the road." This is due to poor driver education in general, which is usually comprised of a one-time driving test as a young adult with a small subsection on cyclist and

²⁶ Conner, B. (2023, Jan. 31). [Advocates raise safety concerns after 3 deadly crashes involving bicycles, scooters in January 2023](#). ABC13.

pedestrian safety.²⁷ Additionally, because most streets were designed exclusively for cars and are now introducing shared cycle lanes, efforts to update drivers have not been successful. E5 explained how in many cases, they have to educate drivers and cyclists themselves during their bike tours.

Another apparent safety deterrent is safety within neighborhoods. While only P2 and P3 mentioned how “rough” it can get around Guadalupe Park (in the Second Ward), E3 mentioned “pockets” of crime which people generally want to avoid during the day and night. E1 and E2 also mentioned previous “drive-by” activity in the 1990s in the Third Ward, a form of shooting out of a vehicle at targets. Gun violence is still a prevalent reality in some areas in these communities. In the Fifth Ward, a 15-year old was killed in a drive-by shooting last summer.²⁸ Another drive-by occurred in Magnolia Park where a pedestrian was shot while walking to a store.²⁹ In the Third Ward, a drive-by occurred, injuring a man exiting a nightclub.³⁰ And recently, residents within the Third Ward are taking action against some of the more recent gun violence crimes in their community.³¹ There is evidence that, especially for women and the elderly, perceived crime can deter physical activity such as walking and cycling (Foster and Giles-Corti, 2008). Although there aren’t studies to document it, the fact that community residents are vocalizing their concerns for local violent crimes suggests that residents are aware of them, which may influence how often they walk or cycle. Still, more research is needed to create a stronger correlation.

1.2. Possible Competitors: Ownership and Public Transit

P14 mentioned how bike ownership was important to them to be able to decorate their own bike. This was corroborated by E5’s example of a pilot project at Texas Southern University, where students were given access to bike-share but opted to own their own bikes instead. Houston benefits from an interesting social biking culture where mass rides are hosted around the city several times a week, month, and year. Many have decorated bikes with lights, speakers, and paint, exemplifying personality and style.³² If cycling is considered

²⁷ Grief, N. (2023, Jan. 6). [Hey Drivers, Here’s How to Actually Share the Road with Cyclists](#). Bicycling.com.

²⁸ Hensley, N., Bauman, A. (2022, Aug. 16). [Teen shot and killed in Fifth Ward drive-by shooting, Houston police say](#). Houston Chronicle.

²⁹ Chron, J. J. (2020, Mar. 12). [Man shot, killed while walking to store in Houston’s Magnolia Park](#). Houston Chronicle.

³⁰ deGregood, M. (2023, Feb. 24). [Man injured after shooting near Third Ward, police say](#). Houston Chronicle.

³¹ Homer, M. (2022, Feb. 21). [‘This has to stop’: Third Ward residents demand action to combat rising crime](#). KHOU11.

³² Hannibal Smith, C. (2021, Aug. 9). [Houston mass bike rides boom around the city in the age of COVID](#). Preview Houston Chronicle.

primarily a leisure and social activity, then making it as unique to one's own personality seems a logical solution. However, this could impede efforts for bike-share to compete. Additionally, several participants expressed how they preferred public transit over bike-share (P9, P17). P17 went as far to say that buses are more efficient and safer than biking. While experts couldn't explain the competition with public transit, this on par with Bielinski et al.'s claims that bike-share availability would likely compete with public transit over private car use (2021).

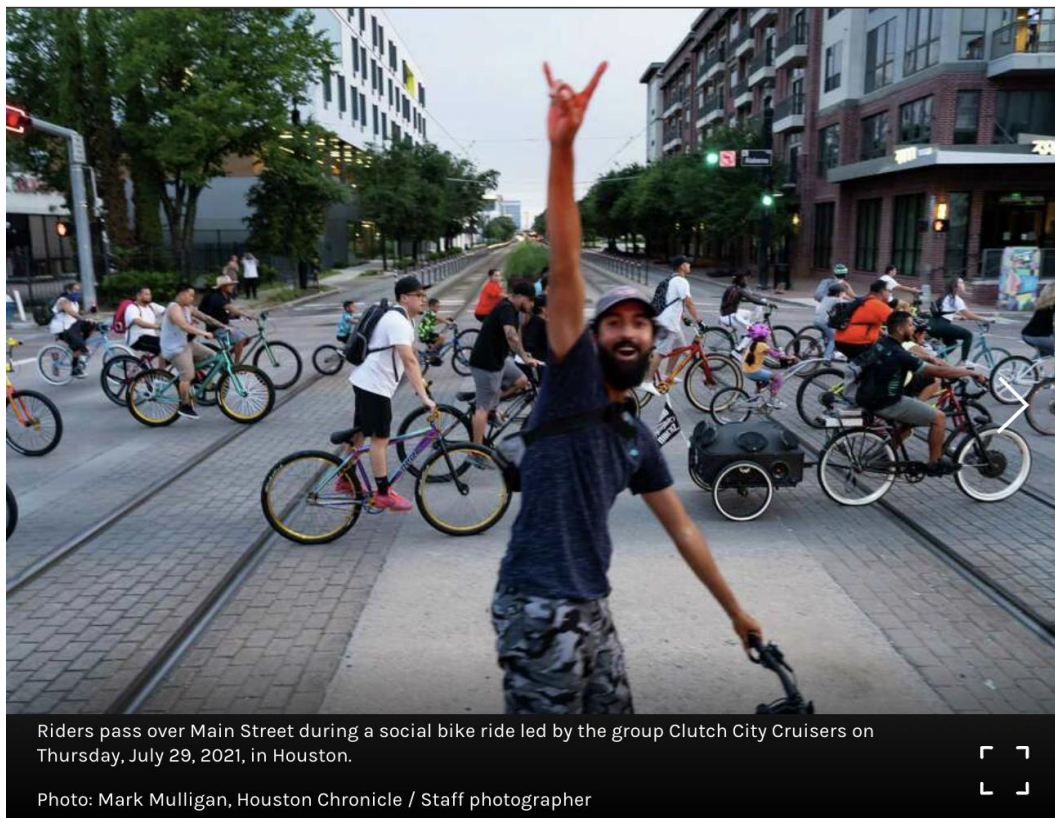


Fig 21: Picture from mass cycling ride in Houston³³

³³ Mark, M. (2021, July. 29). [Houston mass bike rides boom around the city in the age of COVID](#). Preview Houston Chronicle.

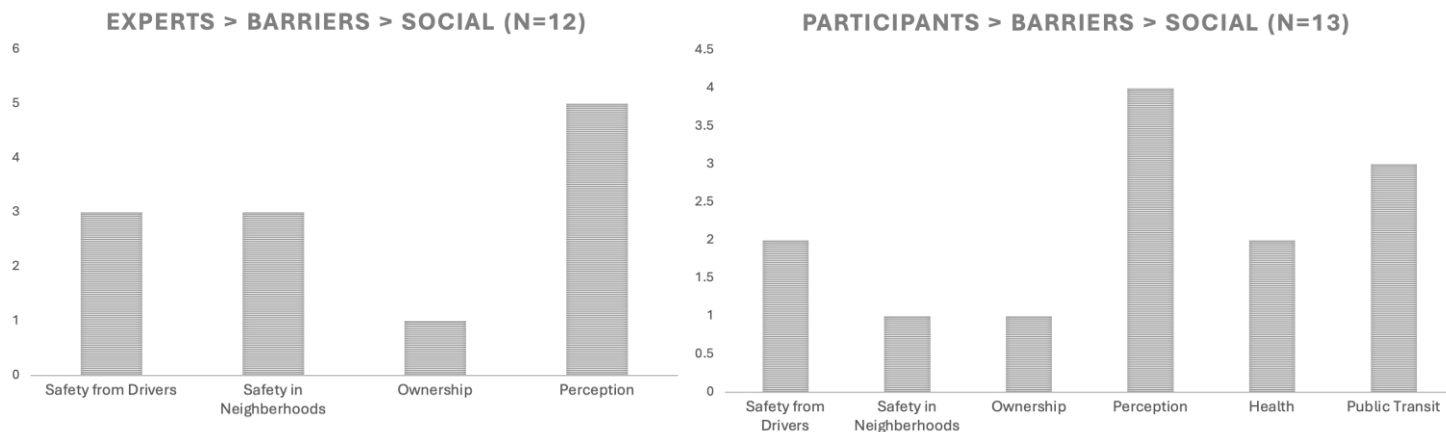


Fig 22 and 23: Coded Social Barriers from Experts and Participants

2. Built Environment

2.1. Deep Distrust of Government

Multiple participants and experts mentioned poor or lack of cycling infrastructure in their communities. P5 and P6 mentioned bike lanes weren't "safe enough," P13 believed there were "poor bike lanes," while P2, P3, and P15 mentioned a complete lack of bike lanes in their communities (outside of the study area). Experts brought up issues around the need for density (E3) and corroborated poor infrastructure (E5). Upon trying to understand the lack of investment in bike lanes, a greater story unfolded about perceptions experts had on the City of Houston specifically. For instance, in 1993, the City of Houston targeted row houses in the Third Ward for demolition as part of an urban renewal project and slum clearance project (E1 and E2). When Project Row House bought out the row houses, the City of Houston claimed they had to be "boarded up, uninhabited, or demolished" (E1 and E2). E3 informed me that the City of Houston was known for demolishing many historic buildings in the area, creating a general distrust for government initiatives and investments.

To better understand how and when this began, an understanding of urban renewal projects is needed. Urban renewal projects were a part of the US Federal Governments housing initiative, passed as the Housing Act in 1949 or otherwise known as the "Slum Clearance and Community Development and Redevelopment."³⁴ The intention of the Act was to "clean up" areas that were run-down or underutilized and build new low and middle-income housing (Carmon, 1999). Between the 1950s and 70s, hundreds of thousands of families were displaced

³⁴ Nelson, R., Ayers, E. Digital Scholarship Lab, ["Renewing Inequality,"](#) American Panorama.

in areas considered “slums” and cleared for private development across the US (Carmon, 1999, Nelson and Ayers, n.d.). Although the goal was to build new, affordable housing, federal funds were used for commercial and industrial developments, primarily to benefit higher-income residents and business interests (Carmon, 1999). In Houston’s case, lower-income neighborhoods were partially or entirely demolished or split up from each other through the construction of highways and housing (Lin, 1995). For instance, the Fourth and Fifth Wards were divided by the construction of I-45 and I-10, benefitting suburban commuters from surrounding areas (Lin, 1995).

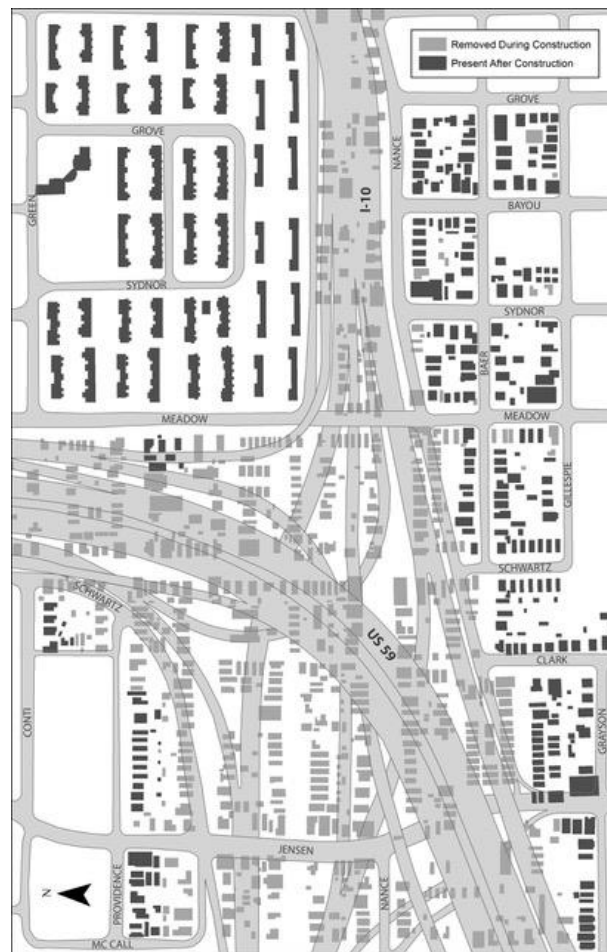


Fig. 24: Fifth Ward Structures Before and After Highway Construction (Shelton, 2017), screenshot from Shelton’s article³⁵; low-income and minority neighborhoods were greater targets for highway construction

Another significant case of this was in the 1970s, when the City of Houston was seeking to expand highways through the city. Two neighborhoods were exposed to the same threats, Courtlandt Place, an affluent, primarily white neighborhood and the Third Ward.³⁶ Despite using similar arguments that both were historic districts that needed to be preserved and not

³⁵ Shelton, K. n.d. [Right In The Way: Generations Of Highway Impacts In Houston](#). The Metropole.

³⁶ Bliss, L. (2015, Nov. 30). [How the Fight Against Urban Renewal Shaped 1970s Houston](#). Bloomberg.

destroyed, only Courtlandt Place received historical status. The highway was then expanded into Third Ward with the argument that it would increase economic development (Shelton, 2017). Shelton terms “infrastructural citizenship” as a form of advocating for one's community, especially when an infrastructure project threatens it (Shelton, 2017). This is currently relevant due to the Texas Department of Transportation’s (TxDOT) current project to expand I-45 into the Fifth Ward. P17 mentioned the I-45 highway expansion plan would “displace dozens of local residents” and that vouchers given out to residents to compensate for displacement were given out at lower amounts in the Fifth Ward. E5 mentioned that their bike tour route has been redirected due to the expansion plan. The City of Houston has recently sued TxDOT out of environmental justice concerns meanwhile, the Federal Highway Administration (FHA) has told TxDOT to halt further processes until the plan is evaluated for further civil rights violations.³⁷ In essence, it seems a deep distrust of local government is present with a history of invasive and destructive infrastructure projects.

