10-1-2014

Public Bikesharing in North America During a Period of Rapid Expansion: Understanding Business Models, Industry Trends & User Impacts, MTI Report 12-29

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MTI Report 12-29

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REPORT 12-29

PUBLIC BIKESHARING IN NORTH AMERICA DURING A PERIOD OF RAPID EXPANSION: UNDERSTANDING BUSINESS MODELS, INDUSTRY TRENDS AND USER IMPACTS

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October 2014

A publication of
Mineta Transportation Institute
Created by Congress in 1991

College of Business
San José State University
San José, CA 95192-0219

TECHNICAL REPORT DOCUMENTATION PAGE

1. Report No. CA-MTI-14-1131	**2. Government Accession No.**	**3. Recipient's Catalog No.**
4. Title and Subtitle Public Bikesharing in North America During a Period of Rapid Expansion: Understanding Business Models, Industry Trends and User Impacts		**5. Report Date** October 2014 **6. Performing Organization Code**
7. Authors Susan A. Shaheen, Ph.D., Elliot W. Martin, Ph.D., Nelson D. Chan, Adam P. Cohen, and Mike Pogodzinski, Ph.D.		**8. Performing Organization Report** MTI Report 12-29
9. Performing Organization Name and Address Mineta Transportation Institute College of Business San José State University San José, CA 95192-0219		**10. Work Unit No.** **11. Contract or Grant No.** DTRT12-G-UTC21
12. Sponsoring Agency Name and Address California Department of Transportation Office of Research—MS42 P.O. Box 942873 Sacramento, CA 94273-0001 U.S. Department of Transportation Research & Innovative Technology Admin. 1200 New Jersey Avenue, SE Washington, DC 20590		**13. Type of Report and Period Covered** Final Report **14. Sponsoring Agency Code**

15. Supplemental Notes

16. Abstract

Public bikesharing—the shared use of a bicycle fleet—is an innovative transportation strategy that has recently emerged in major cities around the world, including North America. Information technology (IT)-based bikesharing systems typically position bicycles throughout an urban environment, among a network of docking stations, for immediate access. Trips can be one-way, round-trip, or both, depending on the operator. Bikesharing can serve as a first-and-last mile connector to other modes, as well as for both short and long distance destinations. In 2012, 22 IT-based public bikesharing systems were operating in the United States, with a total of 884,442 users and 7,549 bicycles. Four IT-based programs in Canada had a total of 197,419 users and 6,115 bicycles. Two IT-based programs in Mexico had a total of 71,611 users and 3,680 bicycles. (Membership numbers reflect the total number of short- and long-term users.)

This study evaluates public bikesharing in North America, reviewing the change in travel behavior exhibited by members of different programs in the context of their business models and operational environment. This Phase II research builds on data collected during our Phase I research conducted in 2012. During the 2012 research (Phase I), researchers conducted 14 expert interviews with industry experts and public officials in the United States and Canada, as well as 19 interviews with the manager and/or key staff of IT-based bikesharing organizations. For more information on the Phase I research, please see the Shaheen et al., 2012 report *Public Bikesharing in North America: Early Operator and User Understanding.*

For this Phase II study, an additional 23 interviews were conducted with IT-based bikesharing organizations in the United States, Canada, and Mexico in Spring 2013. Notable developments during this period include the ongoing expansion of public bikesharing in North America, including the recent launches of multiple large bikesharing programs in the United States (i.e., Citi Bike in New York City, Divvy in Chicago, and Bay Area Bike Share in the San Francisco Bay Area).

In addition to expert interviews, the authors conducted two kinds of surveys with bikesharing users. One was the online member survey. This survey was sent to all people for whom the operator had an email address. The population of this survey was mainly annual members of the bikesharing system, and the members took the survey via a URL link sent to them from the operator. The second survey was an on-street survey. This survey was designed for anyone, including casual users (i.e., those who are not members of the system and use it on a short-term basis), to take "on-street" via a smartphone.

The member survey was deployed in five cities: Montreal, Toronto, Salt Lake City, Minneapolis-Saint Paul, and Mexico City. The on-street survey was implemented in three cities: Boston, Salt Lake City, and San Antonio.

17. Key Words Bikesharing; North America; User impacts; Industry trends; Business models	**18. Distribution Statement** No restrictions. This document is available to the public through The National Technical Information Service, Springfield, VA 22161		
19. Security Classif. (of this report) Unclassified	**20. Security Classif. (of this page)** Unclassified	**21. No. of Pages** 218	**22. Price** $15.00

Form DOT F 1700.7 (8-72)

Library of Congress Catalog Card Number:
2014949233

To order this publication, please contact:

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ACKNOWLEDGMENTS

The Mineta Transportation Institute (MTI) and the Transportation Sustainability Research Center (TSRC) of the Institute of Transportation Studies at the University of California, Berkeley, generously funded this research. The authors give special thanks to the North American bikesharing operators who made this research possible. We also thank Matthew Christensen and Audrey Koh of TSRC for their help in data collection, synthesis, and report formatting, and Rachel Finson in her role as a project manager. We further thank Ingrid Ballus Armet for assistance with translation of survey and interview instruments to Spanish, and for conducting interviews with Mexican operators. We similarly thank Marie Mundler for supplying translations to Canadian French for our Montreal survey instrument. We sincerely thank the members of our bikesharing advisory committee for their role in instrument design. The contents of this report reflect the views of the authors and do not necessarily indicate sponsor acceptance.

The authors also thank MTI staff, including Executive Director Karen Philbrick, Ph.D.; Director of Communications and Technology Transfer Donna Maurillo; Research Support Manager Joseph Mercado; and Webmaster Frances Cherman.

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EXECUTIVE SUMMARY

Public bikesharing systems offer accessible shared bicycles for first-and-last mile trips connecting to other modes, as well as for both short and long distance destinations in an urban environment. Access to the bicycles is gained through membership in a bikesharing organization. While the majority of North American bikesharing operators charge for use (membership and use-based fees), some community-based bikesharing organizations do not. This report highlights Information Technology (IT)-based bikesharing activities in the United States, Canada, and Mexico.

Bikesharing systems typically permit both one-way trips and round-trips with bikes available on-demand (no reservation) via a network of docking stations for retrieving and parking bicycles. Thus, bikesharing can facilitate connections to and from public transit and provide a means to make local trips within the bikesharing network.

IT-based bikesharing has grown rapidly in North America over the past five years. Between 2007 and December 2013, there were 37 IT-based public bikesharing program launches and three program closures in the United States; four program launches and no program closures in Canada; and three program launches and no program closures in Mexico. Three programs (one in the U.S., one in Canada, and one in Mexico) have temporarily suspended operations for the 2013 season.

This study evaluates public bikesharing from several angles, including current operational practices, business models, membership demographics, and environmental and social impacts in North America. Background information includes a worldwide perspective and a literature review of recent bikesharing research. As part of this study, the authors conducted interviews with 14 local government representatives and other bikesharing experts, as well as 19 bikesharing operators in the United States and Canada during Phase I (2012) of this research study and an additional 23 interviews of public bikesharing operators in the United States, Canada, and Mexico during Phase II (2013) of this study (including follow-up interviews with 14 operators that participated in the Phase I research). In addition, the authors performed a survey of bikesharing members in five North American cities in 2013 and conducted a survey of casual users (or short-term users) in three cities in 2013. The authors surveyed the members of four operators in 2011.

In the 2012 season, there were 22 IT-based bikesharing operators in the U.S. claiming approximately 884,442 users sharing 7,549 bicycles. In Canada, there were four IT-based bikesharing programs with 197,419 users sharing 6,115 bicycles. In Mexico, there were two IT-based bikesharing programs with 71,611 users sharing 3,680 bicycles.

The operator and stakeholder interviews documented the growth of public bikesharing in North America. In the 2012 season, there were 22 IT-based public bikesharing systems in the United States, with approximately 884,442 users and 7,549 bicycles. Canada had four IT-based bikesharing organizations, with more than 197,419 users and 6,115 bicycles. Mexico had two IT-based bikesharing operators with 71,611 users and 3,680 bicycles. In North America, casual users accounted for 85.5% of all bikesharing users during 2012.

At the close of the 2012 season, the majority of bikesharing programs were non-profits (representing 15 of 28).

Between January and December 2013, 14 programs launched in North America, and one closed (i.e., Bike Nation Anaheim). Beyond 2013, at least 25 other locations are exploring public bikesharing.

North American bikesharing operating revenue came from advertising sales, gifts, grants, sponsorships, membership fees, and usage fees. Of systems that responded, sponsorships accounted for approximately 42% of operating revenue, 22% came from membership fees, and 19% from usage fees. During the 2012 season, a daily (24-hour) membership pass in the U.S. averaged about US$7.75, and an annual membership about US$62. In Canada, a daily pass averaged US$7.25, and an annual membership US$79 (using 1CAD:1USD). An annual membership in Mexico averaged US$24 (using 1MXN:0.08USD). New station kiosk costs in the U.S. averaged about US$44,600, while kiosk relocation averaged almost US$6,500. Costs of expansion averaged US$3,100 per dock and US$5,900 per bicycle. Rebalancing—the redistribution of bicycles among bikesharing stations—expenditures from surveyed U.S. systems averaged US$6,500 per month, or US$667 per station per month.

Over half of reporting operators had station kiosks on both public and private land. To encourage multi-modal travel between bikesharing and public transit, the distance between a public transit stop and a bikesharing kiosk averaged about 400 feet (120 meters). More than half also indicated working with their local governments to improve bicycle infrastructure prior to launching their programs. All public bikesharing programs interviewed support bicycle safety and encourage helmet usage. However, public bikesharing experts and users generally perceive compulsory helmet laws as a challenge to bikesharing use because of the inconvenience associated with carrying a helmet, lack of availability for last-minute trips, and difficulties associated with providing sterile shared-use helmets. A number of programs and vendors are trying to develop helmet dispensing options and other innovative technologies to encourage helmet use and enhance user safety. Annual accident rates in 2012 averaged 4.23 reported crashes per operator in North America.

Theft and vandalism rates remain negligible. Insurance coverage was dependent on the operator’s business model, but the four most common types of insurance coverage carried include general liability coverage, worker’s compensation, commercial auto, and inland marine coverage.

The authors conducted two different kinds of surveys with users. One type of survey was the online member survey. This survey was sent to all individuals for whom the operator had an email address. The population of this survey was mainly annual members of the bikesharing system, and the respondents took the survey via a URL link sent to them from the operator. The second survey was an on-street survey. This survey was designed for anyone, including casual users (those who are not members of the system) to take “on-street” via a smartphone.

The member survey was implemented in five cities including: Montreal, Toronto, Salt Lake City, Minneapolis-Saint Paul, and Mexico City. The on-street survey was deployed in three cities: Boston, Salt Lake City, and San Antonio.

The member survey received a total N = 6,168 completed surveys, with Montreal at N = 1,102, Toronto at N = 1,015; Minneapolis-Saint at N = 630; Salt Lake City at N = 72; and Mexico City had at N = 3,349. The on-street survey had a far smaller sample size, with the vast majority residing in Boston at N = 191, followed by B-cycle in San Antonio at N = 13, and Salt Lake City with (N = 1). These surveys were analyzed separately to generate insights regarding membership profiles within diverse systems in different North American countries.

The survey results show that bikesharing is causing a diverse array of modal shifts within the different cities surveyed. Bikesharing was found to reduce the number of respondents using the bus in four of the five cities. In Montreal and Toronto, 56% and 39% of members reported taking the bus less often versus 6% (Montreal) and 3% (Toronto) reporting using the bus more often. In Mexico City, 34% of members stated using the bus less often, while 20% reported taking the bus more often. In Minneapolis-Saint Paul, 18% noted using the bus less often, while 16% reported taking the bus more often. Salt Lake City was the only system where increased bus usage (8%) out-numbered a decrease in bus use (4%).

In terms of shifts in rail, more members in Salt Lake City and Minneapolis-Saint Paul increased (14% and 11%, respectively) their use of rail than decreased it (7% and 2%, respectively). In Montreal and Toronto, 57% and 49% reported decreasing rail usage, while 7% and 8% reported increasing rail use. Finally in Mexico City, 17% reported decreasing rail while 13% reported increasing rail. The remaining percentages in all cities reported no change in use.

These modal shifts in public transit are likely due to the differences in public transit networks within the respective cities. Mexico City, Montreal, and Toronto are all large cities with dense public transit networks. In contrast, Minneapolis-Saint Paul and Salt Lake City are relatively smaller, with less intensive transit systems. Follow-up questions asked respondents who reduced their use of public transit as to the primary reason why. The most common response was that bikesharing provided “faster travel and lower cost” than the public transit option.

The survey also found that bikesharing reduced respondents driving by large margins in all cities. In Montreal and Toronto, 29% and 35% reported driving less. In Minneapolis-Saint Paul and Salt Lake City, 53% and 55% noted driving less, and in Mexico City, 53% reported driving less. Very few respondents noted driving more. In terms of walking, more respondents in Mexico City (45%), Minneapolis-Saint Paul (33%), and Salt Lake City (29%) increased walking versus decreasing walking (27%, 23%, and 25%, respectively). In Montreal and Toronto, 23% and 24% reported walking more often, while 34% and 39% noted walking less often.

The member survey also asked questions about bikesharing safety, particularly focusing on helmet use. Respondents in all cities generally felt safe and comfortable with bikesharing bikes. Helmet use by members while using bikesharing bicycles varied widely across cities,

with 74% of respondents in Mexico City reporting never wearing a helmet while bikesharing. In Montreal, Toronto, Minneapolis-Saint Paul, and Salt Lake City, the percentage of respondents never wearing a helmet was 54%, 46%, 42% and 15%, respectively. Helmet use was highly correlated with helmet ownership. For example, Mexico City had the lowest rate of helmet ownership, while Salt Lake City had the highest. The survey probed why respondents did not wear a helmet and found a diversity of reasons beyond lack of helmet ownership including that bikesharing use is often unplanned, and helmets are difficult to carry around.

The casual user survey, which was an experimental method in this study, found that most respondents were members in Boston, while the majority were 24-hour pass holders in San Antonio (Salt Lake City had only one annual member respond). The most common trip purpose in Boston was “go to/from work,” whereas the most common in San Antonio was “exercise/recreation.” Respondents were asked how they would have made their most recent trip, if bikesharing was not available. The most common response in San Antonio was “I would not have made this trip,” whereas the most responses in Boston were split between “subway or trolley” and “walk.”

Finally, data from the survey conducted in Minneapolis was anonymously linked to bikesharing activity data from that operator. These data were used to explore how information from the surveys can be overlaid with activity data to yield further insights about bikesharing impacts. The cross-tabulated data of bikesharing trip counts overlaid with the modal shift data showed that respondents who used bikesharing to substitute for other modes employed bikesharing more frequently, taking more trips (on average) than those who used bikesharing as a complement to other modes. Interestingly, this result cuts across all modal shifts reported by respondents and suggests that those who frequently use bikesharing use it in substitution of most every mode. It also suggests that those using bikesharing as a complement to other modes still employed the service often but not as much as those substituting all modes with bikesharing.

This report also includes an appendix chapter on bikesharing rebalancing through an analysis of the Hubway bikesharing system in Boston, Massachusetts. The authors used geographic information systems (GIS) mapping tools to understand bicycle distribution and the relative supply and demand for each station to potentially help reduce instances of full or empty stations.

I. INTRODUCTION

Public bikesharing is the shared use of a bicycle fleet by the public. Since the mid-2000s, it has been growing rapidly across the globe. This report focuses on recent developments in public bikesharing in Canada, the U.S., and Mexico. The years of 2012 and 2013, in particular, represent a period of rapid expansion, as reflected in this Phases II study. This report builds upon earlier research conducted by the authors in 2011-2012 (Phase I) (Shaheen et al., 2012). Since 1965, bikesharing has grown across the globe including Europe, North America, South America, Asia, Australia, and the Middle East (Shaheen et al., 2010).

As of June 2014, public bikesharing programs existed on five continents, including 712 cities, operating approximately 806,200 bicycles at 37,500 stations (Russell Meddin, unpublished data, June 2014). In addition, some large colleges, universities, and employers are participating in bikesharing to serve their students, faculty, and employees. Please note that this report does not include college/university or employer bikesharing programs, as they are typically not accessible by the general public.

The principle of public bikesharing is simple: Bikesharing users access bicycles on an as-needed basis. IT-based bikesharing[1] can be facilitated through a network of stations (typically unattended) or through dockless bikesharing where riders use their mobile electronic devices to find the current location of a nearby bikesharing bicycle. Bikesharing provides a variety of pickup and drop-off locations, enabling an on-demand, very low emission form of mobility. The majority of bikesharing programs cover the cost of bicycle maintenance, storage, and parking. Trips can be point-to-point, round-trip, or both, allowing the bikes to be used for one-way transport and for multimodal connectivity. Generally, trips of less than 30 minutes are free.

Users join the bikesharing organization on an annual, monthly, or daily basis. Members can pick up a bike at any dock by using their credit card, membership card, key, or key-fob, and/or a mobile phone. When members finish using the bike, they can return it to any dock (or the same dock in a round-trip service) where there is room and end their session. Note that “per-trip” usage—the usage of a bikesharing bicycle for a small fare (comparable to a one-way transit fare) on a per-trip basis—has been discussed and proposed in North America; however, it has not yet been implemented to date.

By addressing the storage, maintenance, and secure parking aspects of bicycle ownership, bikesharing encourages cycling among users who may not otherwise use bicycles. Additionally, the availability of a large number of bicycles in multiple dense, nearby locations frequently creates a “network-effect,” further encouraging cycling and, more specifically, the use of public bikesharing for regular trips (e.g., errands, commuting).

Methodology

This study evaluates the change in travel behavior exhibited by members of different programs in the context of their business models and operational environment. The study reports on:

1. Status of bikesharing operations in the U.S., Canada, and Mexico;
2. Key attributes and business models of bikesharing operations in North America;
3. Economics of bikesharing in the U.S., Canada, and Mexico, including key standards for financial modeling and scaling for growth; and
4. Evolution of IT-Based bikesharing in North America.

In addition, the study documents a variety of public bikesharing impacts including:

1. Impact of bikesharing on walking, bicycling, and public transit;
2. Purpose of bikesharing trips, bikesharing system use, and user perception;
3. Impact of public bikesharing on driving and vehicle ownership;
4. Impact of public bikesharing on bus, rail, and other transit ridership;
5. Role of commute distance in public bikesharing use and travel pattern impacts; and
6. Role of business model, operational context, and urban environment on system impact (e.g., mode shift, trip distribution, and accessibility).

To answer these questions, the research team:

1. Completed a literature review on the state of public bikesharing in North America and around the world.
2. Conducted interviews with 23 organizations operating IT-based public bikesharing in the United States, Canada, and Mexico during this Phase II research, as of Spring 2013 (including follow-up interviews with 14 operators that participated in the Phase I research). (See Appendix B for the expert interview script.)
3. Tracked IT-based bikesharing program expansion in North America, as well as planned programs.

4. Administered an online survey to the members of five IT-based public bikesharing systems in North America in Spring/Summer 2013. The survey focused on evaluating how members used the service and altered their travel modes and how vehicle ownership changed as a result of bikesharing. (See Appendices C-E.)

5. Completed an online survey with the casual (short-term) users of three IT-based public bikesharing systems in North America in Spring/Summer 2013 (see Appendices C-F). The survey focused on evaluating how walkup users used the service and altered their travel behavior. See Appendix F.

6. Analyzed operational data from Nice Ride Minnesota in 2013.

7. Used GIS to understand bicycling distribution and rebalancing for Boston, MA's Hubway bikesharing system (see appendix).

The majority of data were collected from February 2013 through August 2013. However, data from Phase I of this study of public bikesharing (Shaheen et al., 2012), periodically referenced in this report, were collected through expert interviews of all 19 North American operators and a user survey of members from bikesharing programs in Montreal, Toronto, the Twin Cities (Minneapolis and St. Paul), and Washington D.C. between May 2011 and June 2012. For more information on the Phase I study, please visit (http://transweb.sjsu.edu/project/1029.html). A summary of the project timeline is included in Figure 1. A summary of the expert interviews and user surveys is included below in Table 1.

