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Barriers and Facilitators to Bikeshare Programs: A Qualitative Study in an Urban Environment

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Abstract

Introduction: Bikeshare programs have emerged across the US to promote bicycling as an active mode of transportation that could potentially improve health and quality of life. However, bikeshare usage is low in some settings. The purpose of this qualitative study is to explore barriers and facilitators of bikeshare use and to identify potential strategies to increase participation in urban environments.

Methods: Focus groups were conducted with urban bikeshare users in Birmingham, Alabama. Thematic analysis was guided by the PRECEDE model, which identifies predisposing (intrapersonal), reinforcing (interpersonal), and enabling (structural) factors related to a health program.

Results: In the four focus groups, the most prominent barriers to utilization identified were age, disability, stigma, and lack of awareness of programs (*intrapersonal*), having small children (*interpersonal*), lack of safety and bicycling infrastructure, bikeshare characteristics such as location, time constraints, cost, ease of use, and availability of bikes (*structural*). The most

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prominent facilitators included enjoyment (*intrapersonal*), peer support (*interpersonal*), and convenience, location, cost, and availability of electric bikes (*structural*). Recommendations to increase usage were primarily structural, such as infrastructure improvement, incentive programs, awareness and safety campaigns, expansion to neighborhoods and trails, increasing time users can ride before docking, and providing more electric bikes

Conclusion: To increase bikeshare use in urban settings, use-restricting policies must be addressed.

Keywords

active transportation; neighborhood disadvantage; qualitative methods; bikeshare

1. Introduction

Active transportation, the use of a human-powered vehicle as walking or cycling to get to a destination, provides substantial health benefits from increased physical activity irrespective of geographical context.¹ For example, bicycling decreases overweight and obesity,^{2–5} cardiovascular risks,^{6,7} and health costs,^{8,9} improves well-being,¹⁰ and increases life expectancy.^{11,12} Due to their relatively low cost and convenience, public bicycle sharing systems, or "bikeshares," can make bicycling accessible to users of diverse socio-demographic profiles.¹³

The use of public bikeshare systems in the U.S. has increased dramatically over the last decade. The number of annual bikeshare trips across the U.S. increased from less than 1.5 million in 2010 to over 45.5 million in 2018, with an additional 38.5 million trips made through scooter share programs that same year.¹⁴ The number of bikeshare bicycles available in the U.S. more than doubled in just one year from 42,500 in 2016 to 100,000 in 2017, while the number of bikeshare trips made in the U.S. increased 25% over the same period.¹⁵ Still, large groups of Americans remain underrepresented in the pool of bikeshare users. These underrepresented groups include women, minorities, and lower income and less educated populations.¹⁶ In most cities, bikeshare users are predominately male, white, and from higher income tiers.¹⁷ A 2016 survey in Washington, D.C., for example, found that 80% of bikeshare members were white, while a 2017 survey in Chicago found that only 2% of bikeshare memberships were held by African-Americans, despite the fact that they comprise 30% of Chicago's population.^{18,19}

In exploring barriers to bikeshare utilization, user safety on streets that are not bicycle friendly is a concern frequently cited.²⁰ Potential users are wary of riding a bike on a street without bike lanes or accommodations. This is a particular concern in Alabama, a state that was ranked 45th in bicycle friendliness by the League of American Bicyclists in 2019.²¹ Several studies have found that the presence of dedicated bike lanes near bike share stations contributes to increased ridership.^{19,22} A separate study of bikeshare in Ontario, Canada, however, found that the presence of bike lanes of bicycle infrastructure near stations had little effect on ridership.²³ As with other barrier types, each system appears to present its own unique conditions.

Further, in many cities, the majority of bikeshare docking stations are located in downtown or predominately upper-income areas, which may decrease user access. Bike station locations often target employment centers, tourist attractions, and recreation areas, all of which tend to be located in urban cores as opposed to residential neighborhoods. Lower-income neighborhoods are frequently underrepresented in terms of bikeshare station locations and bikeshare users.^{17,19} This was the case for the Zyp Bikeshare system in Birmingham, AL, where 27 of the 37 system docking stations were located in the downtown core, 3 more in commercial areas, and only 3 in residential neighborhoods.²⁴

Surveys conducted in several cities have indicated that while minorities and lower-income groups may make up only a small percentage of total users, they have generally positive views of bikeshare systems and express equal interest as other groups in becoming bikeshare users.²⁰ This was the case in Birmingham, where a bikeshare planning survey found very positive attitudes toward bikeshare systems across respondents.²⁵ This gap between attitude and participation is therefore of great interest to planners and bikeshare operators. Several cities have conducted surveys among underrepresented groups to identify the perceived barriers to bikeshare use.²⁶²⁷ Though there are several recurring themes in these surveys, each city and local bike program design, seems to experience unique set of conditions and barriers to broader bikeshare usage.