2.2. Unclear or Poor Definition of Bike Lanes

Another important factor is the quality of bike lanes. The majority of available “bike lanes” in Houston are shared-street, low-comfort (indicated in orange in Fig X). These “lanes” are shared with traffic ranging in speeds from 32 to 64 kmh, with all vehicle types, including trucks. It is then designated “high comfort” if a bike marking is painted on the ground. However, there is no discernable difference in space or rule adherence. There are currently no shared, “high comfort” bike lanes in the Second, Third, or Fifth Wards. Of the lanes present, the difference between dedicated “low” and “high” comfort is a few extra meters of distance between the car and the cyclist. Sometimes, the difference between dedicated and shared on-street lanes is still simply some added paint on the ground. This is just for what the City of Houston is considering a “bike lane,” whereas all other streets generally appear as a shared, low-comfort streets such as Fig X. This can explain why several participants referenced either the poor quality of bike lanes or a complete lack of them (P5, P6, P13, P15). Especially for shared on-street lanes, there is little difference in speeds or driving behaviors on other streets. These bike lanes make up the majority of available bike lanes in the city. The City of Houston published a bike plan to become a “Gold-level Bicycle Friendly City by 2027” in 2017.³⁸ Since then, new upgrades and developments have occurred throughout the bike lanes in the city, and an expansion of dedicated lanes has been created.

³⁷ Shelton, K. n.d. [Right In The Way: Generations Of Highway Impacts In Houston](#). The Metropole.

³⁸ Houston Bikeways. [About the Plan](#).

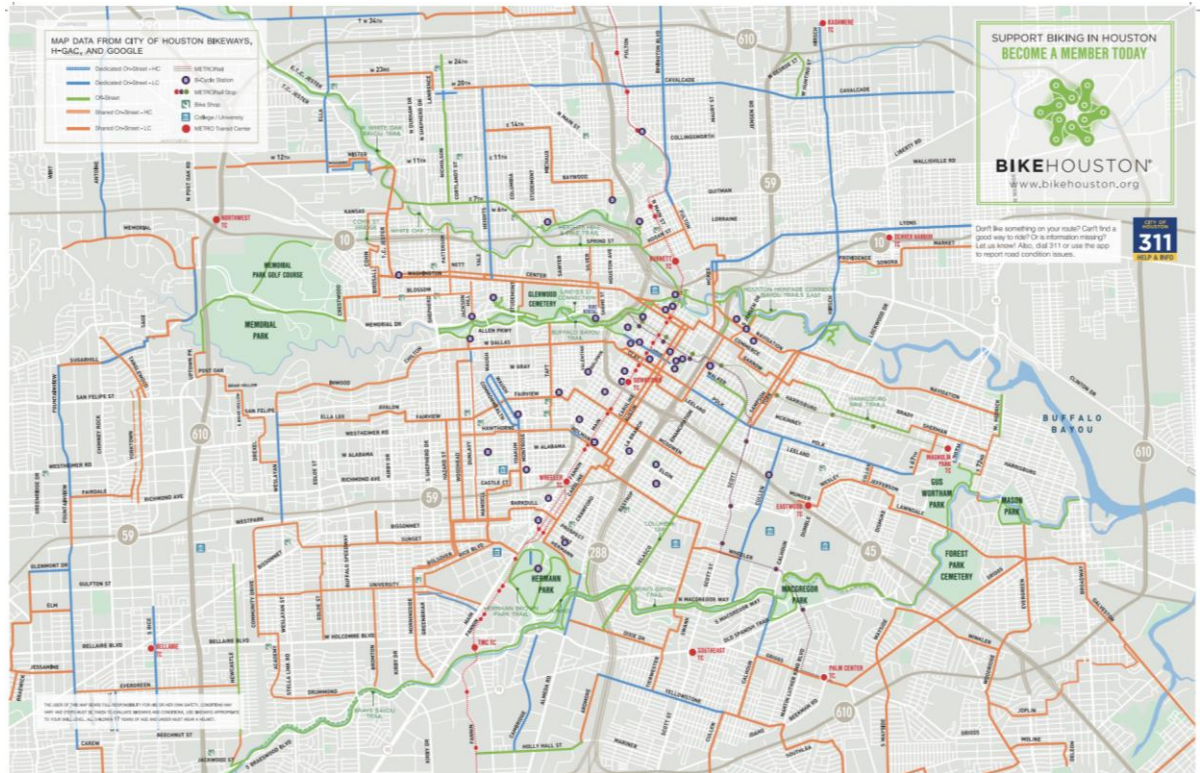


Fig. 25: Bikeways in Houston, screenshot from BikeHouston map³⁹



Fig. 26: Bikeway Examples in Houston, screenshot from BikeHouston map

³⁹ [Bike Houston Map: A Guide for Safe and Fun Cycling in Houston.](#)



Fig. 27: Shared, low-comfort bike lane on Navigation Blvd in the Second Ward, Google Maps ©



Fig. 28: Shared, high-comfort bike lane on Joplin St, Google Maps ©; A sign indicating sharing the road with a bike is present

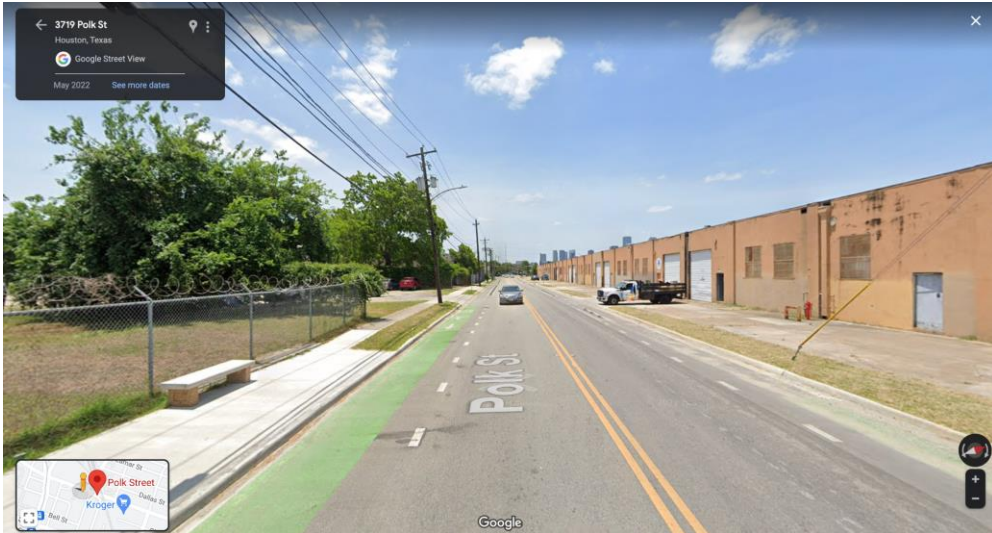


Fig. 29: Dedicated, low-comfort lane on Polk St in the Second Ward, Google Maps ©; additional paint present



Fig. 30: Dedicated, high-comfort lane on Calhoun Rd in Third Ward, Google Maps ©; additional paint but no apparent changes from low-comfort lane on Calhoun Rd



Fig. 31: Off-Street Trail on Valesco St in Third Ward, Google Maps ©; completely separate lanes

2.3. Environment - Lack of Green Space and Weather

Aside from bike lanes, P13 made several comments about the environment, particularly a lack of parks and trees. P13 mentioned how Third Ward generally has “a lot less green space” as the City didn’t start investing in parks until more recently. Due to the heat in Texas, anything more than a 20-minute walk is considered “annoying” (P13). Houston, in general, has very little green spaces per the number of residents in the city and even less so within the study area (see Fig X).⁴⁰ For residents in the study area, there is roughly 9m² of green space per resident (compared to Munich’s 74m² per resident (Taubenböck et al., 2021)).⁴¹ Some studies have identified links between green space and cycling. The presence of more green areas encourages cycling routes through those areas (Campos-Sánchez, Valenzuela-Montes, & Abarca-Álvarez, 2019) while a mix of influences including safety from crime, and road safety as additional factors to consider in regards to green space and cycling (Hogendorf et al., 2020). As discussed in section 3.1.1, safety and crime are present barriers in the study area in addition to less green space availability. Additionally, climate conditions in Houston have become more severe, with higher rates of rainfall, drought, and higher average daily temperatures.⁴² In Ahmed, Rose, and Jacob’s study on the weather impacts on cycling behavior, they found correlations between heavier winds, rains, and extreme heat and less cyclists on the road in Melbourne (2010). These conditions may only worsen as climate change continues to alter the environment in Houston, and therefore could have an effect on bike-share use.

⁴⁰ Radley, W. (2013, Jun. 7). [Yearning for green space: Houston ranks a woeful 39th out of 50 major cities in parks](#). Culture Map Houston.

⁴¹ Own calculation. Sum of area of green spaces within the study area (692,006m²) divided by the combined population (roughly 75,500 residents).

⁴² Douglas, E. (2021, Oct. 7). [Climate change is making Texas hotter, threatening public health, water supply and the state’s infrastructure](#). Texas Tribune.

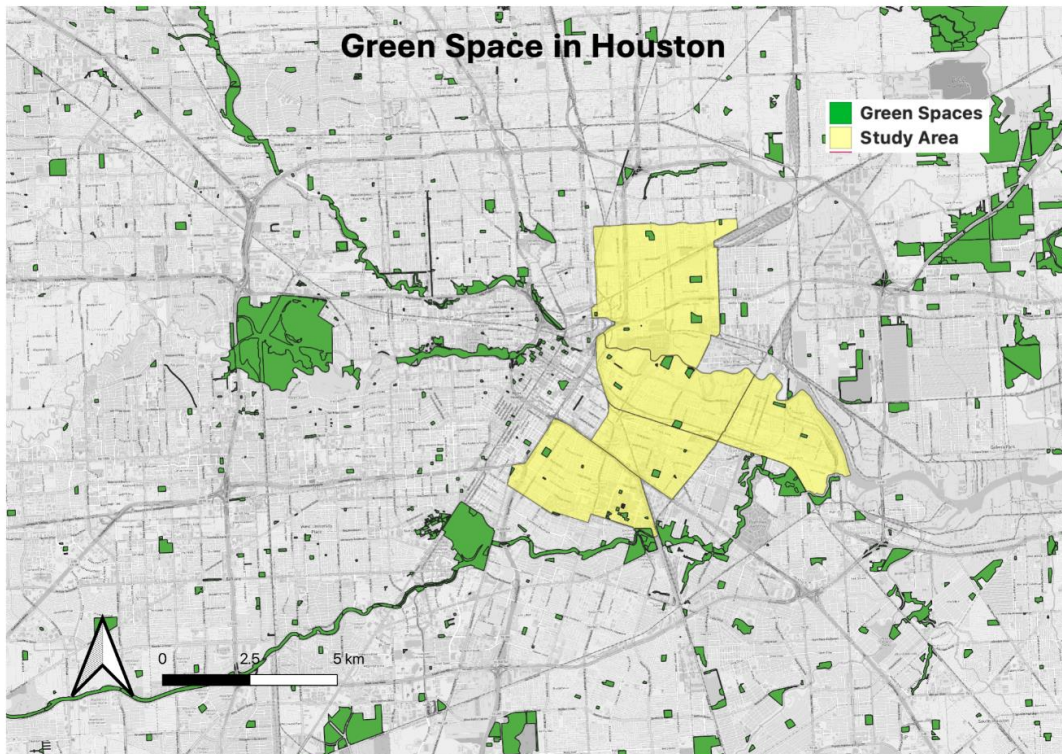


Fig. 32: Green Spaces within Houston and the Study Area, data obtained from [City of Houston GIS Data Hub](#), own map

2.4. Association with Gentrification

Another issue that came up was gentrification. P17 mentioned that the BCycle bikes are seen as a “symbol of gentrification” and were placed there without previous discussions with the community. This was corroborated by Houston BCycle’s accounts that there were no previous discussions with Fifth Ward residents but that the stations were placed along Lyons street. P18 also discussed gentrification alongside issues of urban blight and slum clearance which is hurting the Fifth Ward. P18 mentioned bikes are correlated with “rich people” and are seen as “invaders.” Gentrification in Houston’s underserved communities has been evolving since the early 2000s but has since increased in the last decade.⁴³ This is especially important because eastside communities previously hadn’t seen investment but were instead faced with urban renewal projects that usually caused more socio-economic damage.⁴⁴ As investment from new developers comes in, more green space and bike lanes are added, which is considered evidence of gentrification and jeopardizing affordability. Therefore,

⁴³ Binkovitz, L. (2018, June 6). [How Houston's Third Ward is fighting gentrification](#). Houston Chronicle.

⁴⁴ Gipson, A. (2022, June 24). [Gentrification Spreads Through Houston’s Oldest Communities](#). Houston Chronicle.

while new infrastructure projects such as bike lanes, green spaces, and improved sidewalks should be a welcoming sight, it's attributed to gentrification and displacement.

Take, for example, the current fight against installing a new bike lane on Third Ward's Blodgett Street. Upon hearing about construction, including narrowing down the road from four lanes to two, the community began pushing back on the project, despite street improvements and increased safety measures for pedestrians and cyclists.⁴⁵ The largest complaint is a lack of engagement and planning with stakeholders and locals. At the city council meeting, the president of Southwood Civic Association, Sammye Prince Hughes, said, *"I'm sick and tired and fed up with other people making decisions about what should happen in our community with no input from us. When it comes down to issues being done or changes being made in our community, the only time we find out about it is after it has already started."* This goes back to section 2.1.1 on community distrust of government programs and initiatives. It appears to be an established, long-standing mistrust, and it's possible Houston BCycle is also caught in the complicated dynamics and associations currently present.