Study Components	Fall 2011	Winter 2011	Spring 2012	Summer 2012	Fall 2012	Winter 2012	Spring 2013	Summer 2013
Literature Review								
Public Policy Interviews	14 experts							
2011 Season Closeout Data Collection		19 operators						
Phase I Operator Interviews			19 operators					
Phase I Member Survey			4 operators					
2012 Season Closeout Data Collection						28 operators		
Phase II Operator Interviews							23 operators	
Phase II Member Survey							5 operators	
Phase II Casual (Short-Term) User Survey							3 operators	

Figure 1. North American IT-Based Public Bikesharing Data Collection Timeline

Table 1. North American IT-Based Public Bikesharing Data Collection Matrix (X Denotes Participation)

Program	2012 (Year 1) Operator Interview	2012 (Year 1) Member Survey	2012 End of Season User/ Bicycle Data	2012 End of Season Pricing Data	2013 (Year 2) Operator Interview	Activity Data	2013 (Year 2) Member Survey	2013 (Year 2) Casual (Short-Term) User Survey
Canada								
Bixi Montreal	X	X	X	X	X		X	
Bixi Toronto	X	X		X	X		X	
Capital Bixi	X			X	X			
Golden Community Bike Share	X		X					
Mexico								
Bikla			X	X	X			
EcoBici			X	X	X		X	
United States								
Bike Chattanooga			X	X	X			
Bike Nation					X			
Boulder B-cycle	X			X	X			
Broward B-cycle	X		X	X	X			
Capital Bikeshare	X	X	X	X	X			
Citi Bike								
Charlotte B-cycle			X	X				
Chicago B-cycle	X							
DecoBike Long Beach				X				
DecoBike Miami	X			X				
Denver B-cycle	X		X	X	X			
Des Moines B-cycle	X			X				
Fort Worth B-cycle								
Greenville B-cycle								
Hawaii B-cycle	X		X	X				
Houston B-cycle				X				

Program	2012 (Year 1) Operator Interview	2012 (Year 1) Member Survey	2012 End of Season User/ Bicycle Data	2012 End of Season Pricing Data	2013 (Year 2) Operator Interview	Activity Data	2013 (Year 2) Member Survey	2013 (Year 2) Casual (Short-Term) User Survey
Hubway	X		X	X	X			X
Kansas City B-cycle			X	X	X			
Madison B-cycle	X		X	X	X			
Nashville B-cycle			X	X	X			
Nice Ride Minnesota	X	X	X	X	X	X	X	
Omaha B-cycle	X		X	X	X			
Puget Sound Bike Share								
San Antonio B-cycle	X		X	X	X			X
GREENBike					X		X	X
Spartanburg B-cycle	X		X	X	X			
Spokies			X	X	X			
Tulsa Townies	X		X	X	X			

Organization of this Report

Chapter 2 provides background information on how public bikesharing has evolved and recent worldwide developments, as well as an overview of studies regarding bikesharing research and impacts. Chapter 3 focuses on basic metrics of public bikesharing in North America, and Chapter 4 discusses public bikesharing business models in North America. Chapter 5 presents a summary of the operational understanding gained through interviews with operators, and Chapter 6 examines equity factors impacting public bikesharing.Chapter 7 summarizes the results from the public bikesharing user survey. Chapter 8 concludes with lessons learned from the study. Appendix A presents bikesharing rebalancing in the context of supply and demand for bicycles by examining data from Boston's Hubway bikesharing system and geographic information systems (GIS) software. Appendix B provides a copy of the expert interview script. Appendices C through E include a copy of the member survey in English, Spanish and French. Appendix F provides a copy of the casual user survey.

II. BACKGROUND

First established in Amsterdam in 1965, public bikesharing has been in existence for decades but has recently gained prominence due to the rapid expansion of bikesharing systems into new locations, as well as the scale of their operations. This expansion is based in large part on information technology (IT) that has improved bikesharing communications and tracking and the desire of city governments to move toward sustainable transportation modes. This chapter provides a summary of key studies regarding bikesharing impacts, an overview of the evolution of public bikesharing systems, and a brief synopsis of key worldwide developments.

Bikesharing Impact Studies

Bikesharing has the potential to play an important role in bridging some of the gaps in existing transportation networks, as well as encouraging individuals to use multiple transportation modes. Potential bikesharing benefits include: 1) increased mobility; 2) lower transportation costs; 3) reduced traffic congestion on roads and public transit during peak periods; 4) reduced fuel use; 5) increased use of public transit and alternative modes (e.g., rail, buses, taxis, carsharing, ridesharing); 6) economic development; 7) health benefits; and 8) greater environmental awareness. We highlight several recent studies of the benefits of bikesharing below. The ultimate goal of public bikesharing is to expand and integrate cycling into transportation systems, so that it can more readily become a daily transportation mode for commuting, personal trips, recreation, and improved health.

Reduced Fuel Use and Traffic Congestion

Although before and after studies documenting public bikesharing benefits are limited, a few programs have conducted user surveys and collected bicycle data to record program impacts. Early program data suggest that bikesharing has the potential to reduce emissions due to modal shifts. For example, with an average of 78,000 trips per day and approximately 20 minutes per trip, Vélib' users cover an estimated 312,000 kilometers (193,867 miles) per day (Pucher and Buehler, 2012). A car covering this same distance would have produced approximately 57,720 kilograms (57.72 tons) of carbon dioxide (CO_2) per day. Moreover, following Vélib's 2007 launch, the bicycle mode share in Paris increased from about 1% in 2001 to 2.5% in 2007 (Shaheen et al., 2010). More recently, Citi Bike in New York City recorded almost 529,000 trips and 2,092,147 million kilometers (or 1.3 million miles) traveled after only one month of operation (data from May 27 to June 26, 2013) (Citi Bike, 2013). In Boston, Hubway data show a carbon offset of 285 tons since public bikesharing began there in July 2011 (Hubway, 2013). While limited, available data also suggest that public bikesharing has helped to change behaviors. During the first year of Velo'v, Lyon documented a 44% increase in bicycle trips (Buhrman, 2008). Ninety-six percent of Lyon's public bikesharing members were new users who had not previously bicycled in the city center (Holtzman, 2008). In addition, bicycle riding in Paris increased by 70% after the launch of Vélib' (Bremner & Tourres, 2008).

Table 2 presents a summary of trips, distance traveled, and estimated CO_2 reductions for key Asian, European, and North American bikesharing impact studies. The emission-

reduction estimates vary substantially across studies due to different assumptions about user behavior, trip distribution, and trip substitution, as well as the assumed efficiency of the cars or other modes being displaced.

Table 2. Impacts of Public Bikesharing

Program	Program Location	Year of Data	Trips per Year	Km per Year	CO_2 Reduction (kg per Year)	Before/After Modal Share	Respondents Using an Automobile Less	Replaced/ Forgone Vehicle Trips
Bicing	Barcelona, Spain	2008				0.75%/1.76%[a]		
BIXI Montreal	Montreal, Canada	2011	7,300,000[b]					
Boulder B-cycle	Boulder, United States	2011	18,500[c]		47,174[c]			
Denver B-cycle	Denver, United States	2011	202,731[d]	694,942[d]	280,339[d]			
Hangzhou Public Bicycle Program	Hangzhou, China	2009	62,780,000[e]	376,680,000[e]	69,715,000[e]			
Hubway	Boston, United States	2011	140,000[f]					
Madison B-cycle	Madison, United States	2011	18,500[g]		46,805[g]			
San Antonio B-cycle	San Antonio, United States	2011	22,709[h]		38,575[h]			
Vélib'	Paris, France	2009 2007	28,470,000[i]			1%/2.5%[j]	28%[j]	
Velo'v	Lyon, France	2011	6,493,427[k]					7%[l]

Sources:

[a] Romero, Carlos. "SpiCycles – in Barcelona." Presented at the Final Conference of the Chamber of Commerce & Industry of Romania, Bucharest, Romania, 19 December 2008.

[b] Houle, Marie-Hélène. 2011. "4 174 917 déplacements en BIXI en 2011 - BIXI atteint le seuil des 40 000 membres." http://www.newswire.ca/fr/story/880423/4-174-917-deplacements-en-bixi-en-2011-bixi-atteint-le-seuil-des-40-000-membres.

[c] Boulder B-cycle. 2011. "2011 Annual Report". http://boulder.bcycle.com/LinkClick.aspx?fileticket=wrmQ-L2GXgI%3D&tabid=429h

[d] Denver B-cycle. 2011. "2011 Season Results". http://denver.bcycle.com/News.aspx?itemid=185

[e] Data obtained in a 2009 phone interview with Hangzhou program manager

[f] Hinds, Kate. 2011. "In Its First Season, Boston Bike Share Exceeds Projections; Will Expand Next Spring." http://transportationnation.org/2011/11/29/in-its-first-season-boston-bike-share-exceeds-projections-will-expand-next-spring/

[g] Madison B-cycle. 2012. "2011 Overview." http://legistar.cityofmadison.com/attachments/85a6af7b-3bb3-40bb-b5ab-d91e9720f0cc.pdf

[h] San Antonio Office of Environmental Policy. "San Antonio Bikes." Presented at the Texas Trails and Active Transportation Conference, San Antonio, TX, February 1-3, 2012. http://www.slideshare.net/biketexas/B-cycle-bike-share

[i] The Globe and Mail. 2009. "Paris's Pedal Power Sets Free Uncivilized Behaviour." http://veloptimum.net/velonouvelles/9/ART/6juin/GlobeMail20.htm

[j] DeMaio, Paul. 2009. "Bike-Sharing: History, Impacts, Models of Provision, and Future." *Journal of Public Transportation* 14-4 (2009): 41–56.

[k] Vogel, M. et al. 2014. "From bicycle sharing system movements to users: a typology of Vélo'v cyclists in Lyon based on large-scale behavioural dataset." Journal of Transport Geography. http://liris.cnrs.fr/Documents/Liris-6880.pdf

[l] Bührmann, S. 2007. New Seamless Mobility Services: Public Bicycles.

Increased Mobility

In addition to studies that have demonstrated reduced CO2 emissions and a modal shift as a result of bikesharing, evaluations indicate an increased public awareness of bikesharing as a viable transportation mode and economic stimulator (Home, 1991). A 2008 study found that 89% of Vélib' users said the program made it easier to travel through Paris. Fifty-nine percent of Nice Ride Minnesota users said that they liked convenience most about their program (Nice Ride Minnesota, 2010). Denver B-cycle achieved a 30% growth in users and a 97% increase in the number of rides taken in 2011 (Denver B-cycle, 2011). These studies and anecdotal evidence suggest that public bikesharing programs have a positive impact on the public perception of bicycling as a viable transportation mode. The authors' 2013 member survey (reported in Chapter 7) examines the impacts of public bikesharing from both a social and an environmental perspective.

Links to Public Transit

Nair et al. (2012) conducted an empirical analysis of Vélib' and found a correlation between the close coupling of bikesharing with transit stops with higher usage rates. All but one of the top 20 most-used Vélib stations were within 175 meters (574 ft.) of a Paris Métro station. Furthermore, the 2013 Capital Bikeshare Member Survey Report found that 54% of members started or ended a bikesharing trip at a transit station (Capital Bikeshare, 2013).

Health Benefits

Bikesharing organizations are often interested in promoting healthy living through increased cycling among its members. Some operators track cycling activity and estimate calories expended on a personal or aggregate level. Hubway estimated that 40 million calories were expended on its bicycles over the past two years (Hubway, 2013). Similarly, Citi Bike assessed its users burned 50 million calories just in the first month of operation (assuming a calorie burn rate of 40 calories per mile biked) (Citi Bike, 2013). Capital Bikeshare users expended almost 90 million calories between September 20, 2011 and September 20, 2012 (Capital Bikeshare, 2012).

Capital Bikeshare in Washington, D.C., along with researchers at George Washington University, conducted a user survey in Fall 2012, primarily focused on the system's health benefits. Of over 3,100 responses, 31.5% reported reduced stress, and about 30% indicated they lost weight due to using Capital Bikeshare (Alberts, Palumbo, and Pierce, 2012).

Economic Development

A 2012 University of Minnesota study found that Nice Ride Minnesota users surveyed spent an average of US$1.29 per week on new economic activity that would have likely not occurred without the bikesharing system. Extrapolated across all Nice Ride members, this equates to almost US$29,000 of economic activity per season (Schoner et al., 2012).

Evolution of Public Bikesharing Generations

Industry experts have cited that public bikesharing is categorized into four key phases or generations (DeMaio, 2009; Shaheen et al., 2010):

- First generation: Bicycles placed throughout an area that can be freely accessed by the public;
- Second generation: Coin-deposit systems enabling users to deposit a coin into a dock, check-out a bicycle, and return the bicycle to a dock where they receive a coin;
- Third generation: IT-based systems capable of accepting RFID, credit, and/or debit cards for membership payment or usage; and
- Fourth generation: IT-based bikesharing systems that feature demand-responsive rebalancing (e.g., real-time information that informs the system where there are imbalances in supply and demand) and integrated—both spatially and digitally—with other transportation modes. They can also include dockless station strategies; electric bikes; transit linkages; and mobile, solar docking stations (Shaheen et al., 2010).

In first-generation systems, bicycles are typically painted one color, left unlocked, and placed randomly throughout an area for free use. First-generation systems do not use docking stations. In some of the systems, the bikes are locked; users must get a key from a participating local business and may also need to leave a credit card deposit, but actual bike use is still free. Many first-generation systems eventually ceased operations due to theft and bicycle vandalism, but some are still operating as community-based initiatives.

In second-generation systems, bicycles have designated docking stations/parking locations where they are locked, borrowed, and returned. A deposit, generally not more than US$4, is required to unlock a bike. Although coin-deposit systems helped reduce theft and vandalism, the problem was not eliminated, in part because of user anonymity. A few second-generation systems are still in operation in Europe.

Third-generation, IT-based systems (the focus of this report) use electronic and wireless communications for bicycle pickup, drop-off, and tracking. User accountability has been improved through the use of credit or debit cards. Third-generation bikesharing includes docking stations; kiosks or user interface technology for check-in and check-out; and advanced technology (e.g., magnetic-stripe cards, smartcards, smart keys). Although these systems are more expensive than first- or second-generation systems, they offer substantial benefits because of the incorporation of innovative technologies. IT enables public bikesharing programs to track bicycles and access user information, improves system management, and deters bike theft. These technologies are important to public bikesharing's recent expansion in both locations and scale.

Fourth-generation, demand-responsive, multi-modal systems build upon the technology of third-generation systems by implementing enhanced features that support better user

metrics, such as flexible, solar-powered docking stations or “dockless” bicycles; demand-responsive bicycle redistribution innovations to facilitate system rebalancing; value pricing to encourage self-rebalancing; multi-modal access; billing integration (e.g., sharing smartcards with public transit and carsharing); real-time transit integration and system data dashboards; and GPS tracking. Fourth-generation bikesharing is an evolving concept that has yet to be fully developed.

Worldwide Evolution and Developments of Public Bikesharing

This section provides a brief overview of how public bikesharing has progressed through the different technological generations worldwide.

Early bikesharing systems in Europe and North America operated as small-scale nonprofits. First-generation bikesharing, or White Bikes, began in Amsterdam in 1965, when 50 bicycles were left unlocked throughout the city for free public use (Home, 1991). This initiative failed soon after its launch, however, because bikes were often stolen, damaged, and even confiscated by police (Schimmelpennink, L., December 2012, unpublished data). Despite this experience, public bikesharing systems continued to launch and evolve.

Problems with first-generation bikesharing led Copenhagen to launch the first large-scale, second generation coin-deposit system in 1995. Prior to that, however, according to DeMaio, the earliest small-scale coin-deposit systems were launched in Farsø and Grenå, Denmark in 1991 (DeMaio, 2009). By designating specific bicycle station locations and adding coin-deposit locks, second-generation systems are much more reliable, as users have a defined and secure space to access available bicycles. However, theft is still a major problem with coin-deposit systems largely due to customer anonymity.

The shortcomings of first- and second-generation systems later gave rise to IT-based public bikesharing. While the technology was first associated with a bikesharing system at Portsmouth University in the United Kingdom, Vélo à la Carte, which launched in 1998 in Rennes, France, was the first IT-based system available for public access (DeMaio, 2009). Today, the most widely known IT-based system is Vélib’ in Paris, with 20,600 bicycles and 1,451 bike stations available every 300 meters throughout the city center. In its first year of operation, Vélib’ reported 20 million trips made. As of March 2011, there were 18 European nations operating public bikesharing programs.

In the Americas, the first IT-based bikesharing system, Tulsa Townies, started operating in 2007 in Tulsa, Oklahoma. Tulsa Townies was the first solar-powered, fully automated docking-based system in North America, and it provides its service free of charge. At present, the largest IT-based program in North America is Citi Bike in New York City. Launched in May 2013, New York City’s Citi Bike operates with approximately 6,000 bicycles and 330 stations. Mexico City’s flagship program, EcoBici, launched in 2010 with 1,300 bicycles and has since expanded to 3,530 in 261 stations. In South America, Brazil launched two bikesharing programs in 2008—UseBike in São Paulo and Samba in Rio de Janeiro. Following Samba’s launch, Chile started a public bikesharing program, which operates 180 bicycles and 18 stations.

Asia is now the fastest growing market for bikesharing. The first public bikesharing program to launch in Asia was TownBike in Singapore in 1999; it ended in 2007. Asia-Pacific bikesharing programs are operating in Australia, Mainland China, South Korea, and Taiwan. One of the largest and most discussed public bikesharing programs in Asia is the Public Bicycle system in Hangzhou, China. Collectively, these systems feature over 60,000 bicycles and 2,400 bike stations.

Recent Developments

Recent developments in bikesharing include: 1) the expansion of pay-as-you-go services; 2) membership portability and interoperability; 3) increased community involvement; 4) developments related to equity and access improvement; 5) the advent of helmet dispensing options; 6) research and development of dynamic pricing; 7) Public Bike System Company's recent filing for bankruptcy protection; and 8) additional research.

Occasional Members and Pay-As-You-Go: Public bikesharing organizations are finding innovative ways to respond to a new category of users that don't ride often enough to join a bikesharing system with a long-term membership, but they ride enough to desire easier access than provided for casual users. In Fall 2012, BIXI Montreal created a new membership type known as the "occasional" user where casual users are provided with a program key free of charge to encourage ridership. Each time occasional subscribers use their key, they are given a 24-hour membership at a discounted rate and a longer free ride period before incurring user fees. The occasional membership offers a number of potential benefits including: increasing program ridership and membership, providing users a 24-hour pass option while being able to track individual user data and increased user convenience (bypassing the need for kiosk registration and credit card use during each ride). As of Spring 2013, Nice Ride Minnesota and Capital Bikeshare were considering the implementation of a similar occasional user option.

Membership Portability and Interoperability: As bikesharing continues to expand through cities in North America, interoperability among programs becomes an important benefit, so annual members can access bicycles outside of their home program while traveling. Annual members simply provide their membership card and credit card associated with their account at the kiosk. Any user fees incurred are billed by the system where the trip took place. B-cycle conducted a pilot program between Denver B-cycle and Madison B-cycle during the 2012 season. In March 2013, B-cycle expanded the interoperability program known as "B-connected" to 15 of its U.S. programs (Tongco, 2013).

Community Involvement: Some bikesharing programs are pioneering new efforts to solicit community input for station placement. In 2012, Bike Nation launched a website where the public can suggest a station location and either "like" or "dislike" suggested locations (Bike Nation, 2013). Such public involvement has become commonplace, and several other programs have solicited public input on station locations both at public meetings and via online "suggest-a-station" platforms.

Equity Issues and Public Policy: As public bikesharing becomes more popular, so has interest in expanding service to underserved neighborhoods, notably, low-income and

minority communities. This is of particular interest because bikesharing offers households the ability to lower transportation expenditures while increasing mobility and accessibility to public transit. In Washington D.C., Capital Bikeshare launched the “Bank on DC” program, which provides United Bank or District Government Employees Federal Credit Union account holders a US$25 gift certificate to be used toward the cost of an annual membership (Capital Bikeshare, 2013). In addition, these programs can assist new users in obtaining debit and/or credit cards to use bikesharing. In Boston, as part of a grant to expand the Hubway system, city council members have asked city staff to create a written plan for the expansion of the system into underserved areas (Williams, 2012). Buck (2012) conducted a survey and found that several operators have implemented, or have plans to implement, strategies to address equity. Out of 20 responses from the U.S. and Canada, 35% had existing stations sited based on equity reasons, 35% subsidized membership, 25% had annual membership payment plans, 25% assisted low-income members to obtain bank accounts and credit/debit cards, and 25% did not hold a security deposit on low-income users’ credit/debit cards.