To encourage bikeshare participation by diverse users, many systems have implemented equity programs. A 2019 national scan of bikeshare programs found that roughly three-quarters of larger bikeshare systems (over 150 bicycles) had some type of program to address user equity. Of those programs, nearly 70% targeted affordability, about 50% addressed accessibility, 21% addressed outreach and promotion to specific communities, and about 20% addressed the underbanked (residents without credit or debit cards).²⁸ Sample initiatives included discounted memberships, alternative pay structures, cash payments, reduced fees, increased station locations in low-income neighborhoods, and community education and outreach. The goal of these programs was to increase ridership among underrepresented groups, but their success has varied.¹⁴²⁷

In our own work, using quantitative data from the Zyp Bikeshare program in Birmingham, Alabama, we found that residence in a socioeconomically disadvantaged neighborhood was associated with increased bikeshare utilization, and concluded bikeshare use may be an effective tool to improve the connectivity, livability, and health of urban communities.²⁹ Building on the results of this work, in the current study we conducted focus groups with Zyp Bikeshare users to explore barriers to and facilitators of bikeshare utilization and to identify strategies for increased use that could be beneficial for health and mobility among urban populations.

2. Material and Methods

2.1 Theoretical framework

The study followed the PRECEED-PROCEED model, which is a framework for identifying factors inherent to health behaviors in order to design, implement, and evaluate health promotion programs and interventions.³⁰ PRECEDE stands for Predisposing, Reinforcing,

and Enabling Constructs in Educational/Environmental Diagnosis and Evaluation, and PROCEED refers to Policy, Regulatory, and Organizational Constructs in Educational and Environmental Development.^{31,32} To our knowledge, the PRECEDE-PROCEED model has not been used to assess bikeshare programs. However, as a model used widely for the evaluation of health promotion programs, helping to identify barriers and facilitators to participation, its application in the context of bikeshare programs is both appropriate and innovative.

This study was specifically guided by the PRECEDE portion of the model, which focuses on predisposing, reinforcing, and enabling factors inherent in health behaviors and interventions. Predisposing factors include individual awareness, attitudes, and values that impact health-related decisions. Reinforcing factors include social support and the influence of family, peers, and others. Enabling factors include structural aspects, such as policies, systems, environments, and community or societal resources.^{31,32}

2.2 Study design

To explore barriers to and facilitators of bikeshare use in urban environments, we conducted focus groups with current and former members of a bikeshare program in Birmingham, Alabama where seasonal fluctuation in cycling is minimal, with air temperature lows and highs of 33–51 degrees F in January and 72–91 degrees F in July.²⁹Focus group questions asked about the role of predisposing (intrapersonal) factors, reinforcing (interpersonal), and enabling (structural) factors for the use of the bikeshare program.^{31,32}The protocol for this study was approved by the Institutional Review Board at the University of Alabama at Birmingham, and informed consent was obtained from all participants.

2.2.1 Bikeshare program.—Zyp Bikeshare, a network of 40 stations and 400 bikes, was introduced to Birmingham, Alabama in October of 2015 as an initiative of REV Birmingham in partnership with the Regional Planning Commission of Greater Birmingham and the City of Birmingham. Riders check out bicycles or pedelecs (electric bicycles that offer approximately 80% assistance in pedaling) through daily, quarterly, or annual memberships. There is no cost difference between regular bicycles and pedelecs. At the time of this study, annual memberships were available in three options: Regular (\$75/year), Equity (\$15/year, in cash, for income-qualifying individuals receiving public assistance), and Shyfter (\$200 for 2 years, including event invitations and other benefits). Annual memberships included unlimited rentals at no extra charge. Annual members comprise up to 95% of Zyp bikeshare users. For example, of 815 unique clients during the period from Oct 2015 to Nov 2016, only 4.5% (N=37) were not annual members.²⁹ The non-member daily fee is \$6 per ride, and a credit/debit card is required for use, and a \$75 hold is put on debit/ credit card during use.