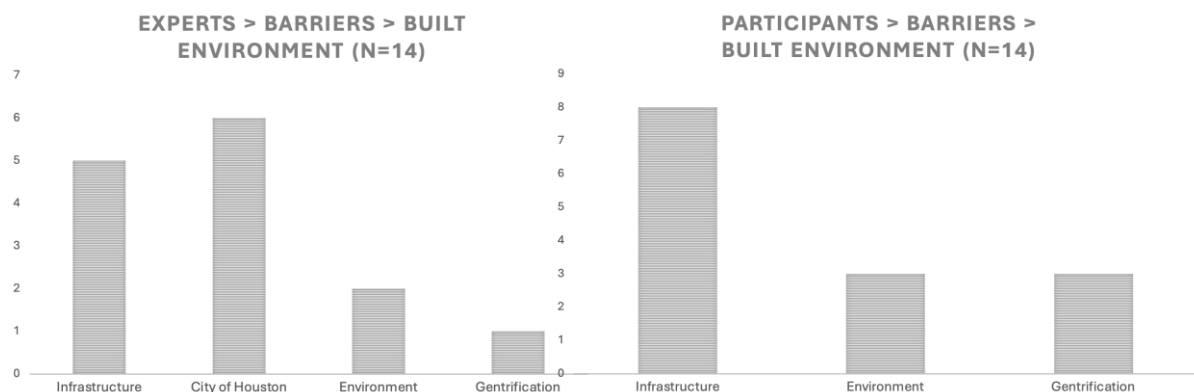


Fig 33 and 34: Coded Built Environment Barriers from Experts and Participants

3. Accessibility

3.1. Trip Planning, Station-Based, and Tech

There were many serious issues presented around the bikes, stations, and locations specifically. For instance, P7 mentioned they didn't understand how to use the docking

⁴⁵ Sewing, J. (2022, Dec. 2). [Sewing: Houston wants to add bike lanes on a busy Third Ward street. Residents are torn.](#) Houston Chronicle.

systems, while P6 mentioned they didn't like to carry their wallet or phone with them. P10 mentioned they needed to move around Houston very quickly and didn't have extra time to plan their trips around the bike-share stations. P17 repeatedly asked, "where would people bike to?" This was a critique of the placement of BCycle stations on Lyons which are simply all along the same street and don't go into surrounding neighborhoods where friends and family may be located.

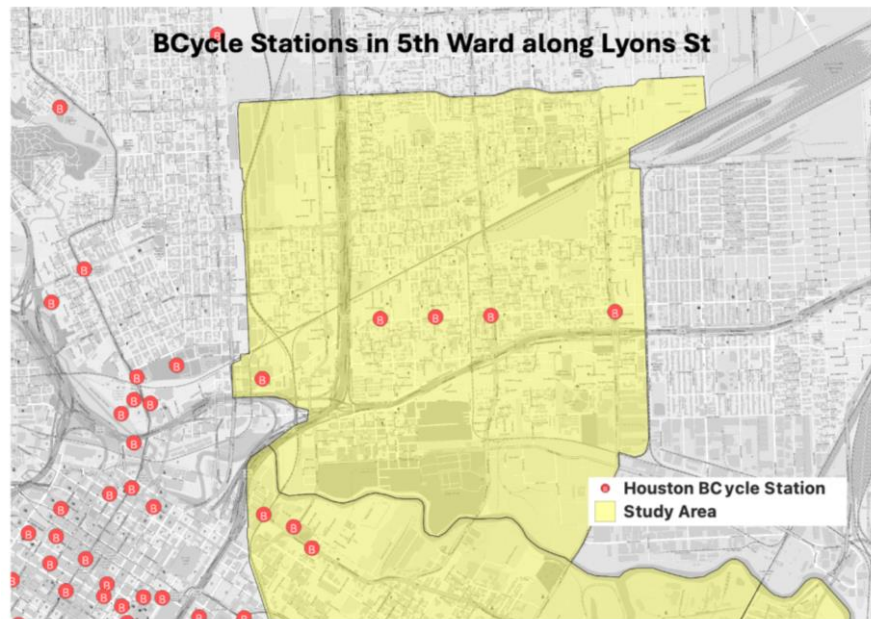


Fig 35: BCycle Station Locations within the 5th Ward

Speaking to experts, E4 mentioned how GO Pass, the equity program that should have benefitted lower-income communities, was not designed as a "seamless enough process." This was because BCycle only provided one place to accept cash payments for the program, which hampered efforts to enroll more people in. E4 mentioned the station network was "designed poorly" without regard for station-to-station connectivity. After discussing with BCycle employees, they admitted the station connectivity design was centered around leisure trips rather than functional trips. E4 understood that "substantial station coverage is needed" for a successful bike-share system, regardless of the neighborhood. E5 mentioned that older residents feel intimidated by the system and have a difficult time linking their cards to the app. E5 also mentioned that users must plan their routes beforehand which can be difficult. In discussing the difficulty in handling the bikes themselves, E5 made a comment about the weight of the bike-share bikes as "heavy" and "not necessarily functional."

Kou and Cai have argued that a dense station-based network is needed for a successful bike-share system, corroborated by Shaheen et al.'s claims that bike-share needs

density, mixed-use locations, located in proximity to public transit (2021, 2014). While the majority of stations are located in denser areas, Houston in general, is not a dense city, with a population density of 1,480/km² (compared to Munich's 4,788/km²).⁴⁶ It's known for its sprawl and decentralism, lending itself to its numerous super-centers scattered throughout its borders (Lin, 1995). When it came to critiques on the bikes themselves, bike-share bikes require additional safety features such as greater weight and fewer gears to ensure riders don't go fast and the bikes can withstand wear and tear.⁴⁷ When it comes to trip planning, the BCycle app does not offer a trip planning feature, and users must contend with setting up their own route to the next station. Although not widely discussed for bike-share, trip planning has been discussed when it comes to cycling. Participants ranked traffic concerns as the greatest influence in route planning in Still's study (2020). Given major road safety concerns expressed in B.1.1, it's likely there are not enough "safe" routes to take from station to station.

3.2. Lack of Information and Critiques of Houston BCycle

Participants and experts alike expressed varying critiques on the accessibility of information. P7 mentioned a lack of clarity in pricing and hourly rates, and P12 and P13 mentioned how more advertising is needed. E5 supported this by describing the general lack of awareness and how using the bike-share system isn't "simple." Upon trying to understand the lack of awareness around the Houston BCycle program, a few major operational transitions occurred during my study. For one, Houston BCycle experienced financial strains and shut down half its stations in November of 2022. Upon trying to find more information about which stations were shut down, the only post that was made in regards to it was a Twitter post announcing temporary suspension without cause (Fig 36). However, an official post was not made until January 18th of 2023, when a member from the Board announced that "as of January 1, 2023, 75 of the 150+ stations are suspended."⁴⁸ This is somewhat confusing information, first in that it's still not clear which stations are suspended, for how long, and the cause of specific station closures. Upon cross-checking between the BCycle App and map, I was able to see how many stations were suspended in east-end neighborhoods. Of the 26 stations that were active at the start of my thesis, only 10 remain, or about 38% (Fig 37). The

⁴⁶ Some areas have more density than others. Calculation based on population size of 2.3 million divided by 600 square miles (1554 square kilometers).

⁴⁷ Plumer, B. (2016, Apr. 22). [A new study looks at why bike share is so much safer than regular biking](#). Vox.

⁴⁸ Houston BCycle. (2023, Jan. 18). [Letter from our Board Chair, Maya Ford](#). Houston BCycle.

majority of operations are now concentrated around Midtown and Montrose districts, higher-income neighborhoods in Houston with more frequented stations.⁴⁹

E4 expressed critiques of the bike provider, Trek Bicycle Corporation in the “terrible contracts” and “highly expensive equipment” it provided to the non-profit. Additionally, critiques of station design and network were made (E4 and E5). E5, in particular, mentioned stations needed to be redone and placed in needed areas through “data, feedback, and more solid plans.” It was difficult to find further information on Trek Bicycle Corp or its subsidiary BCycle and its contracts with Houston BCycle. However, Medard de Chardon has been the most critical of BSS providers, citing different methods BSS companies will take to have market control (2019). Medard de Chardon explains that public-private partnerships give a lot of technological and legal power to private operators, putting strains on cities and local operations (2019). This could be the current case for Houston BCycle, which is struggling under financial strains and analyzing which stations to suspend permanently. As a way to save Houston BCycle, Houston’s Metropolitan Transit Authority of Harris County (METRO), a major transit agency providing bus and rail services is planning to provide BCycle \$500,000 over the next 9 months in its assessment to absorb BCycle as part of their transit operations.⁵⁰ This could be a major change in current bike-share operations, station placement, advertising, and information dissemination as they assess the station network and its connectivity to the transit network.



Fig 36: Twitter post announcement from Houston BCycle on temporary station suspensions on November 10th, 2022

⁴⁹ Begley, D. (2023, Jan. 20). [Metro could take over Houston's BCycle, spending \\$500K to help people get to bus and train stops](#). Houston Chronicle.

⁵⁰ Begley, D. (2023, Jan. 20). [Metro could take over Houston's BCycle, spending \\$500K to help people get to bus and train stops](#). Houston Chronicle.

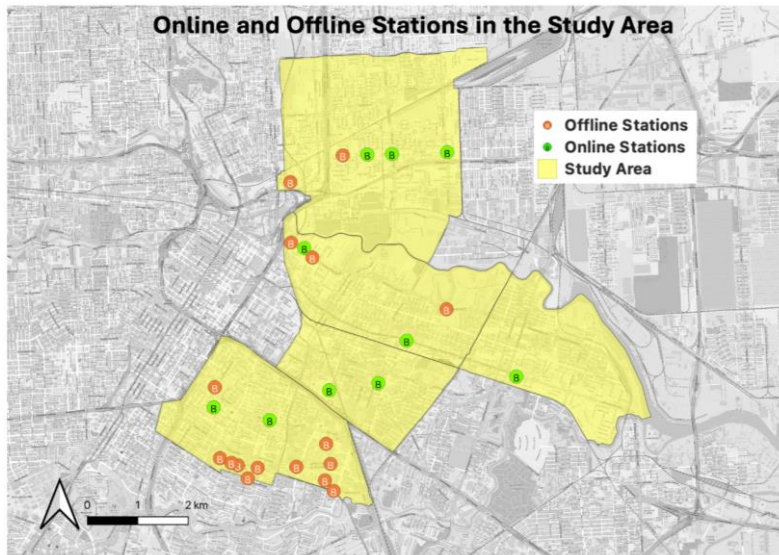


Fig 37: Active/Online and Inactive/Offline BCycle Station Locations within the study area

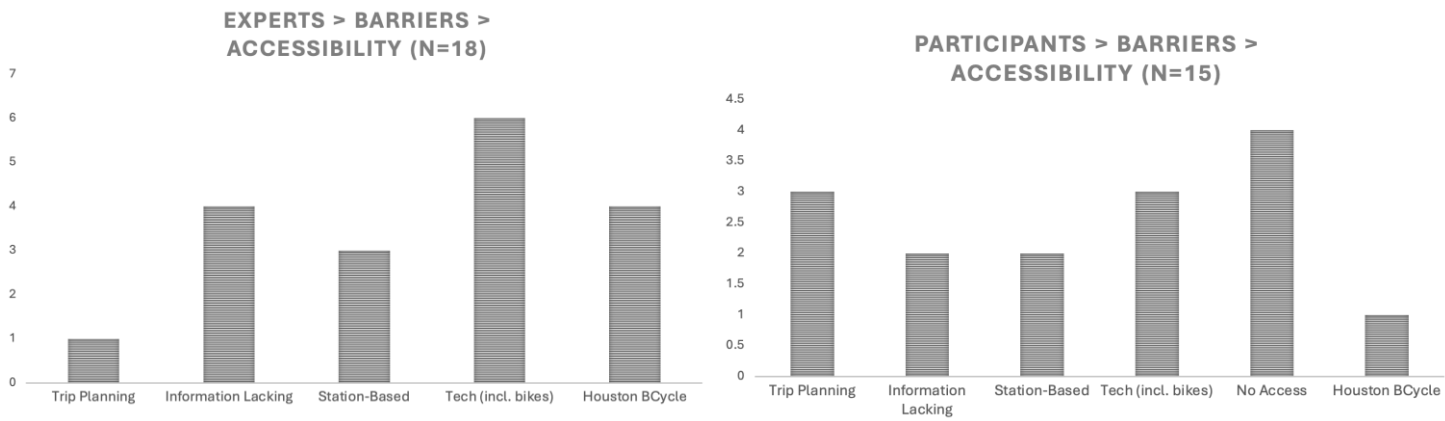


Fig 38 and 39: Coded Accessibility Barriers from Experts and Participants

V. Discussion

This chapter will include reflections and discussions. I will begin by discussing the state of the literature, the research gap, and recommendations. I will conclude the section by reflecting on the advantages and disadvantages of my study.

A. Literature and Research Gap

1. Community Distrust

In general, there is a huge research gap in understanding BSS in underserved communities. In my literature search, there were very few studies with interviews on bike-share and only one study that conducted interviews with underserved communities. That study, *Bringing Bike Share to a Low-Income Community: Lessons Learned Through Community Engagement, Minneapolis, Minnesota, 2011*, by Kretman Stewart, Johnson, and Smith took the form of focus groups as bike-share was being introduced into the community, including several rounds of meetings, advertisements, and engagement practices (2013). Focus group meetings were not recorded, or transcribed, and demographic data was not collected.

There is, however, another thesis conducted in a similar fashion and focus in James Hannig's master thesis, *Perceptions of Bike Sharing in Underserved Communities Within Milwaukee and the Twin Cities* at the University of Wisconsin-Milwaukee (2015). While Hannig's thesis focused on perceptions while I focused on advantages and challenges, many of my responses related more to perceptions. Additionally, Hannig had longer in-depth interviews that I did not always benefit from, given the spontaneous, ethnographic style of my interviews. However, Hannig found similar themes in their responses, including issues of distrust in underserved communities and a need to build trust first before implementing bike-share programs. Interviewees similarly felt bikes were "injected" in their communities and perceived infrastructure changes such as bike-share and bike lanes as "a form of gentrification" (Hannig, 2015, p.33). Hannig's interviewees posed for planners and bike-share operators to have "hard conversations" around race, poverty, and inequity (p. 40). This is because while these topics may not directly relate to BSS, there is a deep distrust from communities not having a voice or of the planning process in general, which projects itself onto BSS. While Milwaukee and the Twin Cities are cities over 3,000 km (~2,000 mi) away from Houston, underserved communities in the US have and are still experiencing similar,

painful processes, including urban renewal, gentrification, poverty, and crime. Yet similarly, Hannig's interviews with community partners revealed deep and meaningful relationships within communities and the organizations that serve them. This is similar to the interview with E1 and E2 on Project Row Houses, where leaders of the program discussed the importance of meeting community needs.

There does not appear to be a lot of literature on the nexus between community distrust, infrastructure, transportation, cycling, or bike-share. While there are a few academic articles linking community distrust and medical research, there are none within urban and transport planning journals. However, in another thesis titled *Planning for Trust: A Relationship-Centered Approach to Community Engagement in City Planning Practice* by Kizz Prusia, there is a discussion of historical approaches city planners had in implementing projects as a top-down approach without public participation or civic input (2019). They proceed to explore several engagement frameworks that I'll explore later in Section B. To summarize, there appears to be a gap in studies focusing on community distrust and planning. However, there are articles relating to infrastructure and transport disparities that can better explain where the community distrust may arise from.