Advent of Helmet Dispensing Options: All public bikesharing programs interviewed support bicycle safety and encourage helmet usage. A number of programs are actively trying to develop helmet dispensing and other innovative technologies to encourage helmet use and enhance user safety. Helmet laws have been frequently identified as a challenge to successful bikesharing operation. Compulsory helmet laws in Australia and New Zealand have been cited as key reasons for under-performance and low usage of bikesharing systems (Davies, 2012). In February 2013, vendor SandVault unveiled its prototype for a helmet dispensing machine in Vancouver, British Columbia. The solar-powered machine enables users to swipe a card, select a size and style helmet, and borrow a RFID-equipped helmet for short-term use, returning it for cleaning when the user’s bike rental is complete (Jackson, 2013). Other vendors are currently developing similar prototypes for helmet dispensing machines. The City of Vancouver (2013) released further details of their proposed helmet vending machine—the machine will integrate helmet vending with a return receptacle. Each machine will hold 30 helmets, tracked by RFID, and offer two different sizes. Upon return, the staff will take the helmets offsite to be sanitized. In Boston, HelmetHub (pictured below) launched its first helmet dispensing kiosks in November 2013 to encourage helmet use for Hubway users. The system employs similar RFID-equipped helmets and was the first system in North America to feature such kiosks despite not having a compulsory helmet law.

Figure 2. A HelmetHub Station Adjacent to Hubway Docks

Peer-to-Peer Bikesharing: In 2012, Spinlister, a smartphone application, launched a peer-to-peer bicycle rental marketplace where a bike owner can make their bicycle available to others for short time periods, enabling direct exchanges between individuals via the Internet. The service is available in over 40 countries and provides insurance for listings in the U.S. and Canada (Spinlister, 2012). Spinlister is one example of a P2P marketplace exclusively offering personal bicycle sharing.

In 2013, the company BitLock created a keyless bike lock accessed via smartphone. A single user or multiple users, depending on the owner's preference, can unlock the lock. The product is currently available only for pre-order, and the first locks are expected to begin shipment in August 2014 (BitLock, 2014).

Figure 3. The App Interface for Spinlister (left) and BitLock (right)

Introduction of Dockless and Geo-Fencing Technologies: A number of bikesharing startups, including Social Bicycles (known as SoBi) are launching dockless or flexible docking bikesharing systems featuring "smart-bikes." By hosting the locking mechanism on the bike rather than the dock, dockless and flexible docking systems enable users to pick-up and drop-off bicycles anywhere within a geographic area by locking the bicycle to a bikesharing station, existing bicycle parking, street furniture, or a designated bikesharing rack. Users identify bicycle availability and locations in real-time through mobile or Internet applications or via bikesharing kiosk screens. The geographic proximity of bikesharing (docked and dockless systems) can be limited through "geo-fencing." A geo-fence is a virtual perimeter, which limits the range of mobility of an enabled bicycle by comparing the GPS-satellite coordinates of the bicycle to the allowable geographic area.

Research and Limited Deployment of Dynamic Pricing: In the past year, there has been a growing body of academic research on the potential of dynamic pricing for bikesharing programs. The goal of location-based and dynamic pricing is to use pricing mechanisms to encourage self-rebalancing of the bikesharing fleet among docking stations by system users in contrast to manual rebalancing by truck. Recent studies have examined various heuristic methods and pricing strategies for rebalancing optimization (Chemla et al., 2013; Lin and Chou, 2012; Rainer-Harbach et al., 2013; Schuijbroek et al., 2013) Early attempts to encourage system self-balancing were started in Paris' Vélib where users are given free extra time to return bicycles to higher elevation kiosks. In 2011, Capital Bikeshare initiated its "Reverse Riders Rewards" program to provide an incentive for its annual members to self-balance the system during peak hours between Monday and Friday 8-10AM. More recently, a program in suburban Beijing also offers users a credit to encourage "reverse ridership" against peak directional flows (Vélo-City, unpublished data, June 2012). A 2013 study applied a dynamic pricing model to London's Barclay's Cycle Hire system, minimizing operating costs by balancing user reward payouts (i.e., incentives given for users to self-rebalance bicycles) against the cost of hiring staff to rebalance. It found that user-rebalancing incentives were a viable option when the commute peak period was less prominent, indicating that staff was needed on weekdays to maintain a certain level of service (Pfrommer et al., 2013). Incentivized bicycle rebalancing and dynamic pricing is expected to be a component of Social Bicycles' North American systems launched in 2014.

Figure 4. The Social Bicycles App Showing a Geo-Fence Around the Operations Area

Public Bike System Company (PBSC) Files for Bankruptcy Protection in January 2014: On January 21, 2014, North America's largest equipment supplier, PBSC (also referred to as "BIXI"), filed for bankruptcy protection. This was the culmination of a tumultuous 2013 for the company, which is based in Montreal, Canada. In March, the company's CEO, Alain Ayotte, stepped down after being with PBSC since its launch. In late-May 2013, PBSC's equipment was deployed on the streets of New York City as part of the Citi Bike program. Shortly after, in early June, Aspen, CO became home to a PBSC bikesharing system operated by a local non-profit. With the help of bikesharing operator Alta Bicycle Share, PBSC's equipment was launched in two more cities that summer: Chicago, IL and Columbus, OH. During Summer 2013, speculation of PBSC's inability to repay its debts became more significant and in September, after performing an audit of PBSC's finances, Montreal's Auditor General expressed serious doubts in its abilities to pay back its debts. A few months later, the company filed for bankruptcy protection.

The impact of this filing has not yet fully materialized. However, at least some cities (i.e., Vancouver and Seattle, WA) that had planned to be host to PBSC equipment in 2014 are looking for other equipment suppliers. In February 2014, the City of Montreal purchased PBSC's local assets to ensure that the system would remain in service through 2014. In April 2014, Bruno Rodi, a Canadian entrepreneur, purchased PBSC in a public bid for US$4 million. At present, REQX Ventures (an investment firm) is negotiating a deal to acquire a majority stake of Alta Bicycle Share. Interestingly, REQX Ventures attempted to bid on PBSC but did not win the bid because they submitted it past the deadline.

Additional Bikesharing Research: Several new reputable research documents have been published about bikesharing since the Phase I MTI bikesharing report was released in 2012. Two publications are of particular note given their thoroughness: 1) The Bike-Share Planning Guide written by the Institute for Transportation and Development Policy (ITDP, 2013) and 2) two web articles published by the Earth Policy Institute, "Dozens of U.S. Cities Board the Bike-Sharing Bandwagon" (Larsen, 2013) and "Bike-Sharing Programs Hit the Streets in Over 500 Cities Worldwide" (Larsen, 2013).

The Bike-Share Planning Guide, published in December 2013, provides a concrete set of methods to effectively implement a successful bikesharing program. To define success, the document identifies several metrics, which the study's authors believe predicate a "world-class" bikesharing system. The two primary metrics identified are: 1) the average number of daily uses per bike, which provides a market penetration measurement and 2) the average number of daily trips per resident, which provides a measurement for infrastructure usage. The study also provides a list of the performance of approximately 24 bikesharing systems based on an analysis of these metrics.

The two articles featured on the Earth Policy Institute's website, written by Research Director Janet Larsen, provide a holistic view of bikesharing numbers at both a national and international level. The articles identify at the time they were published, in April and May 2013, that the worldwide bikesharing numbers had reached over 500,000 bikesharing bicycles and 500 programs in 49 countries worldwide. In the U.S., Larson claimed that the nation's bikesharing fleet was expected to quadruple over the next couple of years, going from 9,000 to 36,000, and the number of cities that have bikesharing programs was expected to double from Spring 2013 to Spring 2014.

III. PUBLIC BIKESHARING BY THE NUMBERS

Chapter three includes a summary of basic and detailed metrics for public bikesharing in North America. Basic metrics include the number of program launches, suspensions, and program closures; the number of long-term users (annual and seasonal); the number of short-term users (1-30 day); and the number of kiosks and docking points. Detailed metrics include the percentage of casual users (short-term) and members (long-term) as a total of bikesharing usage; bike-to-dock ratios; and bike-to-user ratios. For definitions of bikesharing user and member types, please see Table 3 below. This chapter concludes with resident versus tourist usage rates (by applicable region), reciprocity agreements, planned programs, and locations exploring bikesharing.

Table 3. Definitions of Bikesharing Membership and User Types

Membership and User Types	Definition
Casual User	A short-term user who holds membership from one to thirty days.
Member	Someone who holds an annual or monthly membership.
Occasional Membership	A membership option offered at three PBSC systems, beginning in March 2013, which allows short-term users to receive a free key fob. Every time the key fob is swiped, the user receives a discounted 24-hour pass.

Methodology

Between January and March 2013, the authors interviewed 23 of 28 bikesharing programs that were operational during the 2012 season. Of the five that did not respond, two were ineligible based on program suspension (i.e., Chicago B-cycle and Golden Community Bike Share), and three were unreachable based on five failed contact attempts made by both phone and email (i.e., DecoBike Miami Beach, DecoBike Long Beach, Hawaii B-cycle). These programs were asked to provide data on the number of users (long-term, casual, and occasional); the number of bicycles; the number of stations; and the number of docking points their program had at the close of the 2012 season. A map of the program locations operational during the 2012 season is provided in Figure 5.

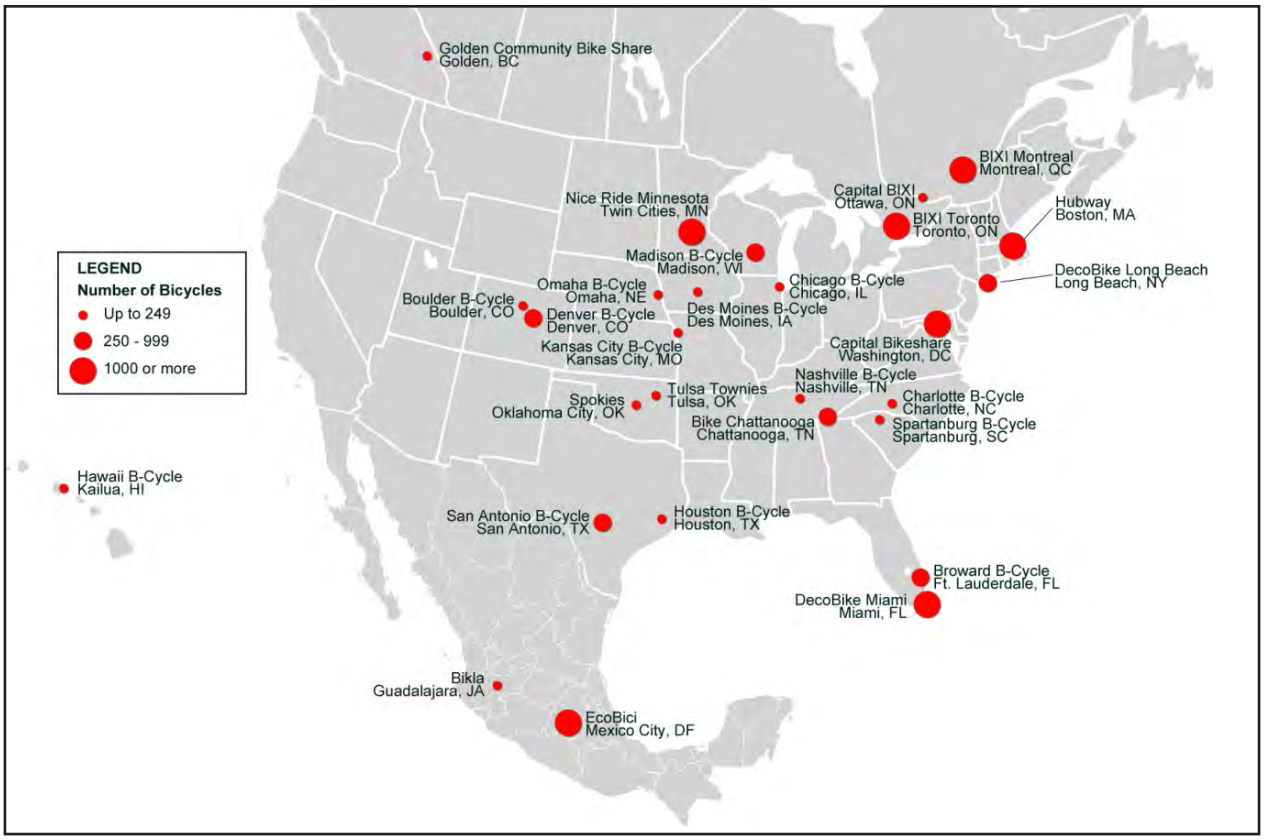

Figure 5. IT-Based Public Bikesharing Systems in North America During the 2012 Season (N=28)

Basic Metrics

Between 2007 and the close of the 2012, there were 22 IT-based bikesharing program startups, one program suspension, and two program closures in the U.S. Since 2009, there have been four program launches and one program suspension in Canada. Since 2008, there have been three program launches and one suspension in Mexico. In the U.S., DecoBike Long Beach NY has temporarily suspended operations until the completed reconstruction of the boardwalk following Hurricane Sandy (October 2012). In Canada, Golden Community Bikeshare in Golden, British Columbia has temporarily suspended operations for one season for municipal fiscal austerity measures. In Mexico, Bikla temporarily suspended operations pending system-wide upgrades. From January 2013 to January 2014, an additional 14 public bikesharing programs have launched operations (listed in order of launch date):

1. Bike Nation in Anaheim, CA;
2. GREENBike in Salt Lake City, UT;
3. Greenville B-cycle in Greenville, SC;
4. Fort Worth B-cycle in Fort Worth, TX;

5. Citi Bike in New York City, NY;
6. WE-cycle in Aspen, CO;
7. 5B Bikeshare in Sun Valley, ID;
8. Divvy in Chicago, IL;
9. CoGo in Columbus, OH;
10. Bay Area Bike Share in the San Francisco Bay Area, CA;
11. Midwest Bikeshare in Milwaukee, WI (limited initial launch);
12. Capital Community Bike Share in Lansing, MI (limited initial launch);
13. SmartBike in Puebla, Mexico; and
14. Austin B-cycle in Austin, TX.

Of those programs, Anaheim is the only system that is no longer in operation. In addition to the aforementioned programs, a pilot program was launched in Hoboken, NJ featuring Social Bicycles equipment. The program's pilot period ended in November 2013, and the region is now looking to establish a permanent system with the European-based company NextBike. Thus, as of the end of 2013, there were 37 IT-based public bikesharing systems operating in North America as shown in Figure 6 below.

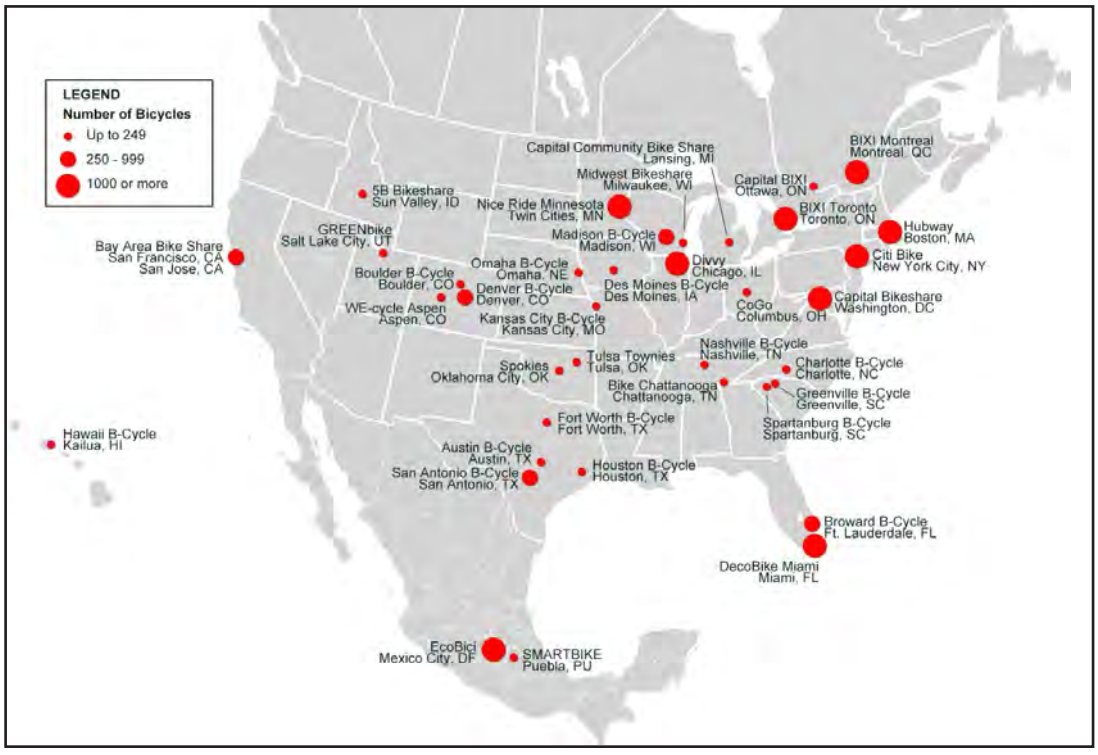

Figure 6. IT-Based Public Bikesharing Programs Operating in 2013 (n=37)

See Figure 7 below that shows the launch year of each program.

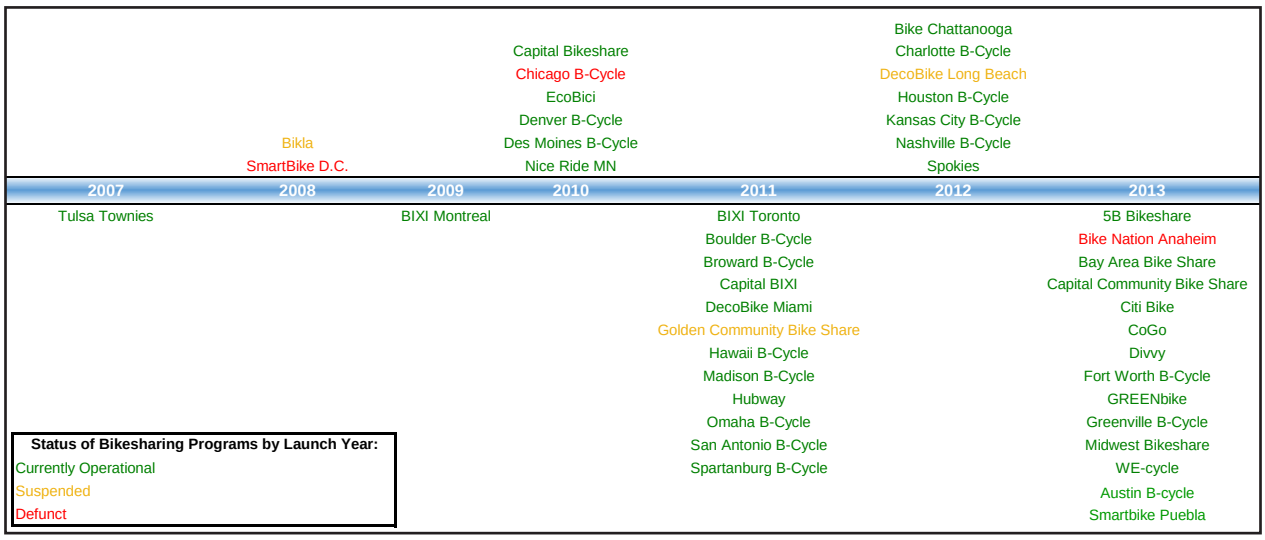

Figure 7. Timeline of North American Bikesharing Program Launches (2007-2013)

Table 4, below, summarizes the number of annual members and short term-users (casual and occasional), as well as the number of bicycles, kiosks, and docking points for the 22 IT-based bikesharing program locations in the United States, four in Canada, and two in Mexico that were operating during the 2012 season.

Table 4. IT-Based Public Bikesharing in North America During the 2012 Season

	United States	Canada	Mexico	North American Total
Number of programs	22	4	2	28
Total Number of users	884,442[b]	197,419[a]	71,611	1,153,472[b]
Number of members	41,695[b]	53,707	71,611	167,013[b]
Number of casual users, 1-30 Day	842,747[b]	143,312	0	986,059[b]
Number of bicycles	7,549	6,115	3,680	17,344
Number of kiosks	800	492	307	1,599
Number of docks	12,955	10,506	7,487	30,948

[a] Note BIXI Montreal had an additional 400 occasional users. Occasional users maintain a key and are billed a 24 hour membership when the key is used.