2.2.2 Data collection.—Participation in focus groups was offered to 400 randomly selected individuals from an electronic mailing list of 869 current and former annual Zyp Bikeshare members. Applying the Excel function RANDBETWEEN, a random number was assigned to each Zyp Bikeshare member, and the list was sorted by ascending value. Invitations for study participation were sent to the first 400 individuals on the list via email

with a subject line, "Seeking participants for research study of bikeshare use." The email body included a recruitment flyer with information about the study and a phone number to call study staff if interested in participation. Individuals who called were screened for eligibility (Zyp Bikeshare member, age 21) and scheduled for one of four focus group sessions. Participants were offered a \$50 gift card to compensate for their time and travel. Focus group discussions were audio recorded, transcribed verbatim, and double-checked for accuracy.

2.2.3 Data analysis.—NVivo 11 was used to organize the data, and analysis was guided by the thematic approach.³³ Transcribed data was read by two investigators (LB, GO) to identify underlying concepts and develop an initial coding structure. The investigators independently coded the transcripts and met to discuss and reconcile divergent coding. Throughout the analysis process, codes were deleted, trimmed, renamed, and elevated into themes that corresponded to categories of the PRECEDE model examining barriers, facilitators, and solutions to bikeshare use that are predisposing, reinforcing, or enabling.

3. Results

A STROBE diagram of study participants is presented in Figure 1. Focus groups (N=4) were held between July 26 and September 26, 2017. A total of 27 individuals participated (N=7, 7, 8, 5 per group, respectively). The characteristics of participants are presented in Table 1. Participants, mean age of 39 years, were predominantly male (63%), White (78%), college-educated (78%), and full-time employed (70%); most of them (93%) were current Zyp Bikeshare members.

Focus group discussions identified barriers and facilitators to bikeshare and recommended solutions. The themes from high-frequency codes are presented in Table 2.

3.1 Barriers

3.1.1 Predisposing (intrapersonal) barriers.—Lack of awareness was considered an important barrier to bikeshare use. Participants felt that potential users were often not aware of features of the program, could not figure out how to use the bikes, and were too intimidated to even try. Age and disability were also identified as barriers. Most participants agreed that older age was a significant hindrance due to the heavy weight of the bike; this limitation was diminished with the use of pedelecs. Stigma due to one's socioeconomic standing was discussed as another deterrent. Participants expressed a concern that poorer people using the bikes out of necessity may feel stigmatized, whereas affluent people who use them by choice are seen in a positive light as "environmentalists."

3.1.2 Reinforcing (interpersonal) barriers.—Several participants discussed having a family as a barrier to bikeshare use. Specifically, the bikes were designed for adults, which limited their use by children, and did not make any provisions for carrying small children.

3.1.3 Enabling (structural) barriers.—The most salient barriers were related to infrastructure and safety, particularly the lack of exclusive bike lanes in the city despite high-volume of traffic. As one participant stated, "We do not have the infrastructure for biking in

Birmingham." This sentiment was expressed repeatedly by participants, who shared that the absence of bicycling infrastructure in combination with unfriendly drivers is unsettling. One participant stated, "I'm terrified of drivers." Others agreed that many drivers are hostile toward cyclists, but in the absence of bike lanes cyclists have no choice but to be in close proximity to drivers. Participants shared stories of being yelled at, honked at, harassed, and even sustaining painful falls.

The cost of the bikeshare was another major enabling barrier. The consensus was that for people struggling with low income, the policies surrounding payment are significant deterrents. First, the point of entry to the program is through a credit/debit card. Participants felt that this excludes socioeconomically disadvantaged people who may not have a credit/ debit card from joining the bikeshare. The non-member daily fee of \$6 was seen as another deterrent for low-income people, as it was higher than the cost of a bus ride. The \$75 hold on credit/debit cards for non-member daily rental disenfranchised those without such funds in their accounts, according to participants. Resentment was apparent when participants recounted getting large fees (\$1,500) for docking the bikes incorrectly, even though these fees were later rescinded. Finally, the cost for the entire family to use the bikes at once was deemed prohibitive and deterring married people with children from using the program.

Time constraint was another prominent barrier. Zyp Bikeshare has a 45-minute limit for checking out a bike; if Zyp bikes are not checked into a docking station every 45 minutes, users get fined. Participants felt that this period was too short and limited the use of bikes significantly. They also felt that this policy was not advertised well and many new users did not understand the 45-minute rule to avoid extra charges.