2. Safety, Infrastructure and Environmental Disparities

Safety and infrastructure were major concerns in both my study and Hannig's (2015). This is because safety issues arise primarily from heavy traffic which is seen as a threat to cycling safety (Hannig, 2015). This is supported by Braun et al.'s study on cycling health risks in underserved communities in Los Angeles, who found underserved neighborhoods to experience both poorer air quality and higher crash risks, posing that net health benefits of cycling are actually lower for marginalized communities (2021). As far as the research goes, this is one of the first studies posing evidence that cycling (and therefore, by association bike-share) don't provide the health benefits equally for all users and is neighborhood-dependent. While they analyzed it from a social equity lens, infrastructure seems to be a major factor in poor safety.

Li et al.'s study explore the concept of "infrastructure deserts" or low-income neighborhoods with deficient infrastructure (2022). This means less access to sidewalks, crosswalks, trails, street lights, trees, and facilities (ex. hospitals), public services (ex. libraries, schools), and recreational areas (parks). The study was conducted in Dallas, Texas' underserved communities, finding that they are 2 to 3.5 times more likely to have deficient infrastructure than higher-income areas (Li et al., 2022). These infrastructure deserts have their history in decades of disinvestment, which began with redlining (discussed in III.A).

Beginning in the 1930s, redlining categorized areas in cities as “hazardous” for bank loans and investment, usually targeting areas where lower-income or minority groups lived (Lynch et al., 2021). In addition to disinvestment, these areas were then targeted for urban renewal projects (discussed in IV.B.2.1) beginning in the 1950s, which cleared homes and displaced families for new facilities and highways rather than affordable housing. Alternatively, industrial zoning is more likely to be zoned within these communities, particularly in Houston’s case.⁵¹ Air quality is worse in Houston’s low-income communities, and children are more likely to develop asthma from nearby industrial polluting. In essence, safety, infrastructure, and environmental disparities are all present in Houston’s underserved communities. These existing disparities are likely major contributing factors to the community distrust present and pose a major barrier to bike-share use.

B. Recommendations

In this section, I’d like to explore meaningful recommendations that address all three major barrier categories -- social, built environment, and accessibility. I’ll introduce other articles and studies that have posed ways of addressing issues of community trust, equitable cycling and bike-share programs, and infrastructure issues. My intention for this section is to provide alternatives for trust-building within communities through models, questions, and possible action items.

1. Forming Community Participation Policy through Applied Ethnography

The research on civic participation in the bike-share planning process is limited. As Afzalan & Sanchez found, there are several limitations in public participation in the bike-share planning process including data collection, reliability, and accuracy (2017). However, because bike-share has the potential to be considered for commuter trips, it requires a similar adherence to urban and transport planning procedures. This includes policy.

Maginn’s study on applied ethnography in the collaborative planning discusses community distrust, particularly in urban regeneration projects, and how misinformation about communities leads to project failures (2007). Maginn poses using applied ethnography into the collaborative planning process by creating a framework that includes reflected policies, processes, and governance practices in order to engage communities more effectively (2007). Applied ethnography includes a set of processes to answer the “why” and “how” of

⁵¹ N.a. (2021, Feb. 10). [Exploring the Legacy of Redlining in Houston](#). Understanding Houston.

policies within communities (p.35). They suggest using questions to guide the “formulation, implementation, and evaluation” of current policy, information on previous policy, and the effects of previous policies on current policies (p. 35). I present suggested questions adapted from her study that planners and bike-share providers can use to analyze their internal policies. These questions, coupled with the Relationship-Centered Community Engagement (RCCE) model presented in the next section, can serve to create transformative results within institutions and organizations to create new community engagements.

Current Policy Issue	Past Policy Efforts	Effects of Past Policy on Current/Future Policy
Who/What is the local community affected?	What types of previous participatory approaches were used?	What were the resource costs of past policies?
What are important actors that make up the community?	How long were previous approaches and what resources did they have?	What were the political costs of past policies?
How does the community actively participate?	What was the community's reaction to it? Was it a success, failure, or mix?	How effective or ineffective was the process in delivering desired outcomes?
What are the community expectations, needs, and wants?	Who was included and who was excluded?	How much overall influence did the local community have over the previous process?

Table 3: Relationship-Centered Community Engagement (RCCE) visual model; (adapted from Prusia 2019, Fig. 5)

2. Relationship-Centered Community Engagement (RCCE)

Upon researching models which addressed building trust as the main component in community engagement and collaboration, Prusia’s thesis at the University of Washington titled, *Planning for Trust: A Relationship-Centered Approach to Community Engagement in City Planning Practice* presented a case of distrust within minority communities and the City of Seattle (2019). Prusia proceeds to present the Relationship-Centered Community Engagement (RCCE) model as a way to conduct relational community engagement rather than authoritative or top-down planning. I have cited numerous cases where the City of Houston has historically been top-down in planning, and distrust has been voiced between underserved communities and the City of Houston. In addition, Houston BCycle’s lack of engagement with underserved communities before station installment is another example of a lack of a relational approach. RCCE’s ultimate goal is to guide the formation of trust and sustained relationships between communities and planners.

RCCE is comprised of three different engagement techniques that I will break down into actionable tasks for planners, bike-share providers, and communities for a more equitable and useful bike-share program in eastside neighborhoods. First, there are

organizational transformations, where the responsibility for engagement and change lies primarily in responsible institutions, namely planners and bike-share providers. Second, the process structure includes the initial ways responsible institutions can begin engaging with communities and their goals. Finally, community outcomes put the community at the forefront of planning by tapping into existing local knowledge through partnerships and storytelling.



Fig 40: Relationship-Centered Community Engagement (RCCE) visual model; (adapted from Prusia 2019, Fig. 5)

1. Organizational Transformation Engagements

Organizational transformations entail a self-reflection that planning offices and bike-share providers must conduct before engaging in projects with the community. This ensures recognition of where a majority of the power and resources lie. Kodransky & Lewenstein state the local government can and does have a lot of influence over shared micro-mobility expansion and requires their active participation in the process (2014). This includes understanding the greater structural context of the city's goals and how they translate to policy. Having a supportive culture and staff trained in relational approaches helps guide new engagement ideas. This helps create new avenues for collecting information where the process may have previously been absent. In Fig 40, I provide engagement strategies, definitions, and action items.

Organizational Transformation Engagements	Definition (Prusia, 2019)	Actions for Planners	Actions for Bike-Share Providers
Structural Context	Understanding the current city's or institutions' goals, norms, visions, and practices to be clear with the community on outcomes.	Provide town hall meetings where information from the City is shared.	Provide events to meet and share information about bike-share goals in the community.
Supportive Culture	Make sure that values, beliefs, norms are aligned with RCCE or relational approach to best engage community.	Training staff on RCCE approaches, ensuring leadership is on board, having resources to collect information.	Training staff on RCCE approaches, ensuring leadership is on board, having resources to collect information.
Trained Personnel/Staff	Have trained people in RCCE or other relational approaches to understand best practices.	Learn and train personnel on RCCE and other relational approaches.	Learn and train personnel on RCCE and other relational approaches.
Information	Collection of information requires time, resources, and maintenance. Information should be collected and published for transparency.	Planners should better understand transportation needs of underserved communities through surveys, interviews, or other community engagement events (Kodransky & Lewenstein, 2014).	Bike-share providers should collect information on the community's expectation and needs from the bike-share program based on greater transportation needs. This can also be done through surveys, interviews, or other events.

Table 4: Organizational Transformation Engagement: Definitions and Action Items

2. Process Structure

Process structure is a way to outline initial approaches and goal-creation with the community. This is done by reflecting on group norms in organizations and how they may have perpetuated existing community issues. This can be followed by clearly defining the roles staff and personnel have in the engagement process. This is to ensure communities know who and when to contact different agencies for answers. A shared-decision making process should be created by either creating the process within the organization itself or inviting affected parties to the table for discussion. Finally, coming up with community-defined goals ensures that communities are at the forefront of final decisions.

Process Structure Engagements	Definition (Prusia, 2019)	Actions for Planners	Actions for Bike-Share Providers
Group Norms	Group norms are based on previous history and practices. May need to reflect on how those group norms perpetuate issues in the communities.	Understanding the spoken and unspoken code of behaviors that are getting in the way of community engagements. Adding more "listening, openness, and accountability." (p. 78)	Understanding the spoken and unspoken code of behaviors that are getting in the way of understanding community. Adding more "listening, openness, and accountability." (p. 78)
Clearly Defined Roles	Having defined roles to establish a relationship. What does the role of a planner have in the city? What does the role of a bike-share provider have in the city?	Present clear direction of who and what the planner is, what they do, and how much power they have in making decisions for the community.	Present what bike-share is, what it seeks to provide for the community, and how much authority bike-share providers have in the city.
Shared Decision-Making	Affected groups should work together to make decisions. This should be more of a process of collaboration than a set of mandates handed down.	Invite all affected groups to the table when making decisions. Land-use decisions should have the support of the community affected.	Create a process that includes the community in the decision-making process, particularly for station-placement.
Community-Defined Goals	Communities are empowered to present their solutions and feel they are being addressed by planners.	Projects in the community should primarily come from the community. Planners can educate of other new ideas but community should ultimately decide.	Must have an understand of the goals of the community when it comes to bike-share. Ex: Do they need more information? Do they need the stations placed somewhere specific?

Table 5: Process Structure Engagements: Definition and Actions Items

3. Community Outcomes

Community outcomes use community partnerships, resources, knowledge, and actors to create and progress with projects. Tapping into existing partnerships or creating them can begin discussions with reliable and trustworthy community experts. Kodransky & Lewenstein mention the advantage of "intermediaries or third-party brokers" who help bridge the gap (2014). They tend to be organizations with existing relationships with the community and can assist with community engagement efforts.

Using history and storytelling can allow communities to inform organizations how local perceptions have been formed and which actors are to blame. The co-creation of knowledge gives the rightful respect and power to residents to create concepts and projects together with organizations. This process is similar to the community-based participatory action team created in Milwaukee, Wisconsin (Dressel, Steinborn, & Holt, 2014). The team is comprised of organizations, including businesses, schools, media, and residents, to form a major partnership for the bicycle program, collecting insightful data and methods from various perspectives.

Community Outcome Engagements	Definition (Prusia, 2019)	Actions for Planners	Actions for Bike-Share Providers
Community Partnerships	Creating, strengthening, and/or supporting community partnerships. Partnerships can take the form of existing contact with other organizations in the community.	Identifying already existing community organizations and tapping into their expertise and contacts. This can be a trusted point of entry for creating engagements.	Creating a partnership with organizations that are community-led and supported.
History	The history of the community has to be understood through community narratives, lived experiences, and local knowledge.	As part of the information collection process, the local history should be documented and understood.	Understand how bike-share plays a role in the history of the community. If bike-share was not previously there, understanding the cycling history and culture.
Storytelling	Engaging the community by focusing on their history and stories. This includes understanding perspectives and “actors” or roles.	Understand the storylines in the community when collecting information. What kind of actor was the planner before? What kind of actor can the planner be moving forward?	Understand the kind of story the community has around transportation and cycling through the information collecting phase. How can bike-share be a new, better actor in the community?
Co-Creation of Knowledge	Knowledge is created from multiple perspectives and sources in the community.	Collecting knowledge from community experts to build a new definition or project outcome together.	Engaging with local cycling groups and biking experts on how bike-share can be useful in the community.

Table 6: Community Outcome Engagements: Definition and Actions Items

C. Advantages and Disadvantages

There are several advantages and disadvantages of my study that I’d like to explore. First, there was a unique approach to interviewing by utilizing an ethnographic strategy and the “go-along” approach. The advantage to this was flexibility in the kinds of people that could be interviewed. Additionally, the use of open-ended questions allowed for a more holistic conversation around bike-share and supporting the use of grounded theory. Another major advantage was the lack of literature on interviews on bike-share in underserved communities. This meant exploring new ways of engaging with residents on urban and transport planning topics while “pioneering” a new way of understanding bike-share perceptions through an ethnographic lens.

While I list the advantage on the lack of literature, it was also a major disadvantage in the little guidance I felt as a graduate student conducting this study. I believe I did not have the proper interview and ethnographic training I should have had previously, relying on the best of my social abilities to gauge situations and ask questions. Additionally, I was only able to conduct interviews on a small part of the population, with some participants not being actual residents of the area but simply working there. I would have liked more time to explore more perceptions, concepts, and themes deeper, especially as METRO’s takeover of Houston BCycle unfolds. Additionally, many news and events I observed were towards the end of my study, which didn’t give me as much time to reflect and inquiring for more information. I would have also preferred separating each district and doing a study for each, rather than grouping the Second, Third, and Fifth Ward into the study area.

While my study had a survey planned, management and internal issues that arose with Houston BCycle during the project time impeded the development and distribution of a planned survey. While I tried to reach many bike-share, cycling, or community experts, very few actually responded back for a meeting. I believe this was due to the holiday season (Thanksgiving, Christmas, and New Years) which limited communications over a three-month period.

IV. Conclusion

I set out to answer the original question of identifying the advantages and challenges of Houston BCycle's station-based bike-sharing system in underserved communities. Through my ethnographic-style interviews, and in adherence to grounded theory, I discovered a set of answers that addressed many more pressing concerns within the communities than the current literature on bike-share use in underserved communities could describe. Road safety, community distrust, and gentrification were issues that were unexpectedly expressed to me in earnest urgency. Currently, the I-45 highway expansion plan threatens to displace Fifth Ward residents (again) meanwhile the Third Ward is still trying to find its voice amidst new urban renewal projects. Second, Third, and Fifth Ward are all struggling with effects of gentrification. Where does bike-share fit into this situation?

It would be worthwhile to consider the original inception of BSS as a the form of protest of the its time. The protests of the 1960s and 70s addressed war, environmental degradation, the growth of inequality, and general lack of peace. What has really changed since that time? We see and feel all of these phenomena over 50 years later, only now, with considerably more evidence for how poorly we've dealt with these issues. I write this at a time when the EU has only recently passed legislation to cap carbon dioxide emissions, when the Ukraine fights for its sovereignty, and when the wealthy have a greater share of wealth every year. Has anything really changed?