[b] These numbers are an approximation because of the suspension of DecoBike Long Beach operations due to Hurricane Sandy in October 2012.

Table 5. IT-Based Public Bikesharing Programs in North America During 2012 Season (n=28)

Program	Location	Total Users	Members (Annual / Seasonal)	Casual (Short-Term) Users (1-30 Day)	Bicycles	Stations	Docks
United States (Total)[a]		***764,796***	***41,547***	***723,222***	***7,549***	***800***	***12,955***
Bike Chattanooga	Chattanooga, TN	3,386	386	3,000	300	30	482
Boulder B-cycle	Boulder, CO	6,000	1,000	5,000	140	22	276
Broward B-cycle	Ft. Lauderdale, FL	15,994	426	15,568	275	27	297
Capital Bikeshare	Washington, DC	81,737	18,737	63,000	1,200	130	2,400
Charlotte B-cycle	Charlotte, NC	7,675	375	7,300	200	20	280
Chicago B-cycle[b]	Chicago, IL	NA	NA	NA	100	7	150
DecoBike Long Beach	Long Beach, NY	NA	NA	NA	400	20	568
DecoBike Miami Beach	Miami Beach, FL	307,000	3,000	304,000	1,000	89	Unavailable
Denver B-cycle	Denver, CO	27,291	2,734	24,557	530	53	1,060
Des Moines B-cycle	Des Moines, IA	1,769	32	1,737	22	5	44
Hawaii B-cycle	Kailua, HI	475	25	450	12	2	20
Houston B-cycle	Houston, TX	1,329	57	1,272	18	3	28
Hubway	Boston, MA	174,646	7,042	167,604	1,000	105	1,785
Kansas City B-cycle	Kansas City, MO	2,173	172	2,001	90	12	132
Madison B-cycle	Madison, WI	13,860	2,150	11,710	300	32	500
Nashville B-cycle	Nashville, TN	1,363	166	1,197	190	20	241
Nice Ride Minnesota	Twin Cities, MN	44,628	3,500	41,128	1,325	145	2,409
Omaha B-cycle	Omaha, NE	829	16	813	33	5	47
San Antonio B-cycle	San Antonio, TX	18,061	1,642	16,419	300	35	600
Spartanburg B-cycle	Spartanburg, SC	1,415	74	1,341	14	2	20
Spokies	Oklahoma, City	55,165	40	55,125	70	7	144
Tulsa Townies	Tulsa, OK	Unavailable	Not Offered	Unavailable	30	3	48
Canada (Total)		***197,419***	***53,707***	***143,312***	***6,115***	***492***	***10,506***
BIXI Montreal[c]	Montreal, QC	149,617	49,217	100,000	5,000	400	8,500
BIXI Toronto	Toronto, ON	38,605	4,185	34,420	1,000	80	1,488
Capital BIXI	Ottawa, ON	8,997	305	8,692	100	10	494
Golden Community Bikeshare	Golden, BC	200	0	200	15	2	24
Mexico (Total)		***71,611***	***71,611***	***0***	***3,680***	***301***	***7,487***

Program	Location	Total Users	Members (Annual / Seasonal)	Casual (Short-Term) Users (1-30 Day)	Bicycles	Stations	Docks
Bikla	Guadalajara, JAL	1,151	1,511	0	150	40	320
EcoBici	Mexico City, DF	70,100	70,100	0	3,530	261	7,167
North America (Total)		***1,033,466***	***166,892***	***866,534***	***17,344***	***1,567***	***29,524***

Notes:

[a] These figures are approximations due to estimated reporting methods from some operators.

[b] Chicago B-cycle, a pilot program, was ineligible to respond to the survey because it ceased operations in 2012.

[c] BIXI Montreal had an additional 400 occasional users. Occasional users have a key and are billed a 24-hour membership when the key is used.

Detailed Metrics

In North America, casual (short-term) users accounted for 85% of all bikesharing users during the 2012 season. Among all North American programs, Bikla and EcoBici had the lowest percentage of short-term users (they only offered annual or seasonal membership), and Tulsa Townies had the highest percentage of short-term users (100%), as Tulsa Townies does not offer any usage other than walk-up transactions. Excluding these special cases, BIXI Montreal had the lowest percentage of short-term users (67%), and Spokies had the highest percentage (99.9%).

Table 6 summarizes percent of short- and long-term users, user-to-bike ratio, and dock-to-bike ratio for all 28 IT-based bikesharing programs operational in North America during 2012.

Member-to-bike ratios were also calculated for both long-term and short-term users. Omaha B-cycle had the lowest long-term member-to-bike ratio (0.5:1), while EcoBici had the highest (19.9:1). Short-term member-to-bike ratios varied dramatically across operators. Nashville B-cycle had the lowest short-term member-to-bike ratio (6.3:1), while Spokies had the highest (787.5:1).

Dock-to-bike ratios are an important metric that often dictates the frequency of fleet rebalancing. A higher average dock-to-bike ratio requires less rebalancing, as there are more empty docks. Both the U.S. and Canada had the same average dock-to-bike ratio of 1.72:1, while Mexico was higher at 2.03:1. Broward B-cycle had the lowest dock-to-bike ratio (1.08:1), while Capital BIXI had the highest (4.94:1).

Table 6. Existing IT-Based Public Bikesharing Programs in North America as of January 2013 (n=28)

Program	Location	Percent Long-Term Users	Percent Short-Term Users	Long-Term Member-to-Bike Ratio	Short-Term User-to-Bike Ratio	Dock-To-Bike Ratio
United States Average		***7.6***	***92.4***	***3.7***	***87***	***1.72***
Bike Chattanooga	Chattanooga, TN	11.4	88.6	1.3	10.0	1.61
Boulder B-cycle	Boulder, CO	16.7	83.3	7.1	35.7	1.97
Broward B-cycle	Ft. Lauderdale, FL	2.7	97.3	1.5	56.6	1.08
Capital Bikeshare	Washington, DC	22.9	77.1	15.6	52.5	2.00
Charlotte B-cycle	Charlotte, NC	4.9	95.1	1.9	36.5	1.40
Chicago B-cycle	Chicago, IL	NA	NA	NA	NA	1.50
DecoBike Long Beach	Long Beach, NY	NA	NA	NA	NA	1.42
DecoBike Miami	Miami, FL	NA	NA	NA	NA	1.42
Denver B-cycle	Denver, CO	10.0	90.0	5.2	46.3	2.00
Des Moines B-cycle	Des Moines, IA	1.8	98.2	1.5	79.0	2.00
Hawaii B-cycle	Kailua, HI	5.3	94.7	2.1	37.5	1.67
Houston B-cycle	Houston, TX	4.3	95.7	2.9	70.1	1.56
Hubway	Boston, MA	4.0	96.0	7.0	167.6	1.79
Kansas City B-cycle	Kansas City, MO	7.9	92.1	1.9	22.2	1.47
Madison B-cycle	Madison, WI	15.5	84.5	7.2	39.0	1.67
Nashville B-cycle	Nashville, TN	12.2	87.8	0.9	6.3	1.27
Nice Ride Minnesota	Twin Cities, MN	7.8	92.2	2.6	31.0	1.82
Omaha B-cycle	Omaha, NE	1.9	98.1	0.5	24.6	1.42
San Antonio B-cycle	San Antonio, TX	9.1	90.9	5.5	54.7	2.00
Spartanburg B-cycle	Spartanburg, SC	5.2	94.8	5.3	95.8	1.43
Spokies	Oklahoma City, OK	0.1	99.9	0.6	787.5	2.06
Tulsa Townies	Tulsa, OK	0	100.0	NA	NA	1.60
Canada Average		***27.2***	***72.6***	***8.8***	***23.4***	***1.72***
BIXI Montreal	Montreal, QC	32.9	66.8	9.8	20.0	1.70
BIXI Toronto	Toronto, ON	10.8	89.2	4.2	34.4	1.49
Capital BIXI	Ottawa, ON	3.4	96.6	3.1	86.9	4.94
Golden Community Bikeshare	Golden, BC	0	100.0	0	13.3	1.60

Program	Location	Percent Long-Term Users	Percent Short-Term Users	Long-Term Member-to-Bike Ratio	Short-Term User-to-Bike Ratio	Dock-To-Bike Ratio
Mexico Average		***100***	***0***	***19.5***	***NA***	***2.03***
Bikla	Guadalajara, JAL	100	0	10.1	NA	2.13
EcoBici	Mexico City, DF	100	0	19.9	NA	2.03
North America Average		***15.6***	***84.4***	***4.90***	***72.3***	***1.79***

Resident Compared to Visitor Usage

Not surprisingly, there are important distinctions between resident bikesharing users and visitors in terms of origins and destinations, as well as trip purpose. These distinctions are not well tracked or studied among the bikesharing programs, at present. During the operator interviews conducted in Spring 2013, programs were asked to provide data on resident versus visitor usage within their systems. Ten out of 18 U.S. programs tracked resident versus tourist users via zip code. Based on the aggregate totals among these 10 bikesharing programs, short-term bikesharing usage (passes 30 days or less) by visitors ranged between 15% and 67% of usage, averaging 46% (n=10/18). In Mexico, EcoBici and Bikla had much lower rates of short-term usage by visitors (seasonal membership), ranging from 0% to 5%, averaging 2.5% (n=2/2). This figure is relatively small largely because EcoBici does not allow for casual memberships. Operators in Canada did not provide data on resident versus visitor usage. Generally, programs co-located in tourist destinations indicated higher levels of patronage by visitors (e.g., programs in Southern California, Colorado, and Florida).

Reciprocity Agreements

In March 2013, B-cycle launched its “B-connected” functionality in 13 cities, enabling usage reciprocity agreements among B-cycle programs, which can voluntarily opt in or out of the program. The B-connected program marks the first successful effort at achieving reciprocal functionality across multiple bikesharing program locations in North America. Previously, the B-connected program had been piloted by the Denver, Boulder, and Madison B-cycle programs in 2012 and early 2013.

Programs Launched in 2013 and Exploratory Locations

As of the end of 2013, 14 programs launched. There were at least 25 locations exploring public bikesharing with launch timeframes in 2014 or still unannounced, as of December 2013. See Figure 8 for a map of 2013 launched programs and locations considering the launch of public bikesharing.

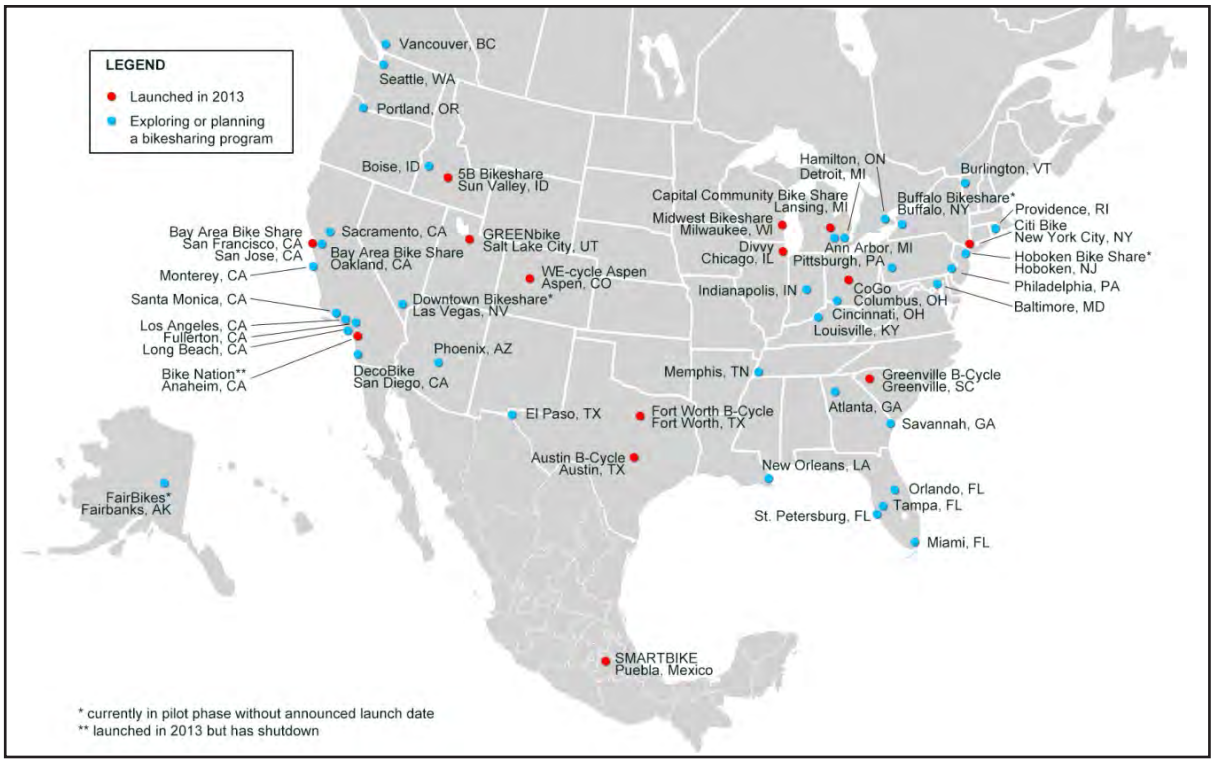

Figure 8. Locations with Launched, Planned (2014), or Exploring IT-Based Public Bikesharing Systems

IV. THE BUSINESS OF BIKESHARING

Chapter four examines bikesharing business models and the financial (revenue and expenditures) aspects of public bikesharing in North America. In this chapter, the authors conclude with an "industry-average" financial model that can be used by existing and planned programs for long-term planning.

Methodology

The authors collected pricing data from the Internet for 26 out of 28 program locations operational in North America during the 2012 season. The authors were able to obtain incomplete pricing information for the suspended Golden Community Bike Share. Data for the now defunct Chicago B-cycle was unavailable. The authors supplemented this section with operator interviews of 23 operational programs in North America as of April 2013. Of the five that did not respond, two were ineligible based on program suspension (Chicago B-cycle and Golden Community Bike Share), and three were unreachable based on five failed contact attempts made by both phone and email. The purpose of the expert interviews was to obtain additional information on membership retention, discounts, operational income and expenditures, expansion costs, and scaling for growth. Please see Chapter 1 for a complete list of the programs included in these interviews. Note that respondent data are limited throughout this chapter; thus, the data can provide insights but, in many cases, are not representative of the full operator population.

Business Models

A number of public bikesharing business models have evolved with the advent of IT-based systems. These include the following in North America: 1) non-profit, 2) privately owned and operated, 3) publicly owned and operated, 4) public owned/contractor operated, and 5) vendor operated. There can be overlap among these models due to variations in ownership, system administration, and operations. A description of each business model is provided in Table 7, while Table 8 shows public bikesharing business models by program.

Table 7. North American Public Bikesharing Business Models

Business Model	Definition	Example
Non-Profit	• Goal of covering operational costs and expanding service • Start-up and operational funding typically are supported by grants, sponsorships, and loans	Denver B-cycle; Nice Ride MN
Privately Owned and Operated	• Owned and operated by a private entity • Operator provides all funding for equipment and operations • May have limited contractual agreement with public entities for rights-of-way	DecoBike MB
Publicly Owned and Operated	• Owned and operated by a public agency or local government • Agency subsidizes bikesharing with system revenue	Golden Community Bike Share
Publicly Owned/ Contractor Operated	• Owned by a public agency or local government responsible for funding and administering the system • Operations are contracted to a private operator	Capital Bikeshare; Capital BIXI
Vendor Operated	• Operated by the same company that designs and/or manufactures the system equipment (the vendor)	Madison B-cycle; Broward B-cycle

Table 8. North American IT-Based Public Bikesharing Business Models by Program (n=40)

Program	Location	Year Launched	Operational Status	Business Model
Canada				
BIXI Montreal	Montreal, QC	2009	Ongoing	Non-Profit
BIXI Toronto	Toronto, ON	2011	Ongoing	Privately Owned/Operated
Capital BIXI	Ottawa, ON	2011	Ongoing	Publicly Owned/Contractor Operated
Golden Community Bike Share	Golden, BC	2011	Suspended (2012)	Publicly Owned/Operated
Mexico				
Bikla	Guadalajara, JAL	2008	Suspended (2013)	Privately Owned/Operated
EcoBici	Mexico City, DF	2010	Ongoing	Publicly Owned/Contractor Operated
Puebla Smart Bike	Puebla, PU	2013	Ongoing	(Unknown)
United States				
Tulsa Townies	Tulsa, OK	2007	Ongoing	Non-Profit
SmartBike D.C.	Washington, D.C.	2008	Canceled (2011)	Street Furniture Contract
Capital Bikeshare	Washington, D.C. Metropolitan Area	2010	Ongoing	Publicly Owned/Contractor Operated
Chicago B-cycle	Chicago, IL	2010	Canceled (2012)	Privately Owned/Operated
Denver B-cycle	Denver, CO	2010	Ongoing	Non-Profit
Des Moines B-cycle	Des Moines, IA	2010	Ongoing	Non-Profit
Nice Ride Minnesota	Twin Cities (Minneapolis, MN; St. Paul, MN)	2010	Ongoing	Non-Profit
Boulder B-cycle	Boulder, CO	2011	Ongoing	Non-Profit
Broward B-cycle	Ft. Lauderdale, FL	2011	Ongoing	Non-Profit
DecoBike Miami	Miami Beach, FL	2011	Ongoing	Privately Owned/Operated
Hawaii B-cycle	Kailua, HI	2011	Ongoing	Privately Owned/Operated
Madison B-cycle	Madison, WI	2011	Ongoing	Non-Profit
Hubway	Boston, MA	2011	Ongoing	Publicly Owned/Contractor Operated
Omaha B-cycle	Omaha, NE	2011	Ongoing	Non-Profit
San Antonio B-cycle	San Antonio, TX	2011	Ongoing	Non-Profit
Spartanburg B-cycle	Spartanburg, SC	2011	Ongoing	Non-Profit
Bike Chattanooga	Chattanooga, TN	2012	Ongoing	Publicly Owned/Contractor Operated
Charlotte B-cycle	Charlotte, NC	2012	Ongoing	Non-Profit
DecoBike Long Beach	Long Beach, NY	2012	Suspended (2012)	Privately Owned/Operated
Houston B-cycle	Houston, TX	2012	Ongoing	Non-Profit

Program	Location	Year Launched	Operational Status	Business Model
Kansas City B-cycle	Kansas City, MO	2012	Ongoing	Non-Profit
Nashville B-cycle	Nashville, TN	2012	Ongoing	Non-Profit
Spokies	Oklahoma City, OK	2012	Ongoing	Publicly Owned/Contractor Operated
5B Bikeshare	Sun Valley, ID	2013	Ongoing	Publicly Owned/Contractor Operated
Austin B-cycle	Austin, TX	2013	Ongoing	Non-Profit
Bay Area Bike Share	San Francisco, CA	2013	Ongoing	Publicly Owned/Contractor Operated
Bike Nation	Anaheim, CA	2013	Ongoing	Vendor Operated
Capital Community Bike Share	Lansing, MI	2013	Ongoing	(unknown)
Citi Bike	New York City, NY	2013	Ongoing	Publicly Owned/Contractor Operated
CoGo	Columbus, OH	2013	Ongoing	Publicly Owned/Contractor Operated
Divvy	Chicago, IL	2013	Ongoing	Publicly Owned/Contractor Operated
Fort Worth B-cycle	Ft. Worth, TX	2013	Ongoing	Non-Profit
GREENBike	Salt Lake City, UT	2013	Ongoing	Non-Profit
Greenville B-cycle	Greenville, SC	2013	Ongoing	Non-Profit
Midwest Bikeshare	Milwaukee, WI	2013	Ongoing	Non-Profit
WE-cycle	Aspen, CO	2013	Ongoing	Non-Profit

Operational Income: North American Public Bikesharing Revenue

Membership fees, usage fees, and sponsorships account for the vast majority of operating income for North American public bikesharing programs.

Programs operational as of March 2013 (i.e., the time of the operational interviews), were asked to provide two sets of financial data: 1) income from long-term (annual or seasonal) and casual/short-term (1-30 day passes) users; and 2) operational income based on category (e.g., revenue sources, such as membership fees and usage fees). The data that the bikesharing operators were able to provide are reported here.