Related barriers were location of stations and availability of bikes. Some participants expressed frustration that bike stations were concentrated downtown, and wished they could expand to "where you can ride somewhere and not just do circles around downtown." Others were discouraged by the unavailability of bikes at popular locations. This was particularly true for pedelecs, due to the heaviness of the bikes and the Alabama heat, which were greatly sought after but rarely available. Finally, several participants commented on the physical heaviness of the bikes, which made riding difficult for many and discouraged people from using the bikeshare. Some participants stated that they themselves, as well as others who were older or had disabilities, could only use the electric-assisted bikes, and many suggested that there should be more of these bikes available. For example, one participant stated, "I need an electric bike. I think that really scares a lot of people when you cannot find one…" "If I don't find an electric bike in the middle of the summer […] I'd just rather walk."

3.2 Facilitators

Comments regarding facilitators of bikeshare use were less frequent than discussions of barriers.

3.2.1 Predisposing (intrapersonal) facilitators.—Participants used the bikes to reduce stress and just for fun. They enjoyed riding the bikes during their leisure time, and it made mundane activities like getting lunch or commuting to work more enjoyable, as

indicated in this representative quote, "I would spend six dollars for the fun of it, you know, and have an experience."

3.2.2 Reinforcing (interpersonal) facilitators.—For those who used the bikeshare program for leisure, friends and family made a difference. Several participants mentioned that they use the bikes to go to lunch with coworkers or to downtown events and attractions with friends. "And when I'm with that group of people, I'm far more likely to get on the bike than if I'm just by myself," stated one.

3.2.3 Enabling (structural) facilitators.—The most salient structural facilitator was convenience. It was a factor not only for people who lived and worked downtown, but extended also to those who could park in remote free parking and then bike into the congested city center. This saved both time and money. For example, one participant stated, "I drive a big truck, and it's kind of hard to find parking sometimes downtown, in the heart of downtown. But I can park way away... I can just Zyp-bike and make it to the congested area of downtown." Another said, "I started just for fun, but I've really found that it's way easier to come downtown on a bike and not have to worry about parking." One participant stated that the Zyp bikes were part of the formula he used when he decided to move downtown. Participants use Zyp bikes not only to get to and from work but throughout the work day as well. For example, many stated that they use the bikes to get to restaurants and workout facilities or to run errands. One participant mentioned that she could use the bikes to get lunch and exercise at the same time, enhancing their convenience.

Not having to worry about a private bike was another facilitator. As one participant said, "I actually have a road bike [...] but I'm hesitant to take that bike places and lock it up, because I've had bikes that were stolen in the past."

The location of the bikeshare stations was also important. One participant stated, "If you live next to a station, it's the most convenient thing in the world." Many appreciated the concentration of stations downtown that made them useful for getting to events such as baseball games and film festivals, as well as to local parks, theaters, restaurants, and education and healthcare facilities.

3.3 Proposed recommendations

When asked what is most important in designing a successful bikeshare program, participants shared insights and offered recommendations to address predisposing (intrapersonal), reinforcing (interpersonal), and enabling (structural) factors.

3.3.1 Predisposing (intrapersonal) recommendations.—Participants felt that a "massive education outreach effort" was needed to inform local residents of bike availability, cost, and program features. They suggested that demos and pop-up bikeshare stations during public events would give people an opportunity to try the bikes and would be an effective way to increase usage. Participants also felt that bikeshare kiosks next to docking stations should have more information, including short video clips to inform potential users of costs, procedures, and safety issues surrounding use. Participants felt strongly that drivers should be educated on road safety and rules for cyclists.

3.3.2 Reinforcing (interpersonal) recommendations.—Participants made recommendations to capitalize on relationships and encourage families and groups to bike together. For example, to motivate families, one participant suggested, "... working with middle school and high schools downtown, because I think exercise is a habit that you get into early... you can work with kids so they want to go with their parents and say hey, 'I did this thing at school today. Let's go bike this weekend.'" Others suggested that planned group rides to museums, historical markers, and restaurants would encourage participation. As one participant stated, "That would fascinate even kids or... just younger generation."