While world events take a lot more work to address, I would note BSS was used as a protest symbol in my study. Community projections and perceptions of BSS reflect current issues present in Houston's land-use and transportation planning practices that had at times, little to do with BSS directly. What remains is evidence that meaningful, positive change is necessary for these communities to move forward with BSS.

That positive change must come from truly listening to communities and their needs. BSS has been argued to perpetuate social issues while masking as a greening project and a band-aid to bigger issues which require extensively more work (Médard de Chardon, 2019). It may be worthwhile to answer other pressing questions within the community such as:

What socio-economic or historical issues may be present in underserved communities through the presentation or expansion of BSS?

When I asked if Project Row Houses cares about bike-share, they responded that they provide for what the community needs. It currently needs assistance with elderly, children, and business development, among other things (E1 and E2). So does Third Ward (or Second

and Fifth Ward) need BSS? As E4 put it, these communities are concerned with too many issues to consider it a need, but with captured motivations and community potential, this could change.

In terms of research implications, I would hope the use of an ethnographic lens creates a curiosity for deeper meaning in all communities, not just those underserved. While the use of surveys, focus groups, and interviews are excellent tools for qualitative data capturing, in the end, we are conducting research within real-world environments and events. Removing or diminishing the bigger contexts of events reduces research to smaller circles, especially when it comes to the applicability and impact of results. Ultimately, urban and transport planning research has a responsibility to be more applicable in our cities and communities, rather than simply filling literature gaps.

When I asked E4 what he thought of my project and its relevancy for the community, they posed that bike-share should be considered as an introduction to other major questions and concerns in Houston's underserved communities. In this case, it can be used as a platform to understand the issues of the time: road safety, community distrust, and gentrification to name a few. These are the barriers to the success of BSS in Houston's underserved communities. How can this be remedied? I propose a series of applied ethnographic models that can address community distrust. Due to the deep-rooted history of redlining, urban renewal, and lack of community engagement, the City of Houston and Houston BCycle's methodology for community engagement (or lack thereof) is called into question. While community distrust is a current obstacle, it's also a starting point and avenue of opportunity to begin new relationships, strengthen old ones, reflect on failed policies, and create a new future created by and for the community.

References

- Afzalan, N., & Sanchez, T. W. (2017). Testing the Use of Crowdsourced Information: Case Study of Bike-Share Infrastructure Planning in Cincinnati, Ohio. *Urban Planning*, 2(3), 33–44. <https://doi.org/10.17645/up.v2i3.1013>
- Ahmed, F., Rose, G., & Jacob, C. (2010). *Impact of weather on commuter cyclist behaviour and implications for climate change adaptation*. 33rd Australasian Transport Research Forum.
- Akhavan, A., Phillips, N. E., Du, J., Chen, J., Sadeghinassr, B., & Wang, Q. (2019). Accessibility Inequality in Houston. *IEEE Sensors Letters*, 3(1). <https://doi.org/10.1109/LSENS.2018.2882806>
- Alcorn, L. G., & Jiao, J. (2019). Bike-Sharing Station Usage and the Surrounding Built Environments in Major Texas Cities. *Journal of Planning Education and Research*, 1–14. <https://doi.org/10.1177/0739456X19862854>
- Bakogiannis, E., Siti, M., Tsigdinos, S., Vassi, A., & Nikitas, A. (2019). Monitoring the first dockless bike sharing system in Greece: Understanding user perceptions, usage patterns and adoption barriers. *Research in Transportation Business & Management*, 33. <https://doi.org/10.1016/j.rtbm.2020.100432>
- Bateman, L. B., Fouad, M. N., Sullivan, A., Heider, L., & Oates, G. R. (2021). Barriers and facilitators to bikeshare programs: A qualitative study in an urban environment. *Journal of Transport & Health*, 21.
- Beirsto, J., Tian, Y., Zheng, L., Zhao, Q., & Hong, J. (2021). Identifying locations for new bike-sharing stations in Glasgow: An analysis of spatial equity and demand factors. *Annals of GIS*, 28(2), 111–126. <https://doi.org/10.1080/19475683.2021.1936172>
- Bielinski, T., Kwapisz, A., & Wazna, A. (2021). Electric bike-sharing services mode substitution for driving, public transit, and cycling. *Transportation Research Part D*, 96. <https://doi.org/10.1016/j.trd.2021.102883>
- Braun, L. M., Rodriguez, D. A., & Gordon-Larsen, P. (2019). Social (in)equity in access to cycling infrastructure: Cross-sectional T associations between bike lanes and area-level sociodemographic characteristics in 22 large U.S. cities. *Journal of Transport Geography*, 80. <https://doi.org/10.1016/j.jtrangeo.2019.102544>
- Buck, D., & Buehler, R. (2012). *Bike Lanes and Other Determinants of Capital Bikeshare Trips*. Transportation Research Board 91st Annual Meeting, Washington, DC, United States. <https://trid.trb.org/view/1130348>
- Buck, D., Buehler, R., Happ, P., Rawls, B., Chung, P., & Borecki, N. (2013). Are Bikeshare Users Different from Regular Cyclists? A First Look at Short-Term Users, Annual

- Members, and Area Cyclists in the Washington, DC Region. *Transportation Research Record Journal of the Transportation Research Board*. <https://doi.org/10.3141/2387-13>
- Buehler, R., & Hamre, A. (2015). Business and Bikeshare User Perceptions of the Economic Benefits of Capital Bikeshare. *Transportation Research Record: Journal of the Transportation Research Board*, 100–111. <https://doi.org/10.3141/2520-12>
- Bullock, C., Brereton, F., & Bailey, S. (2017). The economic contribution of public bike-share to the sustainability and efficient functioning of cities. *Sustainable Cities and Society*, 28, 76–87. <https://doi.org/10.1016/j.scs.2016.08.024>
- Bytheway, J. (2018). Using grounded theory to explore learners' perspectives of workplace learning. *International Journal of Work-Integrated Learning, Special Issue*, 19(3).
- Campos-Sánchez, F. S., Valenzuela-Montes, L. M., & Abarca-Álvarez, F. J. (2019). Evidence of Green Areas, Cycle Infrastructure and Attractive Destinations Working Together in Development on Urban Cycling. *Sustainability*, 11(4730). <https://doi.org/10.3390/su11174730>
- Carmon, N. (1999). Three generations of urban renewal policies: Analysis and policy implications. *Geoforum*, 30, 145–158. [https://doi.org/10.1016/S0016-7185\(99\)00012-3](https://doi.org/10.1016/S0016-7185(99)00012-3)
- Chen, Z., Guo, Y., Stuart, A., Zhang, Y., & Li, X. (2019). Exploring the equity performance of bike-sharing systems with disaggregated data: A story of southern Tampa. *Transportation Research Part A: Policy and Practice*, 130, 529–545. <https://doi.org/10.1016/j.tra.2019.09.048>
- DeMaio, P. (2009). Bike-sharing: History, Impacts, Models of Provision, and Future. *Journal of Public Transportation*, 12(4). <https://doi.org/10.5038/2375-0901.12.4.3>
- Desjardins, E., Higgins, C., & Páez, A. (2022). Examining equity in accessibility to bike share: A balanced floating catchment area approach. *Transportation Research Part D: Transport and Environment*, 102. <https://doi.org/10.1016/j.trd.2021.103091>
- Dressel, A., Steinborn, M., & Holt, K. (2014). Get Wheelin' in Westlawn: Mounting a Bicycling Program in a Low-Income Minority Urban Community. *Sports*, 2, 131–139. <https://doi.org/10.3390/sports2040131>
- Duran-Rodas, D., Villeneuve, D., Pereira, F. C., & Wulfhorst, G. (2020). How fair is the allocation of bike-sharing infrastructure? Framework for a qualitative and quantitative spatial fairness assessment. *Transportation Research Part A*, 140, 299–319. <https://doi.org/10.1016/j.tra.2020.08.007>
- Duran-Rodas, D., Villeneuve, D., & Wulfhorst, G. (2020). Bike-sharing: The good, the bad, and the future-an analysis of the public discussion on twitter. *European Journal*

- of *Transport and Infrastructure Research*, 20(4), 38–58.
<https://doi.org/10.18757/ejtir.2020.20.4.5307>
- Edwards, R. W., Jumper-Thurman, P., Plested, B. A., Oetting, E. R., & Swanson, L. (2000). Community Readiness: Research to Practice. *Journal of Community Psychology*, 28(3), 291–307. [https://doi.org/10.1002/\(SICI\)1520-6629\(200005\)28:3<291::AID-JCOP5>3.0.CO;2-9](https://doi.org/10.1002/(SICI)1520-6629(200005)28:3<291::AID-JCOP5>3.0.CO;2-9)
- Fishamn, E. (2015). Bikeshare: A Review of Recent Literature. *Transport Reviews: A Transnational Transdisciplinary Journal*.
<https://doi.org/10.1080/01441647.2015.1033036>
- Fishamn, E., Washington, S., & Haworth, N. (2015). Bikeshare's impact on active travel: Evidence from the United States, Great Britain, and Australia. *Journal of Transport & Health*. <https://doi.org/10.1016/j.jth.2015.03.004i>
- Fishback, P., Rose, J., Snowden, K., & Storrs, T. (2022). New Evidence on Redlining by Federal Housing Programs in the 1930s. *Federal Reserve Bank of Chicago*.
<https://doi.org/10.21033/wp-2022-01>
- Fishman, E., Washington, S., Haworth, N., & Watson, A. (2015). Factors influencing bike share membership: An analysis of Melbourne and Brisbane. *Transportation Research Part A*, 71, 17–30. <https://doi.org/10.1016/j.tra.2014.10.021>
- Foster, S., & Giles-Corti, B. (2008). The built environment, neighborhood crime and constrained physical activity: An exploration of inconsistent findings. *Preventive Medicine*, 47, 241–251. <https://doi.org/10.1016/j.ypmed.2008.03.017>
- Franckle, R. L., Dunn, C. G., Vercammen, K. A., Dai, J., Soto, M. J., & Bleich, S. N. (2020). Facilitators and barriers to bikeshare use among users and non-users in a socioeconomically diverse urban population. *Preventative Medicine Reports*, 20. <https://doi.org/10.1016/j.pmedr.2020.101185>.
- Ghekiere, A., Van Cauwenberg, J., de Geus, B., Clarys, P., Cardon, G., Salmon, J., De Bourdeaudhuij, I., & Deforche, B. (2014). Critical Environmental Factors for Transportation Cycling in Children: A Qualitative Study Using Bike-Along Interviews. *PLoS ONE*, 9(9). <https://doi.org/10.1371/journal.pone.0106696>
- Glaser, B., & Strauss, A. (1967). *The discovery of grounded theory: Strategies for qualitative research*. Aldine.
- Goodman, A., & Cheshire, J. (2014). Inequalities in the London bicycle sharing system revisited: Impacts of extending the scheme to poorer areas but then doubling prices. *Journal of Transport Geography*, 41, 272–279. <https://doi.org/10.1016/j.jtrangeo.2014.04.004>
- Grasso Hull, S., Barnes, P., & Chavis, C. (2020). Bike Share Equity for Underrepresented Groups: Analyzing Barriers to System Usage in Baltimore, Maryland. *Sustainable*

- Transportation and Infrastructure Systems*, 12(8).
<https://doi.org/10.3390/su12187600>
- Hammersley, M., & Atkinson, P. (2019). *Ethnography: Principles in practice* (4th ed.). Routledge.
- Hannig, J. (2015). *Perceptions of Bike Sharing in Underserved Communities Within Milwaukee and the Twin Cities* [Thesis, University of Wisconsin Milwaukee].
<https://dc.uwm.edu/etd/876>
- Hess, A.-K., & Schubert, I. (2019). Functional perceptions, barriers, and demographics concerning e-cargo bike sharing in Switzerland. *Transportation Research Part D*, 71, 153–168. <https://doi.org/10.1016/j.trd.2018.12.013>
- Hogendorf, M., Groeniger, J. O., Noordzij, M., Beenackers, M. A., & van Lenthe, F. J. (2020). Longitudinal effects of urban green space on walking and cycling: A fixed effects analysis. *Health & Place*, 61. <https://doi.org/10.1016/j.healthplace.2019.102264>.
- Hure, M., & Passalacqua, A. (2016). La Rochelle, France, and the invention of bike sharing public policy in the 1970s. *Journal of Transport History*, 38(1), 106–123. <https://doi.org/10.1177/0022526616676275>
- Jacques, D. N. (2021). Using MAXQDA in Ethnographic Research: An Example with Coding, Analyzing, and Writing. In *The Practice of Qualitative Data Analysis: Research Examples Using MAXQDA*.
- Kim, Y., & Newman, G. (2019). Climate Change Preparedness: Comparing Future Urban Growth and Flood Risk in Amsterdam and Houston. *Sustainability*, 11(4). <https://doi.org/10.3390/su11041048>
- Kodransky, M., & Lewenstein, G. (2014). *Connecting Low-Income People to Opportunity with Shared Mobility* (p. 41). Institute for Transportation and Development Policy.
- Korver-Glenn, E., Jain, M., Thompson, J., Steinberg, A., Herkes, D., & Kramer, T. (2017). Environmental Equality in Neighborhood Amenities and Planning: A Houston, Texas, Case Study. *Environmental Justice*, 10(6), 193–200. <https://doi.org/10.1089/env.2016.0046>
- Kou, Z., & Cai, H. (2021). Comparing the performance of different types of bike share systems. *Transportation Research Part D*, 94. <https://doi.org/10.1016/j.trd.2021.102823>
- Kretman Stewart, S., Johnson, D. C., & Smith, W. P. (2013). Bringing Bike Share to a Low-Income Community: Lessons Learned Through Community Engagement, Minneapolis, Minnesota, 2011. *Preventing Chronic Disease*, 10. <https://doi.org/10.5888/pcd10.120274>.