Four U.S. programs indicated long-term users contributed between 3.6% and 33% of overall revenue (averaging 16.9%) compared to casual (short-term) users, which attributed between 44% and 67% of overall revenue (averaging 53.4%). One program in Mexico stated 0% of their income was from casual users because they did not offer short-term memberships. A summary of the responses is included in Table 9.

Table 9. Percent Revenue between Casual (Short-Term) and Members (Long-Term) in North America (n=4)

Program	Percent Revenue from Members	Percent Revenue from Casual Users
Program 1 Publicly Owned, Contractor Operated	15%	44%
Program 2 Publicly Owned, Contractor Operated	33%	67%
Program 3 Non-profit	16.1%	48.4%
Program 4 Non-profit	3.6%	54%

Five U.S. programs (23%) provided detailed financial information about the operational revenue from their programs (n=5/22); a limited number responded to this question given the proprietary nature of these data. Four of these programs are non-profits; one is publicly owned and contractor operated. The program names have been withheld to protect proprietary financial information. The programs categorize their operating income into six categories: 1) advertising sales, 2) gifts, 3) grants, 4) sponsorships, 5) membership fees, and 6) usage fees. Membership fees comprised between 3.7% and 41.0% of operating revenue, averaging 21.7% among four programs. Usage fees included between 4.4% and 33.0%, averaging 18.5% of operating revenue among four programs. All five programs had sponsorships ranging from 10.7% to 100% of operating revenue, averaging 41.7%. See Table 10 for a breakdown by program.

Table 10. Percent Operating Revenue by Category for Five U.S. Public Bikesharing Programs (n=5)

Program		Advertising Sales	Gifts	Grants	Membership Fees	Usage Fees	Sponsorships
Program 1 Non-profit		0%	0.5%	5.3%	28.6%	16.6%	48.9%
Program 2 Non-profit		52.5%	0%	0%	3.7%	33%	10.7%
Program 3 Publicly owned, Contractor operated		0%	0%	71.1%	13.3%	4.4%	11.1%
Program 4 Non-profit		1%	0%	0%	41%	20%	38%
Program 5 Non-profit		0%	0%	0%	0%	0%	100%
	High	52.5%	0.5%	71.1%	41%	33%	100%
	Mean	26.8%	0.5%	38.2%	21.7%	18.5%	41.7%
	Low	1%	0.5%	5.3%	3.7%	4.4%	10.7%

Subscription costs and usage fees for the 2012 season are listed in Table 11 through Table 13. During the 2012 season, 20 U.S. programs charged for daily memberships with an average cost of US$7.77; three programs offered three-day subscriptions averaging US$17.33; six programs offered week-long passes averaging US$16.50; and 12 programs offered month-long plans averaging US$28.09. Eighteen programs offered seasonal or year-long memberships averaging US$62.46 (n=18/22). Tulsa Townies, which provides free usage for up to 24 hours, was excluded from these averages.

In Canada, four programs charged for daily memberships with an average cost of US$7.25; three programs offered three-day passes averaging US$14.00; four programs offered monthly passes averaging US$33.88; and four programs offered seasonal or year-long memberships averaging US$79.00 (n=4/4). In Mexico, one program offered a daily pass for US$12.00; one provided a monthly pass for US$4.00; and two programs offered annual subscriptions averaging US$24.00 (n=2/2). Note: all prices are shown in USD (Exchange rates were 1CAD:1USD and 1MXN:0.08USD).

In the 2012 season, all U.S. programs provided free usage for the first 30 minutes. Fifteen U.S. programs had a daily usage maximum for casual users averaging US$67.88. Seventeen U.S. programs had a daily usage maximum averaging US$64.39 between all users. In Canada, all programs provided free usage for the first 30 minutes. In Mexico, one program provided free usage from 0 through 45 minutes, while another program charged for use ranging from US$0.12 to $0.20 for the first 45 minutes. In Mexico, both EcoBici and Bikla track users who check-out bicycles in excess of two and three hours, respectively. Each user with a check-out exceeding this length receives a penalty, and after three penalties, he or she is dropped from the program.

Table 11. Cost of Public Bikesharing in the U.S. (2012 Season) (U.S. Dollars) (n=22)

		Subscription Cost					Trip Usage Fees (Minutes)					
Organization Name	**Location**	**24-hr**	**3-day**	**7-day**	**Month**	**Seasonal or Year**	**0-30**	**31-60**	**61-90**	**+30**	**Daily Max Casual Users**	**Daily Max Members**
Bike Chattanooga	Chattanooga, TN	$6.00				$75.00	Free	Free	+$5.00	+$5.00	$100.00	$100.00
Boulder B-cycle	Boulder, CO	$5.00		$15.00		$55.00	Free	Free	+$4.00	+$4.00		
Broward B-cycle	Ft. Lauderdale, FL	$5.00	$25.00			$45.00	Free	+$1.00	+$2.00	+$4.00	$50.00	$50.00
Capital Bikeshare	Washington, D.C.	$7.00	$15.00		$25.00	$75.00	Free	+$1.50	+$3.00	+$6.00	$94.00	$70.50
Charlotte B-cycle	Charlotte, NC	$8.00				$65.00	Free	+$4	+$4.00	+$4.00	$75.00	$75.00
Chicago B-cycle	Chicago, IL	*Data Unavailable*					*Data Unavailable*					
DecoBike Miami Beach	Miami Beach, FL	$24.00			$35.00		Free	Free	+$4.00	+$4.00		$60.00
DecoBike Long Beach	Long Beach, NY	$24.00			$50.00		Free	Free	+$4.00	+$4.00		$60.00
Denver B-cycle	Denver, CO	$8.00		$20.00	$30.00	$80.00	Free	+$1.00	+$4.00	+$4.00		
Des Moines B-cycle	Des Moines, IA	$5.00			$30.00	$50.00	Free	Free	+$1.25	+$1.25	$65.00	$65.00
Hawaii B-cycle	Kailua, HI	$5.00			$30.00	$50.00	Free	+$2.50	+$2.50	+$2.50	$100.00	$100.00
Houston B-cycle	Houston, TX	$5.00		$15.00		$70.00	Free	Free	Free	+$2.00		
Kansas B-cycle	Kansas City, MO	$7.00		$15.00	$25.00	$65.00	Free	+$2.00	+$2.00	+$2.00	$40.00	$40.00
Madison B-cycle	Madison, WI	$5.00				$65.00	Free	+$2.00	+$5.00	+$5.00	$75.00	$75.00
Nashville B-cycle	Nashville, TN	$5.00		$10.00	$15.00	$50.00	Free	Free	+$1.50	+$1.50	$45.00	$45.00
Hubway	Boston, MA	$5.00	$12.00			$85.00	Free	+$2.00	+$4.00	+$8.00	$100.00	$80.00
Nice Ride Minnesota	Twin Cities, MN	$6.00			$30.00	$65.00	Free	+$1.50	+$4.50	+$6.00	$65.00	$65.00
Omaha B-cycle	Omaha, NE	$5.35			$32.10	$64.20	Free	Free	+$1.34	+$1.34	$64.20	$64.20
San Antonio B-cycle	San Antonio, TX	$10.00		$24.00		$60.00	Free	Free	+$2.00	+$2.00	$35.00	$35.00
Spartanburg B-cycle	Spartanburg, SC	$5.00			$15.00	$30.00	Free	Free	+$1.00	+$1.00	$35.00	$35.00
Spokies	Oklahoma City, OK	$5.00			$20.00	$75.00	Free	+$2.00	+$2.00	+$2.00	$75.00	$75.00
Tulsa Townies	Tulsa, OK	*Free if Returned within 24 hours*					*Free if Returned within 24 hours*					
United States Average		***$7.77***	$17.33	***$16.50***	***$28.09***	***$62.46***	Free	+$0.98	+$2.74	+$3.45	***$67.88***	$64.39
United States Median		***$5.00***	$12.00	***$15.00***	***$30.00***	***$65.00***	Free	+$2.00	+$2.25	+$2.00	***$65.00***	$64.20

Table 12. Cost of Public Bikesharing in Canada (2012 Season) (U.S. Dollars) (n=4)

		Subscription Cost				Trip Usage Fees (Minutes)					
Organization Name	**Location**	**24-hr**	**3-day**	**Month**	**Seasonal or Year**	**0-30**	**31-45**	**46-60**	**61-90**	**91-120**	**+30 min**
BIXI Montreal	Montreal, QC	$7.00	$15.00	$30.25	$80.50	Free	Free	+$1.75	+$3.50	+$7.00	+$7.00
BIXI Toronto	Toronto, ON	$5.00	$12.00	$40.00	$95.00	Free	+$1.50	+$1.50	+$4.00	+$8.00	+$8.00
Capital BIXI	Ottawa, ON	$7.00	$15.00	$30.25	$80.50	Free	Free	+$1.75	+$3.50	+$7.00	+$7.00
Golden Community Bike Share	Golden, BC	$10.00		$35.00	$60.00	Free			*Data Unavailable*		
Canadian Average		***$7.25***	***$14.00***	***$33.88***	***$79.00***	***Free***	***+$0.50***	***+$1.67***	***+$3.67***	***+$7.33***	***+$7.33***
Canadian Median		***$7.00***	***$15.00***	***$32.63***	***$80.50***	***Free***	***$1.50***	***$1.75***	***$3.50***	***$7.00***	***$7.00***

Table 13. Cost of Public Bikesharing in Mexico (2012 Season) (U.S. Dollars) (n=2)

		Subscription Cost			Trip Usage Fees (Minutes)					
Organization Name	**Location**	**24-hr**	**Month**	**Year**	**0-30**	**31-45**	**46-60**	**61-90**	**91-120**	**+30 min**
EcoBici	Mexico City, DF			$32.00	Free	Free	+$0.80	+$2.80	+$2.80	
Bikla	Guadalajara, JAL	$12.00[a]	$4.00	$16.00	+$0.24	+$0.40	+$0.40	+$0.64	+$0.80	+$0.80
Mexican Average		***$12.00***	***$4.00***	***$24.00***	***+$0.12***	***+$0.20***	***+$0.60***	***+$1.72***	***+$1.80***	***+$0.80***

[a] Note that the daily pass price is higher than the monthly pass rate. The authors hypothesize that this pricing structure is designed to keep the costs low for Guadalajara residents; however, this conclusion has not been confirmed.

Factors Impacting Profitability

Some programs operational as of March 2013 provided information on four key factors impacting profitability: 1) station location, 2) membership retention, 3) discounts, and 4) new revenue sources.

Bikesharing Station Locations

Operators were asked to provide data on which bikesharing station locations: 1) produce the greatest membership, 2) yield the greatest ridership, and 3) generate the most revenue.

Membership: Fifty percent of responding operators reported that tourist locations (e.g., hotels, monuments, waterfronts) generated the greatest membership (n=8/16). Thirty-one percent indicated that high-density, urban, mixed-use locations co-located with public transit produced the greatest membership (n=5/16). Eighteen percent stated the following locations as generating the greatest membership: 1) university locations, 2) residential locations, and 3) location co-located with a titled program sponsor (n=3/16).

Ridership: Sixty-seven percent indicated that high-density, urban, mixed-use locations co-located with public transit produced the greatest ridership (n=10/15). Twenty percent reported that the location of a linear greenway or similar bike facility produced the greatest ridership (n=3/15). Thirteen percent noted that stations where it “felt safe” to bike and stations nearby automobile parking produced the greatest ridership (n=2/15).

Revenue: Fifty-three percent reported that tourist locations produced the greatest revenue (n=8/15). Twenty-seven percent stated that stations co-located with public transit produced the greatest revenue (n=4/15), and 13% indicated that stations co-located at recreational facilities (e.g., parks and trails) produced the greatest revenue (n=2/15). Seven percent (n=1/15) noted that a station co-located nearby automobile parking produced the greatest revenue. See Figure 9 below.

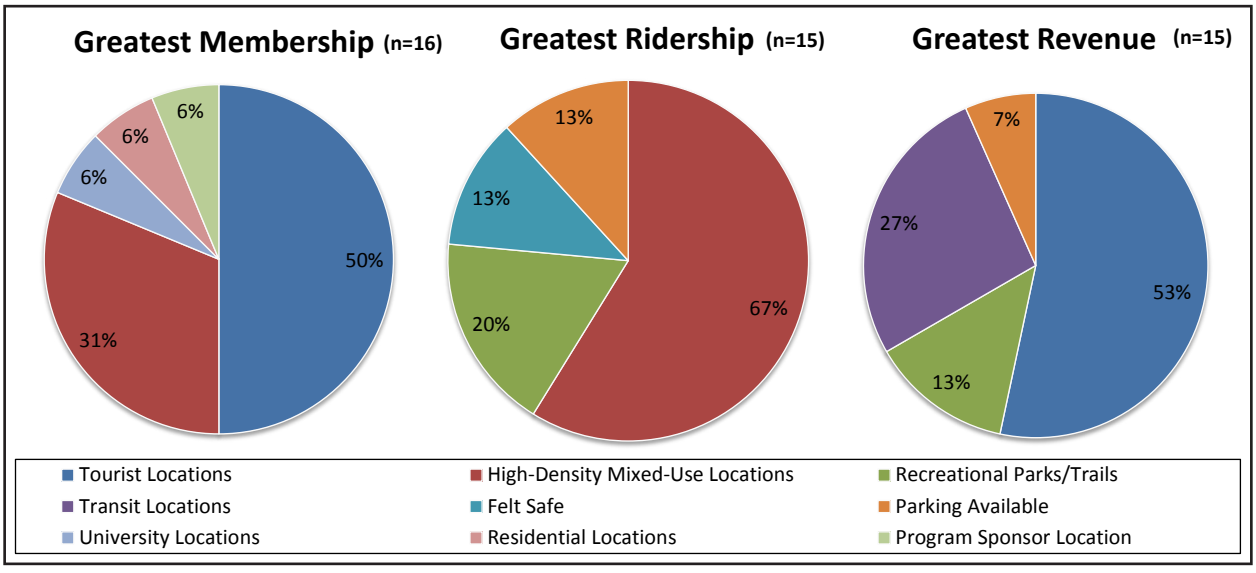

Figure 9. Station Location Metrics (n=15)

In the figure above, it is apparent that station location distinctly affects a station's function or purpose within a bikesharing program. While "High-Density Mixed-Use Locations" account for the greatest ridership in most programs from the sample, not a single operator reported those stations as generating the greatest amount of revenue. Conversely, "Tourist Locations" tend to account for the greatest revenue but not the greatest ridership. This finding is consistent with previous conclusions that casual users—often tourists—account for the greatest revenue within a system and members account for the greatest ridership.

A number of operators indicated a *park-and-ride* phenomenon with their station siting. Twenty-three percent (n=3/13) reported that automobile parking (i.e., "Parking Available") was a prerequisite for station success with respect to membership sales. Twenty-two percent (n=2/9) stated that vehicular parking was a prerequisite for high ridership at their most popular stations. Seven percent noted that a station co-located with vehicle parking produced the greatest revenue (n=1/14). Overall, parking availability was considered an important factor by 43% of the operators when locating a bikesharing kiosk (n=6/14).

Membership Retention

Membership retention is a measure of how many annual or seasonal members renew their subscriptions after they expire. In the United States, eight program locations had been operating more than one season and tracked member retention (as of March 2013). Among these programs, member retention ranged from 20% to 70%, with a median of 70% (n=7/7). In Canada, three program locations estimated their membership retention at 70% (n=3/3).

Discounts

Programs operational as of March 2013 were also asked to indicate what percentage of memberships were sold at a discount. In the United States, five programs indicated selling some discounted memberships. Among these programs, the percentage of memberships sold at a discount ranged from 2.5% to 80%, with a median of 5% (n=5/18). In the U.S., the average discount was 23% (n=4/5). In Canada, three program locations indicated that 5% of their memberships were sold at a discount (n=3/3). In Canada, the average discount was US$25 (n=3/3). No programs in Mexico provided any discounts at the time of the operator interviews.

New Revenue Sources

Nine programs interviewed planned on implementing new revenue sources for 2013. Three planned to offer an occasional user package (i.e., users who maintain a key and are billed a 24-hour membership each time bikesharing is used). Another three programs planned to add new sponsor revenue; another two planned on selling advertising space; and one planned to start an online store.

Operational Expenditures

Only two U.S. programs provided complete financial information on the operational expenditures for their programs. An additional four U.S. programs and one Mexican program shared limited expenditure information for insurance only. Five of these programs are non-profits; two are publicly owned and contractor operated. The program names have been withheld to protect proprietary financial information. The programs categorized their operating expenditures into eight categories: 1) system operation; 2) depreciation and amortization; 3) insurance; 4) payroll; 5) office expenditures; 6) marketing; 7) professional services; and 8) other. Among the two programs providing financial data on expenditures, depreciation and amortization comprised an average of 42%. Payroll expenditures averaged 20%; office costs averaged 3.0%; and marketing averaged 3%. Among the seven programs providing data on insurance costs, these premiums ranged from 1.5% to 7.3% of operating expenditures, averaging 4.8%. Net operating margins for the two programs that provided complete financial information ranged between 2.7% and 30.8%. See Table 14 for a breakdown by program.

Table 14. Percent Operating Expenditures by Category for Five North American Public Bikesharing Programs

Program	System Operation	Depreciation and Amortization	Insurance	Payroll	Office Expenditures	Marketing	Professional Services	Other
Program 1 Non-profit	14.9%	29.9%	5.1%	35.0%	4.1%	3.6%	2.0%	5.3%
Program 2 Non-profit	0%[a]	53.5%	7.3%	4.7%	1.8%	1.5%	0%	31.3%
Program 3 Publicly Owned, Contractor Operated			3.7%					
Program 4 Non-profit			6.8%					
Program 5 Non-profit			2.8%					
Program 6 Non-profit			6.5%					
Program 7 Publicly Owned, Contractor Operated			1.5%					
High	14.9%	53.5%	7.3%	35.0%	4.1%	3.6%	2.0%	31.3%
Mean	14.9%	41.7%	4.8%	19.9%	3.0%	2.6%	2.0%	18.3%
Low	14.9%	29.9%	1.5%	4.7%	1.8%	1.5%	2.0%	5.3%

[a] This operator installed their system and has all casual users (i.e., they do not offer memberships). Minor maintenance is done with government staff. Thus, no costs were reported for this category by the program, as they do not have a specific budget for maintenance—this is covered through the county budget.

Scaling for System Expansion and Capital Expenditures

Expansion of Bicycle Numbers

An important aspect in the expansion of public bikesharing is the growth in the number of bicycles after a city deploys a system. Figure 10 shows the number of bicycles at the end of 2012 and compares it to the original number of bicycles at the time these systems were opened. Data are displayed for 23 systems in which the authors were able to obtain launch and current bicycle data. Across North America, EcoBici (Mexico City) and Nice Ride Minnesota (Twin Cities) added 2,416 and 625 total bicycles, respectively, after their initial system launch. In contrast, BIXI Montreal launched with 5,000 bicycles and has not added any bicycles since initial program deployment in 2009. The length of time that a system has been operating does not appear to affect the level of increase in bicycle numbers, evidenced by Nice Ride Minnesota and EcoBici, which both launched in 2010 and added more bicycles (in absolute and percentage terms) than other systems that launched the same year and years prior. Generally, system expansion in North America after program launch is relatively small to date.