3.3.3 Enabling (structural) recommendations.—Short-term recommendations included more effective marketing to the public. Several types of incentives were proposed to increase bikeshare use among new and recurring users: loyalty programs, such as membership discounts for riding more miles or discounts for renewing or referring friends; incentives such as half price, free days, or a lower-priced first month for new users to try to bikes; discounted student rates to increase student usage; and working with local employers and businesses to use bikeshare membership as an employee benefit or a perk for signing a lease.

Other structural recommendations included increasing the 45-minutes time limit between required dockings and adding more bikes and docking stations in key areas. Providing more pedelecs was strongly suggested by multiple participants. In terms of safety, focus groups recommended installing better lights and louder bells on bikes as well as making helmets available. Safety training for both users and drivers was also recommended.

Long-term structural recommendations pertained to infrastructure improvements to support cycling, including dedicated bike lanes and locating more stations near trails so people can ride longer periods away from traffic. Participants also recommended that the program should expand across the larger metropolitan area, away from downtown, and particularly to low-income communities to provide affordable active transportation options and increase connectivity.

4. Discussion

Guided by the PRECEDE model, this qualitative study conducted focus groups with current and former members of a bikeshare program to identify barriers to and facilitators of bikeshare use in an urban area. Study results show that information, social support, program features, financial resources, and bicycling infrastructure impact people's willingness and ability to use bikeshare. Our data also outline proposed solutions to improve bikeshare uptake and utilization.

One of the most striking characteristics of the discussions was the lack of references to physical activity as a motivator for bikeshare use. Participants told about using the Zyp bikes to reduce stress, for fun, and out of convenience, but there was virtually no discussion of using them to stay fit or improve one's health. This observation has important connotations for public health programs. While public health practitioners may see active transportation as a health-enhancing activity, actual users may be focused exclusively on its primary

The majority of discussions focused around enabling/structural barriers, facilitators, and recommendations. This indicates that the most important factors surrounding bikeshare utilization pertain not to internal motivators or interpersonal factors but to program features and characteristics of the built environment. Our conclusions corroborate findings from previous studies regarding barriers related to fees, use policies, and cycling infrastructure. ^{19,22,23} For example, a bikeshare program in a low-income Minneapolis community identified similar barriers as reported in our study: payment methods requiring credit cards, the time limit with no additional fee being too short, the system at the kiosks confusing to use, and streets not being bike-friendly.²⁶ Cost was a concern in surveys among low-income residents of large cities, and an important barrier for low-income people in this research as well.²⁷ Our participants indicated that the program was not practical for low income people given the location of bikeshare docking stations in the urban core near businesses and tourist attractions, as opposed to in neighborhoods, a practice found in other studies^{17,19}

Not surprisingly, given that Birmingham is ranked 45th in terms of friendliness toward cyclists, the most prominent barrier related to infrastructure and the lack of safety.²¹ Participants cited poor cycling infrastructure and fears of motorists insensitive to cyclists as barriers to bikeshare use. The impact of infrastructure on bikeshare use is unclear in the current literature, with some studies reporting that changes to the built environment, such as the addition of bike lanes, increase ridership,^{19,22} while others finding no effect.²³

In terms of facilitators, we found that bikeshare programs appeal to users who are concerned about convenience and bicycle theft.⁴³ As such, bikeshare programs in smaller to mid-size cities could benefit from college students as reliable user bases.⁴⁴ Further, location of docking stations may be key to broadening support from racial/ethnic minorities and people in low-income neighborhoods. However, it is important to note that factors that facilitate initiation of use may be different from factors that increase the frequency of use. While spatial factors, such as proximity of docking stations, may encourage people to start using bikeshares, the frequency of bikeshare use is likely affected by individual motivations.⁴³

To increase use of bikeshare programs, participants in our focus groups suggested that awareness campaigns and incentive programs would be important. They suggested that encouraging families and groups to ride together might increase usage. However, given that the size of the bikes preclude small children from using them, and numbers of bikes may be prohibitive to groups, this idea may not work as the program is now.