- Kusenbach, M. (2003). Street Phenomenology: The Go-Along as Ethnographic Research Tool. *Ethnography*, 4(445). <https://doi.org/10.1177/146613810343007>
- Lauwers, L., Leone, M., Guyot, M., Pelgrims, I., Remmen, R., Van den Broeck, K., Keune, H., & Bastiaens, H. (2021). Exploring how the urban neighborhood environment influences mental well-being using walking interviews. *Health & Place*, 67. <https://doi.org/10.1016/j.healthplace.2020.102497>
- Lazarus, J., Pourquier, J. C., Feng, F., Hammel, H., & Shaheen, S. A. (2020). Micromobility evolution and expansion: Understanding how docked and dockless bikesharing models complement and compete – A case study of San Francisco. *Journal of Transport Geography*, 84. <https://doi.org/10.1016/j.jtrangeo.2019.102620>
- Li, Z., Wang, X., Zarazaga, J., Smith-Colin, J., & Minsker, B. (2020). Do infrastructure deserts exist? Measuring and mapping infrastructure equity: A case study in Dallas, Texas, USA. *Cities*, 130. <https://doi.org/10.1016/j.cities.2022.103927>
- Lin, J. (1995). Ethnic Places, Postmodernism, and Urban Change in Houston. *The Sociological Quarterly*, 36(4), 629–647. <https://doi.org/10.1111/j.1533-8525.1995.tb00457.x>
- Lune, H., & Berg, B. L. (2017). *Qualitative Research Methods for the Social Sciences* (9th ed.). Pearson.
- Lusk, A. C., Anastasio, A., Shaffer, N., & Li, Y. (n.d.). Biking practices and preferences in a lower income, primarily minority neighborhood: Learning what residents want. *Preventative Medicine Reports*, 7, 232–238. <https://doi.org/10.1016/j.pmedr.2017.01.006>
- Lynch, E. E., Malcoe, L. H., Laurent, S. E., Richardson, J., Mitchell, B. C., & Meier, H. C. S. (2021). The legacy of structural racism: Associations between historic redlining, current mortgage lending, and health. *SSM - Population Health*, 14. <https://doi.org/10.1016/j.ssmph.2021.100793>
- Lyu, Y., Cao, M., Zhang, Y., Yang, T., & Shi, C. (2021). Investigating users' perspectives on the development of bike-sharing in Shanghai. *Research in Transportation Business & Management*, 40. <https://doi.org/10.1016/j.rtbm.2020.100543>
- MacArthur, J., McNeil, N., Cummings, A., & Broach, J. (2020). *Adaptive Bike Share: Expanding Bike Share to People with Disabilities and Older Adults*. 2674(8), 556–565. <https://doi.org/10.1177/0361198120925079>
- Maginn, P. J. (2007). Towards more effective community participation in urban regeneration: The potential of collaborative planning and applied ethnography. *Qualitative Research*, 7(1), 5–151. <https://doi.org/10.1177/1468794106068020>

- McNeil, N., Dill, J., MacArthur, J., Broach, J., & Howland, S. (2017). *Breaking Barriers to Bike Share: Insights from Residents of Traditionally Underserved Neighborhoods*. Transportation Research and Education Center (TREC). <https://doi.org/10.15760/trec.176>
- Medard de Chardon, C. (2019). The contradictions of bike-share benefits, purposes and outcomes. *Transportation Research Part A*, 121, 401–419. <https://doi.org/10.1016/j.tra.2019.01.031>
- Medard de Chardon, C., & Caruso, G. (2015). Estimating bike-share trips using station level data. *Transportation Research Part B*, 78, 260–279. <https://doi.org/10.1016/j.trb.2015.05.003>
- Medard de Chardon, C., Caruso, G., & Thomas, I. (2017). Bicycle sharing system ‘success’ determinants. *Transportation Research Part A*, 100, 202–214. <https://doi.org/10.1016/j.tra.2017.04.020>
- Meng, S., & Brown, A. (2021). Docked vs. Dockless equity: Comparing three micromobility service geographies. *Journal of Transport Geography*, 96. <https://doi.org/10.1016/j.jtrangeo.2021.103185>
- Mooney, S. J., Hosford, K., Howe, B., Yan, A., Winters, M., Bassok, A., & Hirsch, J. A. (2019). Freedom from the station: Spatial equity in access to dockless bike share. *Journal of Transport Geography*, 74, 91–96. <https://doi.org/10.1016/j.jtrangeo.2018.11.009>
- Mora, R., & Moran, P. (2022). Portraying perceptions of bike-sharing schemes (BSS) in Santiago, Chile: What both regular users and pedestrians tell us. *Transportation Research Interdisciplinary Perspectives*, 13. <https://doi.org/10.1016/j.trip.2021.100534>
- Parkes, S. D., Marsden, G., Shaheen, S. A., & Cohen, A. P. (2013). Understanding the diffusion of public bikesharing systems: Evidence from Europe and North America. *Journal of Transport Geography*, 31, 94–103. <https://doi.org/10.1016/j.jtrangeo.2013.06.003>
- Patel, S. J., & Patel, C. R. (2022). Prioritising barriers for successful implementation of public bicycle-sharing system. *Proceedings of the Institution of Civil Engineers - Municipal Engineer*, 175(2), 61–71. <https://doi.org/10.1680/jmuen.18.00068>
- PeopleForBikes, & Alliance for Biking & Walking. (2015). *Building Equity—Race, ethnicity, class, and protected bike lanes: An idea book for fairer cities*.
- Ploeger, J., & Oldenziel, R. (2020). The sociotechnical roots of smart mobility: Bike sharing since 1965. *Journal of Transport History*, 41(2), 134–159. <https://doi.org/10.1177/0022526620908264>

- Prusia, K. (2019). *Planning for Trust: A Relationship-Centered Approach to Community Engagement in City Planning Practice*. University of Washington.
- Pucher, J., & Buehler, R. (2008). Cycling for Everyone: Lessons from Europe. *Transportation Research Record: Journal of the Transportation Research Board*, 58–65. <https://doi.org/10.3141/2074-08>
- Qian, X., & Niemeier, D. (2019). High impact prioritization of bikeshare program investment to improve disadvantaged communities' access to jobs and essential services. *Journal of Transport Geography*, 76, 52–70. <https://doi.org/10.1016/j.jtrangeo.2019.02.008>
- Ricci, M. (2015). Bike sharing: A review of evidence on impacts and processes of implementation and operation. *Research in Transportation Business & Management*. <https://doi.org/10.1016/j.rtbm.2015.03.003>
- Rinaldo, R., & Guhin, J. (2019). How and Why Interviews Work: Ethnographic Interviews and Meso-level Public Culture. *Sociological Methods & Research*, 1–34. <https://doi.org/10.1177/0049124119882471>
- Rocher, L., Hendrickx, J., & de Montjoye, Y.-A. (2019). Estimating the success of re-identifications in incomplete datasets using generative models. *Nature Communications*, 10(3069). <https://doi.org/10.1038/s41467-019-10933-3>
- Rutakumwa, R., Mugisha, J. O., Bernays, S., Kabunga, E., Tumwekwase, G., Mbonye, M., & Seeley, J. (2020). Conducting in-depth interviews with and without voice recorders: A comparative analysis. *Qualitative Research*, 20(5). <https://doi.org/10.1177/1468794119884806>
- Saldaña, J. (n.d.). *The Coding Manual for Qualitative Researchers*. SAGE.
- Shaheen, S. A., Guzman, S., & Zhang, H. (2010). Bikesharing in Europe, the Americas, and Asia. *Transportation Research Record: Journal of the Transportation Research Board*, 2143, 159–167. <https://doi.org/10.3141/2143-20>
- Shaheen, S. A., Guzman, S., & Zhang, H. (2012). Bikesharing across the Globe. In *City Cycling* (pp. 183–210). UC Berkeley.
- Shaheen, S. A., Martin, E. W., Chan, N., Cohen, A. P., & Pogodzinski, M. (2014). *Public Bikesharing in North America During a Period of Rapid Expansion: Understanding Business Models, Industry Trends and User Impacts*. Mineta Transportation Institute.
- Shelton, K. (2017). *Power Moves: Transportation, Politics, and Development in Houston*. University of Texas Press.
- Si, H., Shi, J., Wu, G., Chen, J., & Zhao, X. (2019). Mapping the bike sharing research published from 2010 to 2018: A scientometric review. *Journal of Cleaner Production*. <https://doi.org/10.1016/j.jclepro.2018.12.157>

- Still, M. L. (n.d.). *Expert Cyclist Route Planning: Hazards, Preferences, and Information Sources*. 221–235. https://doi.org/10.1007/978-3-030-59987-4_16
- Taubenböck, H., Reiter, M., Dosch, F., Leichtle, T., Weigand, M., & Wurm, M. (2021). Which city is the greenest? A multi-dimensional deconstruction of city rankings. *Computers, Environment and Urban Systems*, 89. <https://doi.org/10.1016/j.compenvurbsys.2021.101687>.
- The League of American Cyclists. (2014). *The New Majority: Pedaling Towards Equity*. https://www.bikeleague.org/sites/default/files/equity_report.pdf
- Thelwall, M., & Nevill, T. (2021). Is research with qualitative data more prevalent and impactful now? Interviews, case studies, focus groups and ethnographies. *Library and Information Science Research*, 43(2). <https://doi.org/10.1016/j.lisr.2021.101094>
- Thorne, R., Wild, K., Woodward, A., & Mackie, H. (2020). Cycling projects in low-income communities: Exploring community perceptions of Te Ara Mua – Future Streets. *New Zealand Geographer*, 76, 170–181. <https://doi.org/10.1111/nzg.12276>
- Urquhart, C. (2013). *Grounded Theory for qualitative research: A practical guide*. SAGE.
- van den Hoonaard, W. C. (2003). Is Anonymity an Artifact in Ethnographic Research? *Journal of Academic Ethics*, 1, 141–151. <https://doi.org/10.1023/B:JAET.0000006919.58804.4c>
- Vojnovic, I. (2003). Governance in Houston: Growth Theories and Urban Pressures. *Journal of Urban Affairs*, 25(5), 589–624. <https://doi.org/10.1111/j.1467-9906.2003.00004.x>
- Wang, Z., Xue, M., Zhao, Y., & Zhang, B. (2020). Trade-off between environmental benefits and time costs for public bicycles: An empirical analysis using streaming data in China. *Science of the Total Environment*, 715. <https://doi.org/10.1016/j.scitotenv.2020.136847>
- Webster, K. M., & Cunningham, C. J. L. (2013). Preparing for Bike-Sharing: Insight From Focus Groups and Surveys, Chattanooga, Tennessee, 2010. *Health Promotion Practice*, 14(1), 62–68. <https://doi.org/10.1177/1524839912447191>
- Yeo, A., Legard, R., Keegan, J., Ward, K., McNaughton Nicholls, C., & Lewis, J. (2013). Chapter 7: In-Depth Interviews. In *Qualitative Research Practice: A Guide for Social Science Students and Researchers* (Second, pp. 978–1446209127). SAGE Publications Ltd.
- Zaninetti, J.-M. (2009). Is Houston Turning Green? *Bulletin of Geography, Socioeconomic Series*, 12, 121–135. <https://doi.org/10.1515/v10089-009-0008-z>.

Appendix A - Field and Interview Notes

Second Ward, Magnolia Park, and Greater Eastwood: 2511 Navigation Blvd. and 6948 Harribsurg Blvd. BCycle Stations

2511 Navigation Blvd. BCycle Station

I started my interviews at the bike-share station located at 2501 Navigation Blvd, Houston, TX 77003 on 8.11.2022 in Second Ward. The station is located in a mixed-use area, with restaurants, stores, and residential areas all located within close proximity to each other. Navigation Blvd. has 4 traffic lanes split by a pedestrian walkway and recreation strip. I decided to walk within a 250 meter radius of the station to capture results between 12p and 2pm. The weather was temperate (70F/21C) and sunny, with a relatively low amount of pedestrians on the street.

I began by leaving my car parked on N. Live Oak Street. Immediately, I encountered P1 on their front porch. P1 was between 60-80 years of age. Upon asking my questions, they responded that they hadn't ridden a bike in years but believed it was safe to ride in the area. They did not believe there were any present barriers to riding. Upon asking about their motivation to use BCycle, they said they felt "too old" for it. I informed them that e-bikes were also available and accessible for older riders from which they expressed interest.

I turned onto Navigation Blvd. crossing the street to the BCycle station. About half the bikes were gone at that time of the day (12:06). I didn't see any foot traffic in the area but noticed a small kiosk called Buns & Drafts, a burger restaurant. I entered and scanned to see if anyone was open for an interview. P2 and P3 (between ages 20-40) walked in to order lunch to which I directed my questions toward them. They informed me they worked within the vicinity. They informed me they both don't ride bikes at all. They said they felt an advantage to bike-share was the good weather in Houston (doesn't often rain or get cold). They informed me they lived out in the suburbs and don't have access to bikes or cycling infrastructure in their communities. They believe that in the second ward, it gets very "rough" at night due to homeless and vandalization that occurs in and around Guadalupe Plaza Park (0.2 miles away). Guadalupe Plaza Park also has a bike-share station (Guadalupe Park Plaza Station). I didn't visit the station as I did not personally feel safe approaching people in the area at the time. This is because many people were laying down on benches or sleeping bags at the park, and I didn't want to cause issues by disturbing them.



Fig. X: 215-299 S Jensen Dr. BCycle Station

I proceeded to walk down Canal St. where I met P4 waiting for the bus. The area was primarily deserted so I was hesitant to approach. There were no cycle lanes in the area. P4 was between 40-50 years old and explained they did like to ride bikes and owned their own. An advantage they see to bike-share is that he can run errands such as going to the store, seeing a doctor, and visiting with their partner. A disadvantage (for him personally) is that they have eye problems that may require surgery, therefore cannot bike around themselves currently.

I continued and took a turn at N. Paige St. where I encountered New Hope Housing⁵², a non-profit organization providing affordable, permanent housing for vulnerable citizens in Houston. There was a lot of activity in front of the building and in the parking lot, so I took the opportunity to approach different people. In the parking lot, P5 and P6, between the ages of 20-30, were working to pack up a U-Haul truck. They informed me never they ride bikes. They informed me an advantage of bike-share could be the possibility of visiting family. However, they said a disadvantage is that they don't like to carry a wallet or phone when they exercise and can't necessarily ride with their family. This is because the bikes only come in a standard adult size and the bike lanes aren't safe enough in their opinion.

I then approached P7 who was exceptionally interested in providing feedback on his experience with cycling and bike-share and was between the ages 50-70. During our conversation, a police officer approached me and asked me what I was doing (since I was holding a clipboard and approaching residents) I informed him I was doing a thesis project and capturing responses. P7 informed me they had never used bike-share. They expressed a

⁵² <https://www.newhopehousing.com/>

lot of interest in bike-share although never gave me a clear perceived advantage. They told me a disadvantage was the lack of clarity in pricing and hourly rates and that they didn't understand how to use the app or docking systems well.