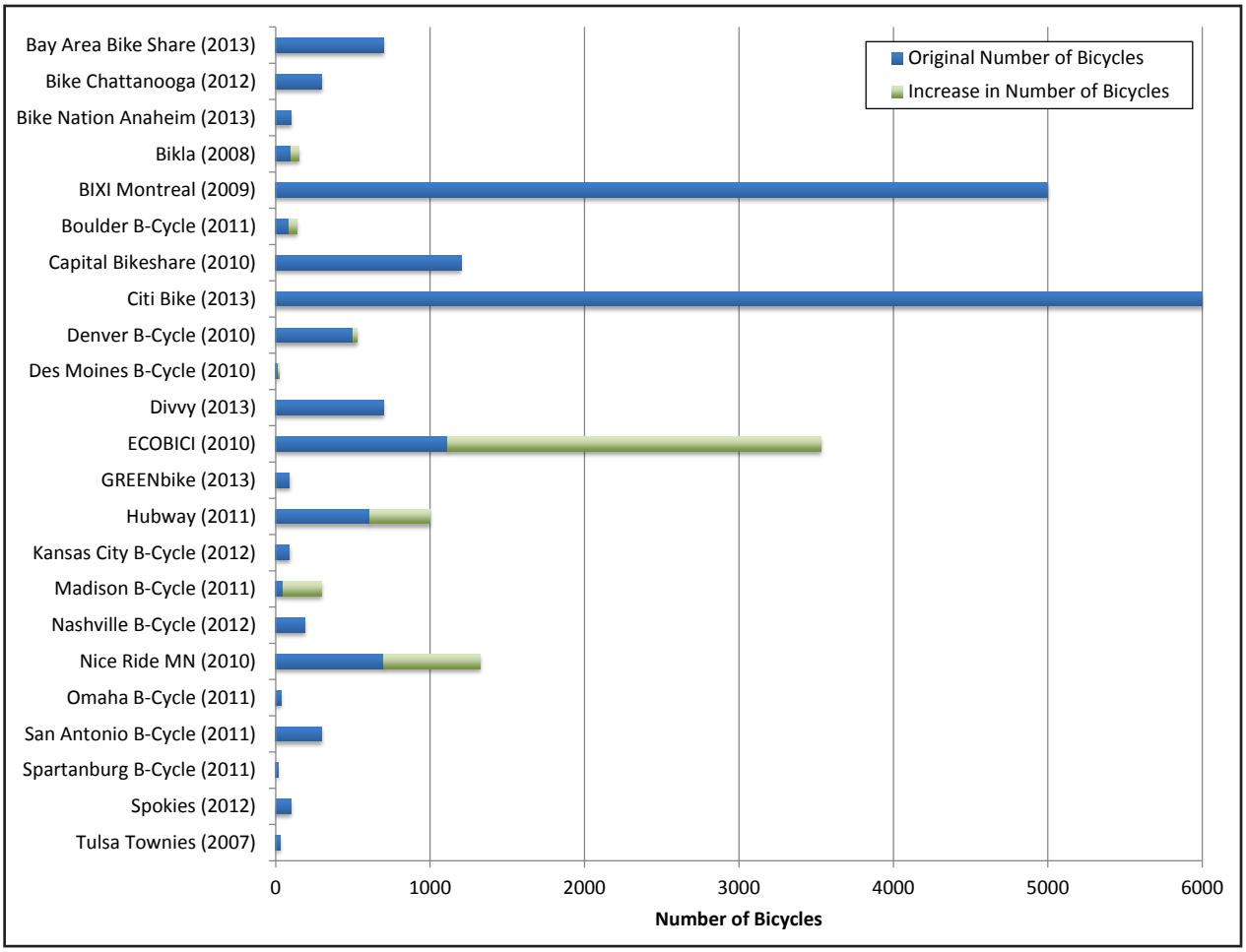

Figure 10. Increases in the Number of Bicycles Since Opening (n=23)

Future Growth Plans

Figure 11 shows existing program size (measured in bicycles) compared against predicted future program size (in bikes). This analysis is based on expert interviews with bikesharing programs in which the operators were asked to describe their forecasted fleet size in three years. Bike Nation, EcoBici, Capital Bikeshare, and Nice Ride Minnesota indicated the greatest forecast in bicycle growth.

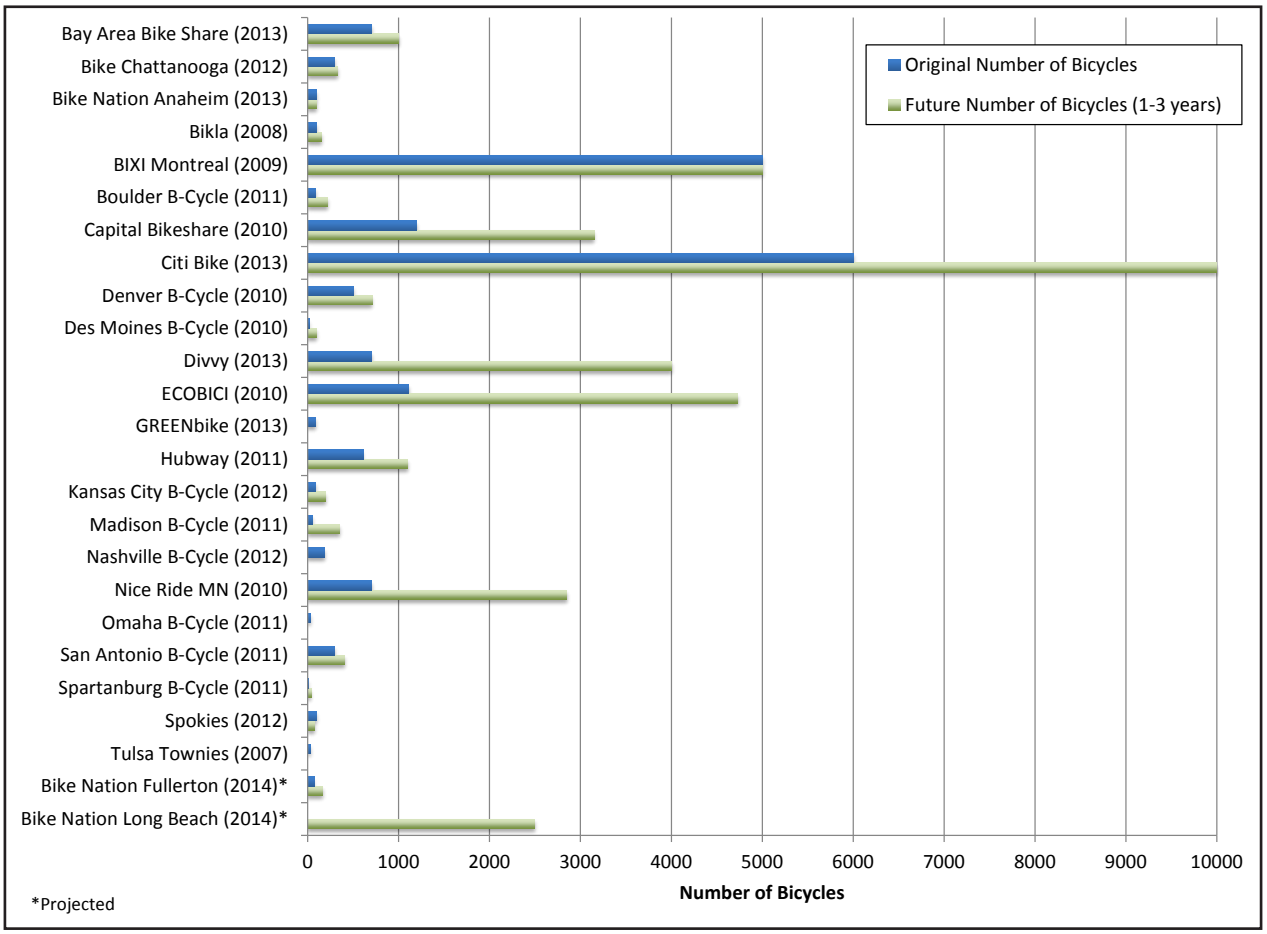

Figure 11. Comparison of Initial Size of System Against Future System Size (n=25)

Factors Impacting Bikesharing Station Placement

Operators indicated using three different types of tools to make station placement determinations: 1) geographic information systems (GIS), 2) Microsoft Excel, and 3) proprietary or back-end software systems. Thirty-five percent of the programs indicated using GIS (n=7/20), 40% reported that they used Microsoft Excel (n=8/20), and 25% stated that station placement considerations were dependent on data from proprietary or back-end software systems (n=5/20).

Detailed factors considered by the operators included population density, land use, employment density, bicycle infrastructure, public transit proximity, and walkability. Two programs placed stations based on “destination locations,” and another program sited

stations based on the potential to positively impact health. Three additional programs stated that accessibility with a truck or trailer, weather data, and four hours of direct sunlight were prerequisites for their station placement (due to solar mobile docking stations). One program reported that they used an origin and destination matrix to determine bikesharing station placement.

Six programs indicated criteria for determining station placement were proprietary and could not be released. One program stated that they had separate criteria for determining station relocation, noting that station relocation was constantly re-evaluated and determined by both the number of checkouts and revenue.

Expansion Costs

Thirteen U.S. programs and one Mexican program provided financial data on system expansion costs (including kiosk costs and station relocation costs). No Canadian program locations responded to this question. Station costs (including bicycles, docks, and installation) ranged from US$29,500 to US$50,000, with a median value of $47,639 (n=13). In Mexico, one program stated their total capital cost was $120M MXN (US$9.7M) (average of US$36,781 per station). Because of varying costs due to kiosk size, operators were also asked to provide the number of docks and bicycles included with the kiosk costs, if these data were available.

In the U.S., expansion costs per new dock ranged from US$2,375 to US$4,348, averaging US$3,101 (n=11). In Mexico, one program stated their total capital cost was US$120M MXN (US$9.7M USD), with an average of US$2,742 per bike. In the U.S., expansion costs per bicycle ranged from US$4,750 to $8,889, with a median of US$5,590 per bicycle (n=12/13).

Five programs provided data on kiosk relocation costs. Relocation costs varied widely from program to program depending on whether or not the program was: 1) using grid versus solar power and 2) had local technicians trained in kiosk removal and reinstallation versus hiring special technicians to conduct the relocation. Kiosk relocation costs (including removal and reinstallation) varied from US$600 to US$12,000 per a kiosk, with a median value of US$5,816 (n=6/13). (The exchange rate of 0.08MXN:1USD was used to convert currencies.)

Cost of Pre-Balancing and Re-Balancing

Operationally, programs were split over whether they pre-balanced their systems (re-locating bicycles prior to the start of the commute) or re-balanced their systems (in response to commute patterns). Most programs were unable to distinguish the costs of balancing their systems because they did not actively track this. Staff in the field engaged in other system monitoring or maintenance tasks typically complete balancing. Four U.S. programs provided data on the cost of balancing their systems. Three of these programs stated that they spent between US$1,450 and USUS$6,483 per month. Two also provided cost estimates on a per-a-station basis. These programs estimated the cost of balancing per station at US$6,000 and US$10,000 annually or US$500 and US$833 per station on a monthly basis.

Growth Potential

Operators were asked to assess the growth potential of bikesharing in their communities. Specifically, what percentage of individuals 16 years of age or older within walking distance of their system could be a bikesharing user? In the U.S., growth potential was estimated at 32% of individuals 16 years of age or older within walking distance of bikesharing (n=7/13). In Canada, growth potential was estimated at 9.5% of individuals 16 years of age or older within walking distance of bikesharing (n=3/3). No programs in Mexico responded to this question.

Summary

In summary, existing and planned programs can anticipate spending approximately US$45,000 for a new bikesharing kiosk (including installation, bicycles, US$3,000 per dock point and US$6,000 per bike). "Pre" and "post" balancing ranges from US$500 to approximately US$800 per month per kiosk, and insurance averages about 5% of total operating expenses. Please see Table 15 for an overview of capital and operational expenditures.

Table 15. Anticipated Capital and Operational Expenditures of Key Costs (USD)

Expenditure	Range	Median
Station Costs (including docks, bicycles and installation)	$29,500 to $50,000	$47,639
Cost of Expansion Per Dock	$2,375 to $4,348	$2,919
Cost of Expansion Per Bike	$4,750 to $8,889	$5,590
Kiosk Re-location Cost[a] (Per Kiosk)	$600 to $12,000	$5,815
Cost of Balancing (Per Kiosk, Per Month)	$500 to $833	$667 (Average)
Insurance (as a percentage of total operating expenditures)	1.5% to 7.3%	4.8% (Average)

[a] Costs vary significantly depending on whether local technicians are trained to remove and re-install kiosks locally versus using out-of-town specially trained contracted labor. Costs also vary significantly depending on whether kiosks are attached to grid power or are solar-powered.

V. PUBLIC BIKESHARING OPERATIONS

Chapter V examines some of the operational factors impacting bikesharing in North America. This includes issues related to seasons and hours of operation; station siting; public policy and supportive infrastructure; safety measures and helmet usage; crashes; theft and vandalism; and insurance.

Seasons and Hours of Operation

Of the 23 programs interviewed in Spring 2013, 12 (52%) operate year-round (n=12/23). The remaining 11 (48%) operate seasonally, although the length of the season depends primarily on the weather at the program location (n=11/23). Forty-five percent of the programs, which are currently operating on a seasonal basis, are considering switching to year-round operations (n=5/11). An additional two programs (18%) would like to extend the length of their season but are unable to do so without contractual revisions to their operating agreements (n=2/11). Seven programs (33%) have extended their hours of operation since initially launching their program (n=7/21). One additional program (5%) shifted their hours of operation (opening later and staying open later) (n=1/21). See Table 16 for a summary of seasonality and hours of operation, including data from 2013 programs where available.

Table 16. Seasonality and Hours of Operations for Public Bikesharing Programs in North America (Operational as of August 2013) (n=38)

Program	Location	Seasonality	Hours of Operation
Canada			
BIXI Montreal	Montreal, QC	April-November (considering year-round)	24/7
BIXI Toronto	Toronto, ON	Year-round	24/7
Capital BIXI	Ottawa, ON	April-November	24/7
Mexico			
Bikla	Guadalajara, JAL	Year-round	Varies per station
EcoBici	Mexico City, DF	Year-round	6am-12:30am
United States			
5B Bikeshare	Sun Valley, ID	(unknown)	(unknown)
Austin B-cycle	Austin, TX	Year-round	24/7
Bay Area Bike Share	San Francisco, CA	Year-round	24/7
Bike Chattanooga	Chattanooga, TN	Year-round	24/7
Bike Nation	Los Angeles, CA	Year-round	24/7
Boulder B-cycle	Boulder, CO	Year-round	5am-midnight
Broward B-cycle	Ft. Lauderdale, FL	Year-round	5am-midnight
Capital Bikeshare	Washington, DC	Year-round	24/7
Capital Community Bike Share	Lansing, MI	(unknown)	(unknown)
Charlotte B-cycle	Charlotte, NC	Year-round	7am-10pm
Citi Bike	New York City, NY	Year-round	24/7
CoGo	Columbus, OH	Year-round	24/7
DecoBike	Miami Beach, FL	Year-round	24/7

Program	Location	Seasonality	Hours of Operation
Denver B-cycle	Denver, CO	April-November	5am-midnight
Des Moines B-cycle	Des Moines, IA	Closed winters	5am-11pm
Divvy	Chicago, IL	Year-round	24/7
Fort Worth B-cycle	Ft. Worth, TX	Year-round	24/7
GREENBike	Salt Lake City, UT	Closed winters	24/7
Greenville B-cycle	Greenville, SC	Year-round	5am-11pm
Hawaii B-cycle	Kailua, HI	Year-round	5am-10pm
Houston B-cycle	Houston, TX	Year-round	6am-11pm
Hubway	Boston, MA	Closed winters (considering year-round)	24/7
Kansas City B-cycle	Kansas City, MO	Closed winters (considering year-round)	5am-midnight
Madison B-cycle	Madison, WI	March-December	5am-midnight
Midwest Bikeshare	Milwaukee, WI	(unknown)	(unknown)
Nashville B-cycle	Nashville, TN	Year-round	5am-10pm
Nice Ride MN	Twin Cities, MN	April-November (considering year-round)	24/7
Omaha B-cycle	Omaha, NE	March-November (considering year-round)	6am-11pm
San Antonio B-cycle	San Antonio, TX	Year-round	4am-midnight
Spartanburg B-cycle	Spartanburg, SC	Year-round	5am-10pm
Spokies	Oklahoma City, OK	Year-round	6am-2am
Tulsa Townies	Tulsa, OK	Closed winters	7am-8pm
WE-cycle	Aspen, CO	May-October	(unknown)

Station Spacing and Station Locations

Eleven operators indicated that an appropriate distance to encourage multi-modal cross-flow between bikesharing and public transit was an average of 394 feet (120 meters) with the shortest distance of 50 feet (15.2 meters) and the longest distance of 1,350 feet (0.26 mile or 411 meters). An additional five programs believed the bikesharing kiosks needed to be as close to public transit as possible (preferably adjacent if not co-located to a bus stop or rail entrance). The authors informed interviewees that they were estimating 300 feet (91 meters) per city block and asked the operator to estimate if they believed their city had shorter or longer city blocks.

Figure 12. Examples of Three Kiosk Configurations in North America

Sixty percent of the responding operators reported that their current station spacing was either optimal or very close to optimal (n=6/10). Two programs (20%) indicated they would make their network denser; one program (10%) stated they would place their stations farther apart; and one (10%) noted that they would like to relocate existing stations to higher-use locations (n=4/10).

Fifteen programs quantified the distance they believed to be optimum between kiosks. Among these programs, the shortest distance was 660 feet (200 meters or 1/8 mile).

Bikesharing operators can locate their stations on either public or private land or a mix of the two. One program (5%) reported their stations were located only on private land (n=1/21); eight programs (38%) said their stations were located only on public land (n=8/21); and ten programs (48%) stated that their stations were located on both public and private land (n=10/21). Ninety-one percent (n=19/21) reported use of the land was free (whether public or private). Two programs (10%, n=2/21) indicated they paid some type of fee. Broward B-cycle reported paying business property taxes for each kiosk location, and Madison B-cycle noted paying permit fees, annual per station fees to the City of Madison and US$40 per station per year for the use of municipal electricity for grid-powered stations.

Five North American programs indicated that they had to move minor street furniture to install kiosks. Three programs (in Mexico City, Montreal, and Nashville) stated they were permitted to either move or remove parking spaces for the installation of bikesharing kiosks.

Supportive Bikesharing Policies and Cycling Infrastructure

One of the ways local governments can support public bikesharing is by allowing programs to advertise on their bicycles and kiosks, as well as through the development of supportive cycling infrastructure. Twelve bikesharing programs (52%) interviewed in Spring 2013 indicated working with local government to improve bicycle infrastructure prior to launching their programs (n=12/23). Seven programs (30%) reported continually working with local government after the launch of their programs to improve local cycling infrastructure (n=7/23). All enhancements to bicycle infrastructure improve safety for all bikers and can encourage bikesharing.

Safety Measures: Helmet Laws and Helmet Usage

All public bikesharing programs interviewed support bicycle safety and encourage helmet usage. A number of programs and vendors are trying to develop helmet dispensing options and other innovative technologies to encourage helmet use and enhance user safety. Since the project interviews, Hubway is the only system that has introduced helmet kiosks into its system. Helmet laws are one key policy measure aimed at making cycling safer. Public bikesharing experts and users generally perceive compulsory helmet laws as a challenge to bikesharing use because of the inconvenience associated with carrying a helmet, lack of availability for last-minute trips, and difficulties associated with providing sterile shared-use helmets. Since IT-based public bikesharing launched in North America, Golden Community Bike Share (Golden, BC) has been the only program in which helmet use was required for adult riders. British Columbia has a mandatory helmet law for all ages,

which was implemented in 1996 (Helmet Laws: British Columbia, 2011). Note that Golden Community Bike Share has suspended operations for the 2013 season for municipal fiscal austerity measures. When the program was operational, they offered complimentary helmets with each bike rental. Seven additional operators offer helmets, although use is not mandatory. Six U.S. programs interviewed in Spring 2013 indicated that helmet laws existed in their communities for minors, but they believed that these laws did not affect their operations because their system had a higher age minimum required to use bikesharing. In this study's 2013 operator interviews, two programs indicated providing helmets with their annual memberships; one offered helmets for loan; two programs raffle helmets; and six partnered with nearby bike shops, hotels, and other public facilities to sell helmets—some even offering discounts for bikesharing users.

An anonymous operator indicated that it had recently completed a study on helmet usage within its system. Thirty-two percent of members used a helmet, compared with a rate of 72% helmet use among all bicycle riders citywide. While experts agreed that users would prefer to wear helmets, most do not wear them while using public bikesharing due to the inconvenience of carrying one. A study conducted by the Beth Israel Deaconess Medical Center of more than 3,000 cyclists at 43 bike stations in Washington, D.C. and Boston found that more than half of the cyclists did not wear helmets, and 80% of bikesharing users did not wear them (Lawman, 2012).