Further, although low-income and minority users were not well represented in our study, previous research has found that members of these groups are less likely to know people who use bikeshares and may not be aware of the programs.¹⁷ Therefore, targeted awareness campaigns may increase ridership among underrepresented groups. As for the use of incentives to increase ridership among low-income and minority groups, results have been mixed, with some incentive programs reporting an increase in ridership,¹⁵ while others not. ^{19,27} At the time of this study, the Zyp Bikeshare system was the largest in Alabama, with

43,690 users who completed 218,795 trips. It ceased operation on December 31, 2019 when its original five-year contract expired. The City of Birmingham is reviewing proposals for a new micro-mobility system with an increased focus on equity, locations in low-income neighborhoods, and safety.²⁴

This study has several limitations. A critical limitation is that most participants were white, male, college educated, and in full-time employment. Therefore, findings related to barriers and facilitators may not be applicable to individuals from disadvantaged backgrounds or racial/ethnic minority groups. Also, only bikeshare users were included in the study; therefore responses on uptake of the program among non-users is only speculative. Additionally, we did not interview representatives of the organizations running or associated with the bikeshare program, city officials, or other community stakeholders. Finally, findings may not be applicable to other bikeshare programs or geographic areas.

5. Conclusion

Nevertheless, this qualitative work indicates that bikeshare use likely may increase if programs provide convenient stations, resolve safety issues, ensure affordability, make an effort to accommodate older members, and attract a more diverse membership.^{45,46} To increase bikeshare use among underrepresented populations, race and socioeconomic status should be further examined as potential barriers to bikeshare use. In-depth qualitative and mixed methods studies with racially and ethnically diverse participants who are currently utilizing not a bikesharing program could inform design features of programs that would facilitate the participation of underrepresented groups. Future research should also examine how bikeshare use is affected by placing docking stations in low-income neighborhoods and by awareness campaigns and incentive programs targeting underrepresented users. Finally, future research should examine whether highlighting the health benefits of bicycling or using smart handlebars for fitness tracking increase ridership and improve health outcomes of participants.

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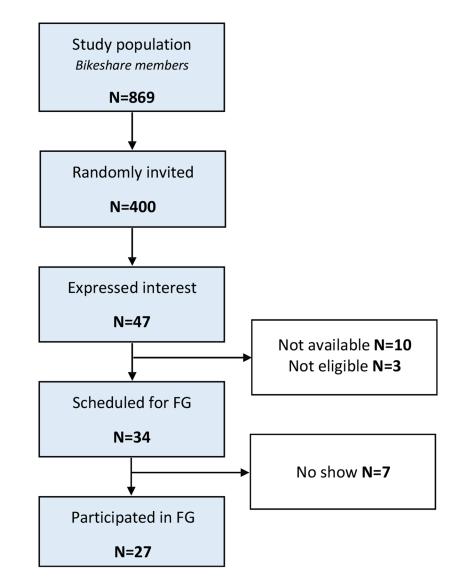
Highlights

Bikeshare use barriers include lack of awareness, safety, infrastructure, and policies.

Bikeshare use facilitators include fun, peer support, and convenience.

Recommendations to increase bikeshare usage are primarily structural.

To increase bikeshare use, use-restricting policies must be addressed.



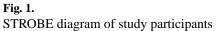


TABLE 1.

Characteristics of study participants (N=27)

Characteristic	% or mean (SD)
Age, years	38.96 (12.39)
Female, %	37.04
Race, %	
White non-Hispanic	77.78
African American	11.11
Other	11.11
Income, %	
<\$20,000	14.81
\$20,001-\$40,000	7.41
\$40,001-\$60,000	22.22
\$60,001-\$80,000	22.22
>\$80,000	33.33
Education, %	
High school	11.11
Some college	11.11
College degree or more	77.78
Employment, %	
Full-time	70.38
Part-time	7.40
Student	7.40
Retired	3.70
Unemployed	11.11
Has access to car, %	88.89
Current Zyp member, %	92.59

TABLE 2.

Themes, sub-themes, and representative codes

Theme	Sub-theme	Representative codes
Barriers	Predisposing (intrapersonal)	 Age Social stigma Disability Lack of information
	Reinforcing (interpersonal)	Friends/family/neighbors
	Enabling (structural)	 Safety Cost Difficulty with use Location Infrastructure Time constraints Availability of bikes
Facilitators	Predisposing (intrapersonal)	• Enjoyment
	Reinforcing (interpersonal)	Friends/family/neighbors
	Enabling (structural)	 Convenience Location Cost Availability of electric bikes Ease of use
Proposed solutions	Predisposing (intrapersonal)	Incentives
	Reinforcing (interpersonal)	 Encouraging family participation Organizing group rides
	Enabling (structural)	 Infrastructure improvement Bikeshare program awareness Expanding to communities, trails Improvements to bikes Safety awareness