I circled back and around Navigation Blvd. and encountered P8 on Navigation Blvd. They informed me that they had never ridden a bike, primarily because there aren't bikes where they live in Galveston. They told me an advantage of bike-share is that they could use it to drive around drunk instead of using their car. A disadvantage to bike-share was that there aren't any bikes available where they live.

Magnolia Transit Center (6948 Harribsurg Blvd.)

Per the recommendation of the acting director at the time, I went to Magnolia Transit Center, where high pedestrian traffic has been observed. Again, the weather was temperate (70F) and sunny, with a relatively low amount of pedestrians on the street. This is because of the connection of the bus and rail line. This was one of the few areas where the street design resembled European standards, with different colored lanes and buffers to demonstrate pedestrian walkways. The area consisted of strip malls of fast food restaurants, gas stations, and car washes. I again took survey to judge the safety levels of the area and decided to approach people at the transit rail station, Magnolia Park Transit Center on the green line.

I approached P9 and upon noticing their confusion with my questions, which I assumed was a language barrier issue, subsequently switched to Spanish. P9 was between 20-40 years old and informed me they had never used bike-share. They informed me that an advantage was that it was an alternative to the Metro line and if there were problems with the line (delays or cancellations), they would consider bike-share. They felt a disadvantage was that Metro was a better option.

I then approached P10 (20-30) on the same platform who informed me they sometimes ride bikes but have never used bike-share. They said an advantage was that she could use if they were drinking and couldn't drive her car. A disadvantage is that they work a lot and need to move around quickly with little time to spare trying to use the bike-share system. They then proceeded to get on the next train that arrived. Thereafter, I asked other people for interviews which they declined.

Third Ward: Project Row House/Holdman Live Oak (2521 Holman Str.)

On 9.11.2023, I went to the 2521 Holman Str. BCycle Station. The weather was again temperate (72F/22C) and sunny, with a relatively low amount of pedestrians on the street. The station is located in front of the Project Row House (PRH)⁵³ main office. The station was opened in an effort to bring bike-share to underserved communities in Houston.⁵⁴ The immediate area did not have bike lanes but the car lanes were wide and had little traffic. Per the recommendation of Ed Pettitt, a local graduate student in urban planning and Third Ward expert, I walked 150m to Doshi House on Emancipation Avenue, where I saw a lot more foot traffic in and around the area.

I encountered P11 (20-30) in the outside patio area of Doshi House who informed me had ridden bikes before but hadn't used bike-share. They informed the general perception and disadvantage of bike-share was that it wasn't popular among locals, although didn't provide more information about why. They proceeded to inform me about the Third Ward and that it's considered a "cultural hub" of Houston.

Ten minutes later, I met P12 and P13 (20-30). P12 had used bike-share before while P13 hadn't, primarily because P13 lives in the suburbs where bike-share isn't available. P12 and P13 believe bike-share is used for leisure and more advertising could help with outreach. They believed the disadvantages included poor bike lanes, safety education, and general perceptions. This is because bike-share is not perceived as a community resource or tool. Third Ward generally has a lot less green space and trees which makes it unpleasant and uncomfortable to cycle in the Third Ward. The City didn't start investing in parks until more recently. Because the weather in Houston and Texas, in general, is so hot, anything more than a 20-minute walk is considered "annoying" in their view. The conversation on bike-share took around 20-30 minutes and they then proceeded to discuss their personal lives and interests with me.

I decided to walk back to PRH where they were hosting artists' displays within each row house, termed the Southern Survey Biennial. The art installments discussed immigration, family, community, and racism in the South. The area was primarily empty except for P14 (20-30), who I approached outside of the artists' studios. P14 informed me they had never used bike-share but were interested. They felt the advantage to bike-share was that they could ride with their children and would consider it only for leisure. A disadvantage was that they'd prefer to simply own their own so they could decorate as they'd like.

⁵³ <https://projectrowhouses.org/>

⁵⁴ <https://www.houstonchronicle.com/news/houston-texas/transportation/article/Houston-bikesharing-program-enjoys-robust-growth-5616067.php>

Through several contacts, I was able to have a meeting with employees at Project Row House (PRH) (E1 and E2, between ages 20-80). I consider these expert interviews as these were residents working and living in the Third Ward for a long time, understanding the deeper nuances of what goes on in the area. For this interview, I primarily asked questions on the non-profit and history of the Third Ward to better understand why bike-share isn't perceived as a resource. They explained that PRH, a non-profit organization, focuses on neighborhood development activities, art programs, and community enrichment for the Third Ward. Neighborhood development programs include the preservation of historical and cultural sites as well as providing affordable housing. Some of the row houses are offered as affordable housing for single mothers and low-income residents. The art programs include artistic rounds, fellowships, artist mentor networks, artist studios, and strategic art plans. Finally, the community enrichment programs include food distribution, a young mothers' program, tutoring, financial advising, and small business incubation. PRH began in 1993 when the City of Houston targeted the row houses for demolition as part of the "Urban Renewal Slum Clearance" projects. The owner of the buildings was living in Singapore and local residents had to reach out and contact them. The City of Houston approved the buy but said the houses couldn't be used at all and had to be boarded up, uninhabited, or demolished. As a way of showcasing how they could be used, they installed an art exhibition you could "drive-by" by painting the houses on the outside. This was because a lot of drive-bys were going on in the Third Ward at the time and they used this project to bring light to a very difficult and painful part of life.

E1 and E3 informed me that PRH is a seek-and-respond organization by seeking projects or things that the community needs and delivering programs. An example of this is a grocery delivery system they set up for older residents who were struggling to drive and collect groceries from the store. Another example included an after-school program for children. They began one by renting out a home in the community and beginning one of the first programs. The Harris County School District found it so successful that they wanted to keep it and continue to fund it. Eventually, the program had to move to Trinity United Methodist Church due to bathroom regulations. E1 and E2 informed me that the projects change according to the changing demographics and people in the community. So far, cycling and bike-share have not been an expressive concern for the community and therefore, they aren't focused on highlighting or assisting in the expansion. The conversation took about an hour. Walking away, I couldn't help but think that they are providing services the local government would and should provide which explains the general public distrust for government initiatives or outside interference.

I then visited Crumbville, TX on Emancipation Blvd., a local bakery in a historically preserved building in the area. This is where I met P15 (age 20-30) and E3 (age 40-60). P15 informed me they hadn't used bike-share but own their own bike and cycles in their free time. An advantage of bike-share is that more people could ride with them if they didn't have bikes and that it's a good option for leisure trips. A disadvantage is that they wouldn't consider using it for taking purposeful trips (store, work, school) because time is a major factor and there are no bike lanes. E3 was also in the store at the time, listening mindfully to our conversation until I directed my questions toward them. I considered E3 an expert for how long they lived in the Third Ward and the community knowledge they had for the area. They informed me that the City of Houston had demolished many buildings in the area, particularly ones with historic value. Because of this, there's a general distrust for government initiatives and investments, given the complicated history (this can be considered a disadvantage). Another disadvantage of bike-share is that there are known pockets of crime within the community that people avoid during the day and night which would deter walking and cycling in general. These pockets are generally known to people in the community and are active deterrence. E3 did not provide any advantages to bike-share so far. I believe this is because it may be tied to a government program.

I was then able to discuss with E4 (20-30) over the phone this day. E4 informed me how the bike-share pequity program launched in Houston didn't work well. For one, the city is not bike-friendly and is terrifying to ride around in. BCycle, the bike provider and subsidiary of Trek Bicycle Corporation, provides highly expensive equipment and terrible contracts, making it difficult to change station locations and bikes. Another reason for the failure of the program was that cash options were only accepted at one location and were not a seamless enough process. In general, the BCycle station network was designed poorly and without regard for station-to-station connectivity. For it to be successful, substantial station coverage is needed, density is needed, and it then comes down to collaborations with the city on urban planning (Houston has none of these things). Bike-share is a sign of gentrification in that it's a brand new system to some communities, isn't simple, requires an app, and therefore a phone, and also a credit card. E4 believed overall believed it could be useful in underserved communities but needs to be useful everywhere else first. Currently, it works best around the Rice University area and downtown. Additionally, it currently only works well for short, recreational trips. Their thoughts on my project were that bike-share is the introduction to other major questions and concerns but is not a priority in underserved communities. There are currently too many issues these communities are dealing with, citing illegal dumping and

environmental racism in the Third Ward as an example. They pointed to other successful bike-share equity programs, namely in Philadelphia as a better example.

Fifth Ward: 4300 Lyons Ave BCycle Station

On 10.11.2022 around 12:30 pm, I visited the Fifth Ward BCycle Stations. Fifth Ward appeared far more blighted compared to the Second and Third Wards. Most people on the street were congregated at bus stops and I didn't feel comfortable approaching. Aside from that, there was nearly no foot traffic on Lyons Ave., where several BCycle Stations are located. I couldn't help but notice that I-10 East and I-69 both run through 5th Ward, both isolating and splitting it apart. The bridges connecting across 5th Ward and into the Central Business District are not pleasant to walk or bike across, with heavy and fast traffic moving through at most hours of the day.

Because I especially didn't feel comfortable approaching residents on the street, I decided to visit local businesses and discuss my project and ask questions. I went to 5th Level Bar + Cafe, one of the only local restaurants (that wasn't a fast food restaurant) where I met P17 (40-60). Upon asking my questions, they offered no advantages to bike-share but instead posed several disadvantages. They kept asking "where would people bike to?" They believe there's nowhere for residents to bike to within the community other than friends'/family's homes. They believe bikes and buses compete and buses are cheaper, more efficient, and safer than biking. Additionally, bikes are seen as a symbol of gentrification in the community and were placed there without prior discussion with the community. They proceeded to inform me about an ongoing issue with the I-45 highway expansion plan that will displace dozens of local residents.⁵⁵ They mentioned that voucher programs meant to compensate people that are displaced were handed at lower amounts and rates in the Fifth Ward than in other communities (namely Second Ward). For example, some people received vouchers for \$500-800 while others received thousands. The conversation lasted around half an hour and he recommended I visit FlyKuttz Barbershop to discuss these issues with other residents.

⁵⁵ <https://www.houstonchronicle.com/news/houston-texas/transportation/article/advocates-want-to-stop-i-45-expansion-16724149.php>

The I-45 expansion plan is part of a highly controversial project from the Texas Department of Transportation to widen the I-45 highway while cutting into Fifth and Second Ward districts, requiring primarily low-income residents to relocate, tearing down schools, churches, and housing. Those that don't have to relocate have to contend with poorer levels of air quality. It's currently on pause pending civil lawsuits and federal investigations of environmental injustice.

FlyKuttz Barbershop was located on Lyons Ave. and in closer proximity to other BCycle stations. There, I encountered P18 and P19 (20-40) where they immediately began talking about gentrification coupled with blight and slum clearance which is hurting the Fifth Ward. They informed me bikes are heavily correlated with “rich” people and are seen as “invaders.” An advantage they mentioned to bike-share was that people usually bike in groups so they can check out multiple at once if they want to ride together.

December and January Updates

December and January proved to be extremely cold winter months for Houston, with higher rates of overnight freezes and rain and subsequent drops in pedestrian and cycling traffic. Houston BCycle underwent a financial crisis, entering into meetings with Houston METRO for possible collaboration and acquisition. During this time, they had to shut down around half of the BCycle stations to stay financially alive.⁵⁶ A survey planned with Mary DeBauche was halted as the future of Houston BCycle was uncertain. Additionally, Mary DeBauche, my informal supervisor and acting director of BCycle at the time, left her position in mid-December while others scrambled to cover her administrative duties. This proved additionally more difficult to acquire expert interviews and contacts.

Luckily on 01.24.2023, I was able to acquire an interview with E5 (30-40), the founder and director of LetsDoThisHouston, a company providing guided bike tours through Houston starting in the Third Ward since 2015. They believed there is a lot of intimidation around bike-share in Houston. They believe older residents have a harder time linking their cards and planning their routes (station to station) which have to be done before getting to the bike station. There’s a general lack of awareness and a “not for me” mentality with bike-share. For example, a pilot program at Texas Southern University (TSU) in the Third Ward failed as students primarily wanted to own their own bikes. Additionally, bike-share bikes are very heavy and not necessarily functional. Stations need to be redone and placed where they’re needed through data, feedback, and more solid plans. The infrastructure is also still poor despite changes made. There’s a high concern for safety as most drivers aren’t educated about driving with cyclists. They believe having informants to help users could assist with this issue. I proceeded to ask them questions about LetsDoThisHouston and how its providing cycling education for visitors and residents. They informed me they had a background in social work and upon moving to Houston, used a BCycle bike, one of a handful of times they had ever ridden a bike. They enjoyed the experience so much that they

⁵⁶ <https://www.houstonpublicmedia.org/articles/news/transportation/2023/01/20/441921/metro-could-take-over-houstons-bcycle-bike-share-program/>

made a Bike and Brunch event in 2015 where they rented bikes from a station, rode around, dropped the bikes off at a station and drove their cars to brunch. After enough of these events, they were able to go full-time by 2018. The audience is primarily made of people who hadn't ridden a bike in a long time and they've added different themes to the tours including music, history, and night light. Each ride essentially feels like an educational course where's they're educating both riders on how to cycle and adhere to laws as well drivers on how to drive with cyclists on the street. When I asked if the City of Houston has gotten involved with the project at all, they admit there are a lot of communication issues. When they looked into renting an empty lot the City owned, they never responded. When I asked what changes have occurred since 2015, there have been more cyclists on the streets, more cycling groups, and better infrastructure. They mentioned how Precinct 1 was voted in by residents and has directly led to more bike lanes. They also mentioned how the I-45 expansion plan has cut off streets they used on their route and they've had to redirect. The interview took about an hour at the Doshi House.