Industry experts, public agencies, and policymakers indicated that individuals may or may not choose to use public bikesharing on the basis of helmet availability and perceived risk. Some also noted that individuals making shorter trips and spontaneous users were less likely to use helmets than commuters. Experts generally agreed that if a helmet law were required in their region, an exemption for public bikesharing would encourage use, if helmet dispensing options were unavailable or not provided. Indeed, Melbourne Bike Share (Melbourne, Australia) has received some attention among the bikesharing industry for its local helmet law, which many experts hypothesize has limited the program's success. The program's 600-bicycle fleet averages 70 trips per day, which is 10% of the usage of comparable programs in London and Dublin, not accounting for differences in density and land use (Lucas, 2010).

In Vancouver, BC, three private companies are developing options for providing sterile shared helmets, including a helmet-rental sanitizing machine and disposable helmets (e.g., SandVault's HelmetStation, a fully integrated helmet-dispensing system that sanitizes the helmets upon return) (Muschi, 2012). Employing similar technology, HelmetHub, based out of Boston, has already launched four helmet vending devices within the Hubway bikesharing program.

Crashes

Experts interviewed as part of the authors' Phase I study had very different views on what aspects of riding in traffic are the most dangerous for bicyclists. Two indicated right turns ("right hook") and "dooring" (when a car door is opened into an oncoming bicycle), while two others indicated left turns ("left hook") and buses. One expert reported that crashes increase in the winter and that light rail could be dangerous because bicycle tires can get

caught in the rails. Another expert reported that large vehicles, in any situation, constitute the greatest hazard for bicyclists. Finally, one expert noted that cyclists can endanger themselves when riding in traffic by not following signs, not stopping at intersections, going too fast, and wearing headsets.

Public bikesharing operators have numerous mechanisms for measuring the number of accidents in their systems. Generally, most North American operators track crash rates in terms of the total number of crashes per season. A few operators track crashes based on the number of crashes per a certain number of rides or miles/kilometers of riding. Experts also indicated that the majority of crashes are relatively minor and that very few are serious or fatal. In the Phase I study that asked about crash rates for the 2011 season—of the 14 operators that provided statistics—crash rates were relatively low, averaging 1.36 crashes per program in North America in 2011. An additional two operators provided crash data using different metrics. One program noted a crash rate of approximately one accident for every 50,000 to 60,000 rides. Another program reported one crash after approximately 100,000 miles (or 160,934,440 meters) of riding (Shaheen et al., 2012).

In the 2011 season, the authors found a slight correlation between program size (number of bicycles) and the average number of crashes reported per year. Operators with more than 1,000 bicycles had an average of 4.33 crashes reported per year (n=2); those with between 250 and 1,000 bicycles averaged 0.6 crashes reported a year (n=5); and those with less than 250 bikes had 0.3 accidents reported per year (n=7) (Shaheen et al., 2012).

As part of this study, 13 operators provided crash data for the 2012 season. Four additional operators provided cumulative crash data since their system launches, but they were unable to provide data for the 2012 season. The authors have excluded cumulative data from this report as many of these programs increased the number of bicycles and kiosks since initial program deployment, and an increase in the bicycle fleet may have contributed to an increasing number of crashes in more recent seasons.

In 2012, crash rates averaged 4.23 accidents reported per program in North America (n=13). This is in contrast to 1.36 crashes reported system-wide in North America in 2011 (Shaheen et al., 2012).

In May 2014, a number of U.S. bikesharing operators supplied crash-related data on their systems (Heath Maddox, SFMTA, unpublished data). The data are normalized across programs per one million trips for Boston, Minneapolis, and San Francisco. The data reflect crashes since the launch of each program. See Table 17. In August 2014, Reuters reported that bikesharing in the U.S. had no fatalities after a cumulative 23 million rides over a seven year period between 2007 and August 2014.

Table 17. Reported Crashes Per Million Trips in U.S.

Program	City and Launch Year	Crashes	Trips	Crashes/1,000,000 Trips
Bay Area BikeShare	San Francisco Bay Area, 2013	2	200,000	10.0
Citi Bike	NY City, 2013	100	8,000,000	12.50
Capital Bikeshare	Washington, DC Metropolitan Region, 2010	96	6,800,000	14.12
Hubway	Boston, 2011	31	1,700,000	18.24
Nice Ride Minnesota	Twin Cities, 2010	2	930,000	2.15

Source: NACTO Bikesharing Listserv, June 2014.

Theft and Vandalism

North American bikesharing operators typically track theft data as the number of annual thefts in their system. The authors have converted this into a percentage of annual thefts in their system for comparability across programs with varying fleet size. Fifteen North American operators provided data on the number of bicycles stolen in 2012. These data are summarized in Table 18 below.

Table 18. 2012 Public Bikesharing Thefts (n=15)

Program	2012 Bicycle Thefts	2012 Theft Rate
Canada		
Bixi Montreal	10	0.20%
Mexico		
Bikla	14	9.30%
EcoBici	15	0.42%
United States		
Bike Chattanooga	0	0%
Boulder B-cycle	0	0%
Broward B-cycle	4	1.45%
Capital Bikeshare	0	0%
Denver B-cycle	1	0.19%
Hubway	7	0.70%
Kansas City B-cycle	0	0%
Madison B-cycle	1	0.33%
Nashville B-cycle	0	0%
Omaha B-cycle	1	3.03%
Spartanburg B-cycle	0	0%
Tulsa Townies	0	0%

Note: Due to more precise question wording in Phase II interviews, the authors have not included theft data from the Phase I study for comparison.

One operator noted that use of a 24-hour camera monitoring system at each docking station was very effective in deterring theft and

The low rate of theft and vandalism among North American public bikesharing operators is due in part to the proprietary nature of the bikes, many of which have proprietary bolts, axle nuts, fenders, and handlebars.

vandalism. In the Phase I study, 12 operators reported some type of minor vandalism to their system during the 2011 season. In the Phase I study, 16 operators described some type of minor vandalism to their system during the 2012 season. During both years, all of the operators indicated that the vandalism was minor and included bicycle and station graffiti, slashed tires, missing or broken parts on bicycles, and periodically someone trying to force a bicycle out of a dock.

The low rate of theft and vandalism among North American public bikesharing operators is due in part to the proprietary nature of the bikes, many of which have proprietary bolts, axle nuts, fenders, and handlebars. It is common for programs to employ special bicycle designs to reduce theft and vandalism and gearing with antitheft and anti-vandalism technology. Other common antitheft and anti-vandalism features include: non-removable seats, theft-deterrent fasteners, and the need for special tools to remove or alter parts.

The industry experts and public agencies interviewed generally agreed that some degree of theft and vandalism will likely occur within public bikesharing systems, but they did not perceive this as a significant problem. A number of experts stated that public bikesharing systems in North America had experienced significantly lower levels of theft and vandalism than those in other countries or regions of the world. Most experts stated that vandalism usually occurred while bikes were docked rather than checked out. The experts also provided a number of key strategies that could be employed to minimize vandalism, most of which focus on reducing theft and vandalism while bicycles are docked. They include the following:

- Locating stations in busy, well-lit areas;
- Maintaining the appearance of the stations, as deterioration (e.g., graffiti) encourages further theft or vandalism;
- Using graffiti-proof paint;
- Establishing a mechanism for users, residents, and businesses to report suspicious activity;
- Having local police periodically patrol public bikesharing stations;
- Installing station cameras and improving station lighting; and
- Selecting corporate sponsors that are “popular” to discourage vandalism that might be targeting a particular sponsor rather than the system itself.

Insurance

In June 2012, the authors conducted five expert interviews with brokers, underwriters, and attorneys with experience in public bikesharing insurance. Some insurance underwriters identified in North America include: Burlington Insurance, Citadel Insurance Services, CNA, First Mercury Insurance Company, Great American Insurance Group, The Hartford,

Hays Companies, Horizon Agency, Inc., Kinsale Insurance, Lloyd's, Municipal Insurance Association of British Columbia, and Philadelphia Insurance Companies.

The experts indicated that public bikesharing insurance varied considerably based upon the operator's business model. This is because local governments, non-profits, and for-profits have different insurance requirements and may have existing policies that could be extended to cover bikesharing systems (e.g., local governments and public transit agencies). Seven types of common insurance policies were identified that could be applicable to public bikesharing, as listed in Table 19 (Shaheen et al., 2012).

Table 19. Overview of North American Bikesharing Insurance

Types of Bikesharing Insurance	
General Commercial Liability	Protects from public and product liability risks that may include bodily injury or property damage caused by direct or indirect actions of the insured. Liability insurance is designed to offer protection against third-party insurance claims (e.g., someone who suffers a loss either from using a bikesharing system or a loss of a non-user resulting from the use of a bikesharing bicycle). Generally, unless self-insured by a sponsor or local government entity, most North American bikesharing programs carry some form of liability coverage. One broker indicated that the minimum premium for liability coverage started at US$5,000 annually for a basic US$1M policy.
Constructive Total Loss	Insurance covering repair costs for an item that is more than the current value of that item. It can also refer to an insurance claim that is settled for the entire property amount on the basis that the cost to repair or recover the damaged property exceeds its replacement cost or market value.
Workers' Compensation	A form of insurance providing wage replacement and medical benefits to employees injured in the course of employment in exchange for mandatory relinquishment of the employee's right to sue his or her employer for the tort of negligence.
Commercial Automobile	Provides financial protection against physical damage and/or bodily injury resulting from traffic collisions and against liability that could also arise. In public bikesharing, this insurance is generally applied towards employees that rebalance bikes using trucks or any other program vehicles, if applicable.
Professional Liability (Errors and Omissions)	A form of liability insurance that helps protect professional advice and service-providing companies from bearing the full cost of defending against a negligence claim made by a user and damages awarded in such a civil lawsuit.
Inland Marine	Indemnifies loss to moving or movable property (e.g., the shipment of bikes and kiosks after purchase).
Rigger's Liability	Insurance designed to protect the movement and relocation of kiosks (specifically when kiosks are relocated using cranes).

Specific to general liability coverage, the experts indicated that a particular challenge is developing one coverage limit that meets the requirements for all property owners (public and private) with kiosks on their land. The minimum liability coverage for property owners with bikesharing kiosks on their property often reflects the highest limits required by an entire group of property owners. According to the experts interviewed, this can make liability policies cost prohibitive, if a property owner requests an excessively large limit over that required by other land owners (e.g., US$10M of liability coverage when other property owners only require US$3M). The operator and the broker must negotiate a coverage level that is acceptable to all property owners with bikesharing kiosks. Generally, the operators do not insure individual bicycles because repair or replacement costs would be less than

the typical deductible. However, according to one insurance broker, a few operators have insured bicycles while they are parked in the kiosk (in the case of kiosk loss) and in storage for seasonal programs. One broker thought the recommended coverage level for bikesharing should be US$2M in constructive total loss, with an additional US$5M umbrella policy. A constructive total loss is a situation where repair costs and salvage costs equal or exceed the value of the insured item. An umbrella policy typically refers to a policy that protects the assets and future income of a bikesharing program in addition to their primary policies.

The experts indicated that there are three key factors that determine premiums: 1) geographic location, 2) limits and deductibles, and 3) system usage. These are explained in greater detail in Table 20.

Table 20. Key Factors Used To Determine Public Bikesharing Insurance Premiums

Geographic location is one of the factors insurers use when pricing a public bikesharing policy. Bikesharing insurance rates can change based on the following:	
Geographic Location	• *Urban vs. Rural:* Bikesharing programs in urban areas generally pay more for insurance than those operating in rural areas because the likelihood of a crash or theft increases where populations are larger. However, if a rural program is in a region where dangerous weather is a constant concern, insurance rates may be higher due to the increased risk of damage. • *Litigious Nature* of the area where a program is operating. • *State Tort Laws:* Some states may require certain types of coverage, which can increase premiums.
Limits and Deductibles	• *Coverage Limit* refers to the highest dollar amount an insurance company will pay for a covered loss. Higher coverage limits increase premium costs. • *Deductible* is the portion of out-of-pocket expenditures that the bikesharing program agrees to pay when a claim is made against the insurance policy.
System Usage	• There are various ways of measuring system use. This can include the number of users, bicycles, or rides within a system. Generally, number of bikesharing rides is viewed as the most accurate measure of system usage. Higher system use results in higher premiums.

In addition to these key factors, insurance premiums can be designed around: 1) percent of kiosk sales (e.g., percent of ridership revenue); 2) percent of gross revenue (e.g., percent of total revenue including ridership, sponsorships, advertising etc.); and 3) number of rides (e.g., premiums based on how often the bicycles are used). Percent of kiosk sales were indicated to be a sub-optimal method of structuring premiums because many operators include a certain amount of free usage built into their system. Gross revenue was the least preferred method because including advertising revenue, along with kiosk sales, does not lead to increased risk. Finally, structuring premiums based on number of rides was perceived to be the most fair and accurate method, as the number of rides can be correlated to the amount of usage and program risk an operator confronts.

The four most common types of insurance coverage carried by North American bikesharing operators include: 1) general liability coverage, 2) worker's compensation, 3) commercial auto, and 4) inland marine coverage. In Spring 2013, seven North American programs stated their insurance premiums ranged from 1.5% to 7.3% of operating expenditures, averaging 4.8%. Only one American program reported having an injury claim filed against their program during the 2012 season (n=1/18).

VI. EQUITY CONSIDERATIONS

Chapter VI examines equity issues important to public bikesharing in North America. This includes issues related to serving low-income communities, minority communities, and the "unbanked" (individuals without access to a debit/credit card).

Methodology

Twenty-three programs operational as of March 2013 were interviewed and asked questions on equity and community outreach. The authors supplemented this section with information from a literature review. Please see Chapter 1 for a complete list of the programs included in these interviews.

Equity Considerations Factoring Into Station Locations

Nine programs (43%, n=9/21) stated that equity considerations factored into their station siting. Sixteen percent reported that their existing station placement was impacted by the goal of serving low-income communities (n=3/19), and 11% indicated that equity considerations are factoring into their programs' future expansion plans (n=2/19). The remaining four programs stated that equity considerations factor into their station placement anecdotally; however, they do not use income maps and the potential for future revenue (both usage and funding) as a determining factor in station placement.

Overcoming the Need for a Credit/Debit Card

Removing debit card "holds" (e.g., security deposit when bikes are checked out) and allowing alternative access to public bikesharing are the primary methods being used by bikesharing programs to obviate the need for a debit or credit card to use in bikesharing. In certain instances, some users who have debit cards but maintain low account balances may not have sufficient funds to use bikesharing because a few hundred dollar balance is typically required to defer vandalism and theft. Both Nice Ride Minnesota and Capital Bikeshare have removed credit/debit card deposits to make their systems more accessible to low-income communities. Denver B-cycle allows low-income members to register through the Denver Housing Authority, and Hubway offers subsidized low-income US$5.00 memberships, which are funded through a grant from the public health commission. Similarly, Bike Nation and Madison B-cycle both offer membership cards not tied to a credit or debit card to low-income users. Two additional programs, Nice Ride Minnesota and Kansas City B-cycle, also indicated that members in their communities were using various forms of "prepaid" cards (paid through jobs and other programs; similar to a prepaid Visa card) to use their systems.

In December 2011, Capital Bikeshare partnered with Bank on DC, United Bank, and District Government Employees Federal Credit Union (DGEFCU) to launch the "Bank on DC" program, aimed at those without a credit or debit card. Bank on DC offers its members a $50 annual membership to Capital Bikeshare, a $25 discount from the regular $75 fee. Additionally, unbanked individuals who sign up for a debit or credit account with United Bank or DGEFCU are offered the $50 annual membership rate.

Additionally, Spartanburg B-cycle stated that they are working with a local college to develop a program to provide system access for users without a credit or debit card. Both programs in Mexico (Bikla and EcoBici) noted innovative solutions for surpassing the need for a debit/credit card. Bikla users have the option of paying via PayPal online or cash in person, and EcoBici users can pay with their telephone number and automatically be charged through their telephone bill.

Experience Serving Low-income Communities

Operators were asked to share their experiences serving low-income neighborhoods within their community. Four programs shared their experiences serving low-income communities. One Canadian program noted that a particular challenge to entry into low-income communities was lack of early adoption; nevertheless, the program caught on after about a year. One U.S. program noted similar experiences stating that usage was below expectations during the pilot of their low-income program. However, after the first year, the operator reported an increase in usage. Although this same operator stated that they had not seen undue damage, their biggest challenge serving low-income communities is finding a sponsor to cover bicycle liability since a credit card is not taken as a form of collateral. Another U.S. operator stated that they had difficulty getting people to sign up (even for free memberships). According to this program, cost is not an issue because they only had 180 subscribers take advantage of this program, and only a third of those actually used the system. A third U.S. operator talked about their outreach efforts to low-income communities including their partnerships with local banks to get the "unbanked" into public bikesharing and working with a county to get low-income commuters to use bikesharing through the Joint Access Reverse Commute (JARC) program.

Denver B-cycle has partnered with Live Well Colorado and the Denver Housing Authority (DHA) to support a pilot program to make bicycles accessible to the city's low-income residents. Live Well Colorado, a non-profit commited to fighting obesity in Colorado, provides usage fees to low-income residents who do not have a credit card. DHA provides capital for docking stations in new large developments and works with building managers to identify renters who qualify for free or discounted memberships.

Figure 13. DecoBike Bilingual Kiosk

Special Marketing Approaches

A number of programs indicated using special marketing approaches to access low-income and minority communities. The most common marketing approaches were multi-lingual kiosks and special outreach events. Seven programs indicated having multi-lingual kiosks, and one also provided bi-lingual printed marketing materials. Three programs conducted special outreach events targeted toward minority communities.

Specifically, one program said this outreach was designed to teach immigrants how to ride bicycles, and another stated their outreach effort was specific to introducing the “sharing” aspect of bikesharing. One program in Mexico noted challenges with education and outreach stating that bicycle use is viewed as inefficient, dangerous, and for low-income persons.

VII. PUBLIC BIKESHARING USER SURVEY ANALYSIS

The research team surveyed members of a select number of public bikesharing operators in Canada, the United States, and Mexico. Two types of surveys were deployed. One type was a *member survey* and the other type was an *on-street intercept survey*. Both surveys were conducted online, but they differed in scope and recruitment. Five operators in the North America participated in the member survey (two in Canada, two in the U.S., and one in Mexico). A total of 6,373 individuals responded. Each operator reviewed the survey with the research team and sent the questionnaire link to all members via email. The member survey covered a broad range of topics including: travel behavior, shopping behavior, modal shifts, helmet use and safety, demographics, and location. The survey took between 10 to 15 minutes to complete. The surveys that were administered can be found in Appendices C through F.

The on-street survey was an experimental effort that aimed to understand more about casual users and bikesharing members immediately after their trip. Three operators participated in the on-street survey—all were located in the U.S. (Hubway in Boston, B-cycle in San Antonio, and GREENBike SLC in Salt Lake City). A total of 205 individuals completed the survey. Casual users often include tourists and other people interested in trying bikesharing, but they may not yet be interested in committing to a long-term membership. This survey was designed to be short (two minutes) and taken on a smartphone. Recruitment for the on-street survey was completed using an experimental approach. Operators placed QR codes on bikesharing stations that translated to a survey link. The text URL to the survey was also listed below the QR code. Users could opt to take the survey by using a QR code reader or by typing the URL into a browser window. The on-street survey was developed due to increased interest in understanding motivations and behaviors of casual users. Because casual users pay more on a per-trip basis, they have been reported to play a notable role in revenue generation across many North American bikesharing operators. Respondents to both surveys could enter into a lottery for a gift-card incentive by providing their email.

Member Survey Analysis

The member survey was completed within five cities across Mexico, Canada, and the United States. In Canada, BIXI bikesharing deployed the member survey in Montreal and Toronto. Two operators in the U.S. participated in the member survey: Nice Ride Minnesota of Minneapolis and Saint Paul (the authors refer to 'Minneapolis-St Paul' as one city in this chapter) and GREENBike SLC of Salt Lake City participated. In Mexico, EcoBICI of Mexico City also contributed to the member survey. This survey was implemented in three languages that span these regions of North America. In Montreal, the survey was translated into Canadian French and deployed in both French and English. The surveys implemented in Toronto, Minneapolis, and Salt Lake City were conducted in English, and the survey of members in Mexico City was implemented in Spanish. Operators worked with the researchers to ensure that the translations to French and Spanish were correct and consistent with the norms and units of the home country.