Appendix B - Summaries with Coded Segments

Summaries with Coded Segments - thesis.mx22

Code	Coded segments	Summary
Experts > Barrier > Ownership	<p>For example, a pilot program at Texas Southern University (TSU) in the Third Ward failed as students primarily wanted to own their own bikes</p> <p>Document (1): 28 - 28 (0)</p>	
Experts > Barrier > Environment	<p>citing illegal dumping</p> <p>Document (1): 25 - 25 (0)</p> <p>environmental racism in the Third Ward as an example.</p> <p>Document (1): 25 - 25 (0)</p>	
Experts > Barrier > Gentrification	<p>Bike-share is a sign of gentrification in that it's a brand new system to some communities</p> <p>Document (1): 25 - 25 (0)</p>	
Experts > Barrier > Accessibility > Trip Planning	<p>planning their routes (station to station) which have to be done before getting to the bike station.</p> <p>Document (1): 28 - 28 (0)</p>	

Experts > Barrier > Accessibility > Information

cash options were only accepted at one location and were not a seamless enough process.

Document (1): 25 - 25 (0)

isn't simple,

Document (1): 25 - 25 (0)

There's a general lack of awareness

Document (1): 28 - 28 (0)

educating both riders on how to cycle

Document (1): 28 - 28 (0)

Experts > Barrier > Accessibility > Station-Based

The station network was designed poorly and without regard for station-to-station connectivity.

Document (1): 25 - 25 (0)

substantial station coverage is needed

Document (1): 25 - 25 (0)

Stations need to be redone and placed where they're needed through data, feedback, and more solid plans.

Document (1): 28 - 28 (0)

Experts > Barrier > Accessibility > Technology (incl. bikes)

cash options were only accepted at one location and were not a seamless enough process.

Document (1): 25 - 25 (0)

requires an app,

Document (1): 25 - 25 (0)

a phone

Document (1): 25 - 25 (0)

also a credit card

Document (1): 25 - 25 (0)

They believe older residents have a harder time linking their cards

Document (1): 28 - 28 (0)

Additionally, bike-share bikes are very heavy and not necessarily functional.

Document (1): 28 - 28 (0)

Experts > Barrier > Houston
BCycle

BCycle, the bike provider and subsidiary of Trek Bicycle Corporation, provides highly expensive equipment and terrible contracts.

Document (1): 25 - 25 (0)

Another main reason for the failure of the equity program was that cash options were only accepted at one location and were not a seamless enough process

Document (1): 25 - 25 (0)

The station network was designed poorly

Document (1): 25 - 25 (0)

Stations need to be redone and placed where they're needed through data, feedback, and more solid plans.

Document (1): 28 - 28 (0)

Experts > Barrier > Perception

the changing demographics and people in the community. So far, cycling and bike-share have not been an expressive concern for the community and therefore, they aren't focused on highlighting or assisting in the expansion.

Document (1): 19 - 19 (0)

city is not bike-friendly

Document (1): 25 - 25 (0)

not a priority in underserved communities.

Document (1): 25 - 25 (0)

intimidation around bike-share in Houston.

Document (1): 28 - 28 (0)

"not for me" mentality with bike-share.

Document (1): 28 - 28 (0)

Experts > Barrier > Safety > Car Drivers

terrifying to ride around in

Document (1): 25 - 25 (0)

There's a high concern for safety as most drivers aren't educated about driving with cyclists.

Document (1): 28 - 28 (0)

as well drivers on how to drive with cyclists on the street.

Document (1): 28 - 28 (0)

Experts > Barrier > Safety > Neighborhood

This was because a lot of drive-bys were going on in the Third Ward at the time and they used this project to bring light to a very difficult and painful part of life.

Document (1): 18 - 18 (0)

Another disadvantage of bike-share is that there are known pockets of crime within the community that people avoid during the day and night which would deter walking and cycling in general.

Document (1): 20 - 20 (0)

These pockets are generally known to people in the community and are active deterrence.

Document (1): 20 - 20 (0)

Experts > Barrier > Infrastructure

PRH began in 1993 when the City of Houston targeted the row houses for demolition as part of the “Urban Renewal Slum Clearance” projects.

Document (1): 18 - 18 (0)

. The City of Houston approved the buy but said the houses couldn’t be used at all and had to be boarded up, uninhabited, or demolished.

Document (1): 18 - 18 (0)

, density is needed

Document (1): 25 - 25 (0)

The infrastructure is also still poor despite changes made.

Document (1): 28 - 28 (0)

I-45 expansion plan has cut off streets they used on their route
and they've had to redirect

Document (1): 28 - 28 (0)

Experts > Barrier > Infrastructure >
City of Houston

PRH began in 1993 when the City of Houston targeted the row
houses for demolition as part of the "Urban Renewal Slum
Clearance" projects.

Document (1): 18 - 18 (0)

. The City of Houston approved the buy but said the houses
couldn't be used at all and had to be boarded up, uninhabited, or
demolished.

Document (1): 18 - 18 (0)

They informed me that the City of Houston had demolished many
buildings in the area, particularly ones with historic value.

Document (1): 20 - 20 (0)

Because of this, there's a general distrust for government initiatives and investments, given the complicated history (this can be considered a disadvantage).

Document (1): 20 - 20 (0)

then comes down to collaborations with the city on urban planning (Houston has none of these things).

Document (1): 25 - 25 (0)

When they looked into renting an empty lot the City owned, they never responded.

Document (1): 28 - 28 (0)

Advantage > Infrastructure

better infrastructure.

Document (1): 28 - 28 (0)

They mentioned how Precint 1 was voted in by residents and has directly led to more bike lanes.

Document (1): 28 - 28 (0)

Advantage > Perception	<p>Currently, it works best around the Rice University area and downtown</p> <p>Document (1): 25 - 25 (0)</p> <p>more cyclists on the streets</p> <p>Document (1): 28 - 28 (0)</p>
Advantage > Motivation	<p>E4 believed overall believed it could be useful in underserved communities but needs to be useful everywhere else first.</p> <p>Document (1): 25 - 25 (0)</p>
Advantage > Motivation > Leisure	<p>Additionally, it currently only works well for short, recreational trips.</p> <p>Document (1): 25 - 25 (0)</p>
Advantage > Community	<p>E1 and E2 informed me that PRH is a seek-and-respond organization by seeking projects or things that the community needs and delivering programs.</p> <p>Document (1): 19 - 19 (0)</p>

An example of this is a grocery delivery system they set up for older residents who were struggling to drive and collect groceries from the store.

Document (1): 19 - 19 (0)

Another example included an after-school program for children.

Document (1): 19 - 19 (0)

E1 and E2 informed me that the projects change according to the changing demographics and people in the community

Document (1): 19 - 19 (0)

more cycling groups

Document (1): 28 - 28 (0)

Participants > Advantage > Environment

an advantage to bike-share was the good weather in Houston (doesn't often rain or get cold)

Document (1): 4 - 4 (0)

Participants > Advantage > Perception

They did not believe there were any present barriers to riding.

Document (1): 3 - 3 (0)

Participants > Advantage >
Perception > Leisure

when they exercise

Document (1): 6 - 6 (0)

believe bike-share is used for leisure

Document (1): 16 - 16 (0)

would consider it only for leisure

Document (1): 17 - 17 (0)

it's a good option for leisure trips

Document (1): 20 - 20 (0)

Participants > Advantage > Safety

believed it was safe to ride in the area

Document (1): 3 - 3 (0)

Participants > Advantage >
Motivation

accessible for older riders from which they expressed interest.

Document (1): 3 - 3 (0)

he can run errands such as going to the store, seeing a doctor,
and visiting with their partner.

Document (1): 5 - 5 (0)

an advantage of bike-share could be the possibility of visiting family

Document (1): 6 - 6 (0)

. They expressed a lot of interest in bike-share

Document (1): 7 - 7 (0)

an advantage of bike-share is that they could use it to drive around drunk

Document (1): 8 - 8 (0)

an alternative to the Metro line and if there were problems with the line (delays or cancellations),

Document (1): 11 - 11 (0)

an advantage was that she could use it if they were drinking and couldn't drive her car.

Document (1): 12 - 12 (0)

were interested

Document (1): 17 - 17 (0)

could ride with their children

Document (1): 17 - 17 (0)

An advantage of bike-share is that more people could ride with them if they didn't have bikes

Document (1): 20 - 20 (0)

An advantage they mentioned to bike-share was that people usually bike in groups so they can check out multiple at once if they want to ride together.

Document (1): 24 - 24 (0)

Participants > Barrier > Ownership they'd prefer to simply own their own so they could decorate as they'd like.

Document (1): 17 - 17 (0)

Participants > Barrier > Public
Transit

an alternative to the Metro line and if there were problems with the
line (delays or cancellations),

Document (1): 11 - 11 (0)

Metro was a better option.

Document (1): 11 - 11 (0)

They believe bikes and buses compete and buses are cheaper,
more efficient, and safer than biking

Document (1): 23 - 23 (0)

Participants > Barrier > Perception

disadvantage of bike-share was that it wasn't popular among
locals

Document (1): 15 - 15 (0)

general perceptions

Document (1): 16 - 16 (0)

bike-share is not perceived as a community resource or tool

Document (1): 16 - 16 (0)

They informed me bikes are heavily correlated with “rich” people and are seen as “invaders.”

Document (1): 24 - 24 (0)

Participants > Barrier > Houston
BCycle

During this time, they had to shut down around half of the BCycle stations to stay financially alive.

Document (1): 27 - 27 (0)

Participants > Barrier > Social >
Trip Planning

need to move around quickly with little time to spare trying to use the bike-share system.

Document (1): 12 - 12 (0)

A disadvantage is that they wouldn't consider using it for taking purposeful trips (store, work, school) because time is a major factor

Document (1): 20 - 20 (0)

They kept asking “where would people bike to?” They believe there's nowhere for residents to bike to within the community other than friends'/family's homes.

Document (1): 23 - 23 (0)

Participants > Barrier > Social > Health

they said they felt “too old” for it

Document (1): 3 - 3 (0)

A disadvantage (for him personally) is that they have eye problems that may require surgery, therefore cannot bike around themselves currently.

Document (1): 5 - 5 (0)

Participants > Barrier > Social > Gentrification

Additionally, bikes are seen as a symbol of gentrification in the community and were placed there without prior discussion with the community.

Document (1): 23 - 23 (0)

about gentrification coupled with blight and slum clearance which is hurting the Fifth Ward.

Document (1): 24 - 24 (0)

They informed me bikes are heavily correlated with “rich” people and are seen as “invaders.”

Document (1): 24 - 24 (0)

Participants > Barrier >
Environment

Third Ward generally has a lot less green space and trees which makes it unpleasant and uncomfortable to cycle in the Third Ward

Document (1): 16 - 16 (0)

The City didn't start investing in parks until more recently

Document (1): 16 - 16 (0)

Because the weather in Houston and Texas, in general, is so hot, anything more than a 20-minute walk is considered "annoying" in their view.

Document (1): 16 - 16 (0)

Participants > Barrier >
Accessibility > Station-Based

they didn't understand how to use the app or docking systems well.

Document (1): 7 - 7 (0)

They kept asking "where would people bike to?" They believe there's nowhere for residents to bike to within the community other than friends'/family's homes.

	Document (1): 23 - 23 (0)
Participants > Barrier > Accessibility > No Access	<p>don't have access to bikes</p> <p>Document (1): 4 - 4 (0)</p> <p>there aren't bikes where they live in Galveston.</p> <p>Document (1): 8 - 8 (0)</p> <p>disadvantage to bike-share was that there aren't any bikes available where they live</p> <p>Document (1): 8 - 8 (0)</p> <p>lives in the suburbs where bike-share isn't available</p> <p>Document (1): 16 - 16 (0)</p>
Participants > Barrier > Accessibility > Information	<p>the lack of clarity in pricing and hourly rates</p> <p>Document (1): 7 - 7 (0)</p> <p>more advertising could help with outreach</p> <p>Document (1): 16 - 16 (0)</p>

Participants > Barrier >
Accessibility > Technology (incl.
bikes)

a disadvantage is that they don't like to carry a wallet or phone
when they exercise

Document (1): 6 - 6 (0)

can't necessarily ride with their family. This is because the bikes
only come in a standard adult size

Document (1): 6 - 6 (0)

they didn't understand how to use the app or docking systems
well.

Document (1): 7 - 7 (0)

Participants > Barrier > Safety >
Neighborhood

gets very "rough" at night due to homeless and vandalization that
occurs in and around Guadalupe Plaza Park (0.2 miles away)

Document (1): 4 - 4 (0)

Participants > Barrier > Safety >
Drivers

safety education

Document (1): 16 - 16 (0)

safer than biking

Document (1): 23 - 23 (0)

Participants > Barrier >
Infrastructure

don't have access to bikes or cycling infrastructure in their
communities

Document (1): 4 - 4 (0)

bike lanes aren't safe enough in their opinion.

Document (1): 6 - 6 (0)

poor bike lanes

Document (1): 16 - 16 (0)

The City didn't start investing in parks until more recently

Document (1): 16 - 16 (0)

no bike lanes

Document (1): 20 - 20 (0)

They proceeded to inform me about an ongoing issue with the I-45
highway expansion plan that will displace dozens of local
residents.

Document (1): 23 - 23 (0)

They mentioned that voucher programs meant to compensate people that are displaced were handed at lower amounts and rates in the Fifth Ward than in other communities (namely Second Ward). For example, some people received vouchers for \$500-800 while others received thousands.

Document (1): 23 - 23 (0)

about gentrification coupled with blight and slum clearance which is hurting the Fifth Ward.

Document (1): 24 - 24 (0)

Participants > User

P12 had used bike-share

Document (1): 16 - 16 (0)

Participants > Non-User > Other

they had never used bike-share.

Document (1): 7 - 7 (0)

they had never used bike-share

Document (1): 11 - 11 (0)

P13 hadn't,
Document (1): 16 - 16 (0)

never used bike-share
Document (1): 17 - 17 (0)

Participants > Non-User > Non-Cyclist

they hadn't ridden a bike in years
Document (1): 3 - 3 (0)

they both don't ride bikes at all.
Document (1): 4 - 4 (0)

They informed me never they ride bikes
Document (1): 6 - 6 (0)

they had never ridden a bike
Document (1): 8 - 8 (0)

Participants > Non-User > Cyclist

they did like to ride bikes and owned their own
Document (1): 5 - 5 (0)

they sometimes ride bikes but have never used bike-share

Document (1): 12 - 12 (0)

had ridden bikes before but hadn't used bike-share.

Document (1): 15 - 15 (0)

they hadn't used bike-share but own their own bike and cycles in
their free time.

Document (1): 20 - 20 (0)