Across all cities, the survey received a total N=6,168 completed surveys. The surveys in Montreal had a sample of N=1,102, Toronto had a N=1,015, Minneapolis-Saint Paul had a N=630, Salt Lake City had a N=72, and Mexico City had a N = 3,349. Because the surveys were conducted in vastly different urban environments, the results are analyzed and reported separately throughout the remaining section. Table 21 below shows the respondent count for the member survey alongside other system metrics.

Table 21. Participating Operators in Member Survey (2012) (n=5)

Operator	City	Responses	Members (Annual / Seasonal)	Bicycles	Stations
BIXI Montreal	Montreal	1102	49217	5000	400
BIXI Toronto	Toronto	1015	4185	1000	400
Nice Ride Minnesota	Minneapolis-Saint Paul	630	3500	1325	145
GreenBIKE SLC[a]	Salt Lake City	72	NA	NA	NA
EcoBici	Mexico City	3349	70100	3530	261

[a] *GREENBike SLC was not operational in 2012.*

Member Survey Demographics

The member surveys exhibited varying demographics across income, education, race, age, and gender. Some commonalities in terms of member distributions relative to the population do emerge. Table 22 presents the key demographics of survey respondents and the general population within the cities of Canada and the U.S. In Table 22, the general population statistics were collected from Statistics Canada and the US Census (US Census, 2014; Statistics Canada, 2013). Specifically, the U.S. population data are drawn from the 2012 American Community Survey (ACS), while the Canadian population data are drawn from the 2011 National Household Survey (NHS). Table 23 presents the key demographics of survey respondents and the general population for Mexico and Mexico City (INEGI, 2011/2012/2014, Gobierno Federal, 2010). The general population data for Mexico were obtained from the Instituto Nacional de Estadística y Geografía (INEGI) and other government documents.

Income Distribution

The side-by-side distributions of the survey and general population show some key distinctions that persist among bikesharing members. As found in the Phase I study (Shaheen et al., 2012; Shaheen and Martin, 2013), the income distribution of bikesharing members is skewed toward a higher income level relative to the population in each of the five cities in our Phase II survey (Minneapolis-Saint Paul, Salt Lake City, Montreal, Toronto, and Mexico City).

The income distribution of bikesharing members is skewed toward a higher income level relative to the population in each of the five cities in the Phase II survey (Minneapolis-Saint Paul, Salt Lake City, Montreal, Toronto, and Mexico City).

Income data were collected and reported in the currency of the home country (Canadian and US Dollars), which have traded close to parity in recent years. Within all four U.S. and Canadian cities (Phase II study) reported in Table 22, bikesharing members hold a higher share of all income categories above US$50,000. The propensity toward higher income among bikesharing members appears strongest in Toronto, where more than 50% of the survey population had a 2012 household income of US$100,000 or more versus 25% of the general population. In Table 23, the differences in relative income between the bikesharing population and the general population of Mexico City are shown to be larger. Mexico reports general income statistics differently from the U.S. and Canada; thus, the data are presented in a separate table. They define general distributions in terms of multiples of the minimum salary, which changes by year and across regions.

The minimum salary in Mexico City was 64.76 pesos per day (or US$4.86 per day as of March 2014). Respondents to the EcoBICI survey reported their income in terms of pesos per month. These two scales were normalized together according to population data intervals defined as multiples of the minimum salary per day and then the intervals were scaled to monthly values. Nearly 50% of bikesharing members reported their monthly income to be in the highest INEGI category of more than five times the minimum salary, versus 11% of the general population.

Education is skewed more toward higher levels among bikesharing members relative to the population. For example, more than 80% of members in the two U.S. cities had a Bachelor's degree or higher.

Educational Distribution

The data within Table 22 show that the distribution of education is also skewed more toward higher levels for bikesharing members relative to the population in our Phase II survey. This difference is more stark in the U.S. cities, as in Salt Lake City and Minneapolis and Saint Paul more than 80% of bikesharing members reported having a Bachelor's degree or higher. In each city, the share of people with at least a Bachelor's degree is 45%. This is higher than the broader U.S. in which this share is now about 29% (US Census, 2014). In Canada, the discrepancy appears not as large, but this is in part a function of a more educated population within the Canadian cities and also differences within the Canadian education system. In Canada, two or three-year colleges play a greater role in the Canadian post-secondary education system than they do in the U.S. The term "college," while often used interchangeably with university undergraduate education in the U.S., has a distinct meaning in Canada. When aggregating these three categories for the Canadian cities, Table 22 shows that 50% to 60% of the population in Montreal and Toronto had a degree from a college or university, whereas roughly 86% to 87% of bikesharing respondents in both cities had an undergraduate degree from a college or university or higher.

These results are consistent with past studies in both bikesharing and other shared-use modes, such as carsharing (i.e., short-term vehicle access) (Shaheen et al, 2012; Martin and Shaheen, 2011). Surveys have consistently found that populations that currently use shared-use modes in these areas have an educational distribution that is skewed higher relative to the general population within Canadian and U.S. cities.

In Mexico, a similar result emerged; bikesharing members were found to be even more concentrated on the higher ends of the education distribution. Responses were aggregated into five categories used to classify education by the Mexican Government. The category of “Educación Superior” was the highest reported by the government, which includes any education including a Bachelor’s degree or higher. In Mexico City, 28% held this education classification, whereas among the bikesharing population, the share was 90%.

Table 22. Member Demographics of Cities Surveyed in Canada and U.S.

HOUSEHOLD INCOME	Montreal		Toronto		Salt Lake City		Minneapolis & Saint Paul	
	2011 NHS	Survey	2011 NHS	Survey	2012 ACS	Survey	2012 ACS	Survey
Less than $10,000	9%	5%	6%	2%	12%	0%	11%	5%
$10,000 to $14,999	6%	4%	4%	1%	7%	3%	5%	3%
$15,000 to $24,999	14%	8%	10%	3%	13%	3%	11%	5%
$25,000 to $34,999	12%	9%	9%	3%	11%	3%	10%	6%
$35,000 to $49,999	17%	14%	14%	6%	12%	10%	14%	12%
$50,000 to $74,999	17%	21%	18%	20%	17%	31%	16%	19%
$75,000 to $99,999	10%	13%	13%	16%	11%	20%	12%	16%
$100,000 to $149,999	9%	16%	13%	23%	10%	17%	12%	18%
$150,000 or more	5%	9%	13%	26%	8%	13%	8%	17%
EDUCATION	**2011 NHS**	**Survey**	**2011 NHS**	**Survey**	**2012 ACS**	**Survey**	**2012 ACS**	**Survey**
Less than high school	13%	0%	18%	0%	15%	0%	12%	0%
High school/GED	18%	3%	24%	3%	14%	0%	18%	2%
Some college/apprentice	12%	10%	5%	10%	19%	7%	19%	11%
2 or 3-year College	22%	32%	20%	40%	7%	4%	7%	3%
University Bachelor’s	20%	37%	20%	37%	26%	43%	27%	42%
Post-Graduate Degree	15%	18%	13%	9%	19%	46%	17%	42%
AGE	**2011 Census**	**Survey**	**2011 Census**	**Survey**	**2012 ACS**	**Survey**	**2012 ACS**	**Survey**
16 - 24	12%	11%	12%	7%	20%	9%	21%	6%
25 - 34	21%	43%	19%	42%	28%	39%	26%	31%
35 - 44	18%	23%	18%	23%	17%	19%	16%	28%
45 - 54	17%	14%	19%	18%	13%	17%	15%	23%
55 - 64	14%	8%	14%	7%	11%	13%	12%	8%
65 years or older	19%	1%	18%	2%	12%	2%	10%	4%
RACE	**2011 NHS**	**Survey**	**2011 NHS**	**Survey**	**2012 ACS**	**Survey**	**2012 ACS**	**Survey**
Caucasian	68%	90%	51%	74%	64%	89%	62%	92%
African-American	9%	1%	8%	2%	3%	1%	17%	1%
Hispanic/Latino	4%	4%	3%	1%	21%	5%	10%	2%
Asian/Pacific Islander	11%	3%	34%	20%	9%	3%	6%	5%
Other/Multi-Racial	7%	2%	4%	4%	3%	1%	5%	0%
GENDER	**2011 NHS**	**Survey**	**2011 NHS**	**Survey**	**2011 ACS**	**Survey**	**2011 ACS**	**Survey**
Male	49%	50%	48.0%	70%	51%	66%	50%	55%
Female	51%	50%	52.0%	30%	49%	34%	50%	45%

Table 23. Member Demographics of Mexico City

Household Income per Month (pesos)	2013 INEGI	Survey	Education	2013 INEGI	Survey	Age	2013 INEGI	Survey	Gender	2013 INEGI	Survey
Less than $1943	13%	3%	Sin bachillerato	45%	1%	16 - 24	27%	11%	Male	48%	65%
$1943 to $3886	21%	4%	Media superior	25%	4%	25 - 34	22%	47%	Female	52%	35%
$3886 to $5828	19%	5%	Tecnica	1%	4%	35 - 44	20%	26%			
$5828 to $9714	16%	15%	Superior	28%	90%	45 - 54	14%	10%			
More than $9714	11%	49%	No especificado	1%	2%	55 - 64	9%	4%			
Not Reported	21%	24%				65+	9%	1%			

Age Distribution

In terms of age, Table 22 and Table 23 show that the bikesharing population is skewed toward younger generations in all Phase II surveyed cities. These percentages are normalized to add to 100%, and they do not include populations younger than 16. Thus, the population shares shown in these tables are not precisely equivalent to the shares of the general population, which considers people younger than 16. In all cities, the dominant age category for bikesharing membership is the 25 to 34 year old demographic; this is also the largest age cohort in the general population in every city except for Mexico City. In the surveyed Canadian cities, bikesharing membership within this age cohort comprises over 40% of the entire sample within each city and is more than double the share of the cohort within the general population.

In three of the four cities surveyed in Canada and the U.S., the share of survey respondents indicating that they were of a Caucasian ethnicity was near 90%.

In the surveyed American cities, the share of 25 to 34 year olds are also the most common age category of the bikesharing population; however, the relative difference to the same share in the general population is smaller (on the order of 5% to 10%).

Table 23 shows a similar but slightly different account for Mexico. Age distribution data for the population of Mexico City were not readily available through INEGI. So Table 23 shows the most recent age distribution for the entire country. Mexico's population is relatively younger than the U.S. and Canada, and hence the general population share of the youngest cohort of 16 to 24 is the most common distribution and is actually larger than the bikesharing member share.

In all cities surveyed in Phase II, the dominant age category for bikesharing membership was the 25 to 34 year old demographic.

The next age cohort of 25 to 34 comprises nearly 50% of the bikesharing sample, and like the populations surveyed in Canada and the U.S., it is the largest age cohort of the bikesharing population in Mexico City. This cohort is greater than the general population by 25 percentage points.

While the populations of bikesharing members surveyed in Canada, the U.S., and Mexico are generally younger than their respective general populations, bikesharing users are not exclusively young. In Montreal, 46% of members are aged 35 or older, while in Toronto and Salt Lake City, the share is roughly 50%. Nice Ride Minnesota had the oldest relative population of bikesharing users. About 51% of sampled users were between the ages of 35 and 54, with another 12% older than 55.

Racial Ethnic Distribution

The Phase II survey found that bikesharing users are more likely to be Caucasian relative to the population within the respective cities. In three of four cities surveyed in Canada and the U.S., the share of survey respondents indicating that they were of a Caucasian ethnicity was near 90%. In Toronto, which had the lowest Caucasian share of all four cities, bikesharing members were 75% Caucasian, while 20% were of Asian origin (including

South Asian, Filipino, Chinese, Japanese, and Korean). Those of Asian origin were the largest of any non-Caucasian group among bikesharing members, who make up 34% of Toronto's total population.

All five cities surveyed showed a marked increase in the frequency of bicycle use in the form of bikesharing. Furthermore, the majority of users in Canada and Mexico use bikesharing at least one to three times per week.

Broadly, this and previous studies have found that Caucasian bikesharing use is higher than the general urban population (e.g., Shaheen et al, 2012). The distribution of racial ethnicity was not collected in Mexico as the bikesharing operator advised researchers to remove this question, given that such data are not commonly collected or asked in Mexico.

Gender Distribution

Finally, the Phase II survey collected data on respondent gender and found considerable differences in the gender split across the five cities. In Montreal, the survey found a 50-50 split of men and women using bikesharing. The remaining cities exhibited a male majority of bikesharing members. Toronto was the highest at 70% male, followed by Salt Lake City at 66%, and Mexico City at 65%. The gender balance of bikesharing users in Minneapolis and Saint Paul is the closest to that of Montreal at 55% male.

Changes in Travel Behavior Before and After Bikesharing

In Montreal, the survey found a 50-50 split of men and women using bikesharing. The remaining cities (Mexico City, Salt Lake City, and Toronto) exhibited a male majority of members.

The survey asked bikesharing members questions about how bikesharing had altered their travel behavior. At the most basic level, the availability of bikesharing was found to increase the frequency in which a bicycle was used. On an ordinal scale, respondents were asked to indicate the frequency with which they rode a bicycle before they joined bikesharing and "currently," at the time of the survey. Figure 14 shows the distribution of responses to the question: "Before you joined <bikesharing>, how often did you ride a bicycle?" The distribution of response in four of the five cities ranged from: "Less than once a month" to "More than once a day." In Mexico, operators recommended adding the option "No la utilizaba," which translates to: "I was never using it." This response was combined with "Less than once a month" in Figure 14 for presentation and was remarkably high at 36%. That combination brought the total to 58% of Mexican respondents that stated that they were riding a bicycle less than once a month prior to bikesharing. In all cities, "Less than once a month" bicycle usage was the most common response. Figure 15 shows the follow-up question asking: "Currently, how often do you check-out a <bikesharing> bicycle?" The distribution in all cities showed a marked increase in the frequency of bicycle use in the form of bikesharing.

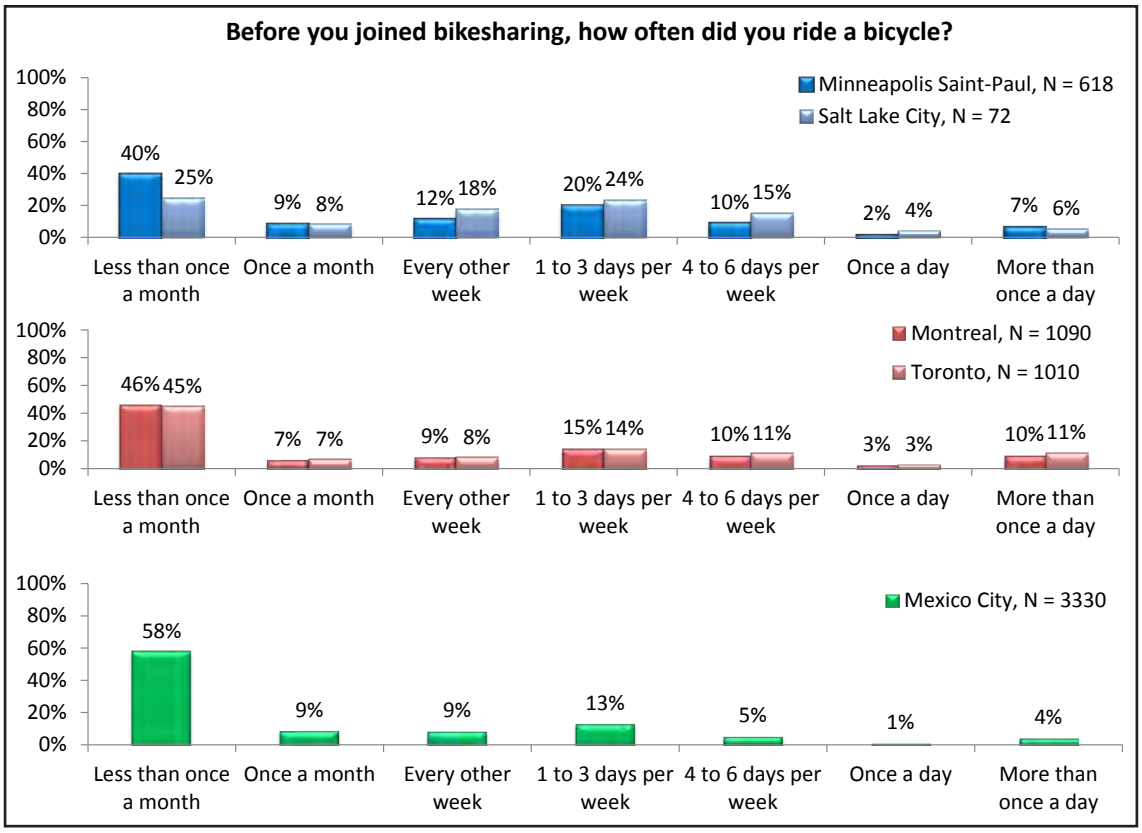

Figure 14. Bicycle Riding Before Joining Public Bikesharing

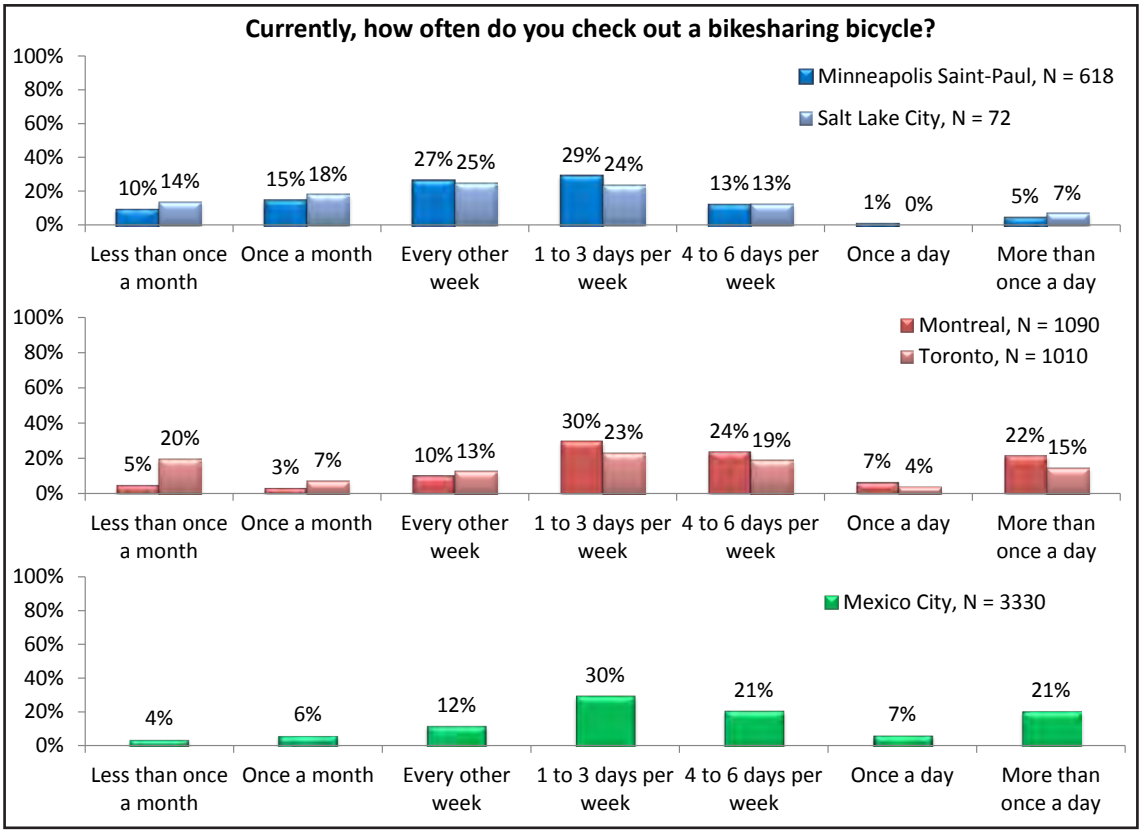

Figure 15. Bikesharing Usage at the Time of Survey

The Phase II survey featured questions that examined modal shift and key travel modes within each city. The question design focused on the ordinal direction of the shift and causality as related to public bikesharing and the movement within each mode. For example, the question design for probing shift in bus behavior appeared as follows:

As a result of my use of bikesharing, I use the bus…

- *Much more often*
- *More often*
- *About the same (bikesharing has had no impact)*
- *Less often*
- *Much less often*
- *I did not ride the bus before, and I do not ride the bus now.*
- *I have changed how I use the bus but not because of bikesharing.*

The question design—which remained the same among different modes—captures the direction of change in a simple manner, allowing the respondent to self-assess whether their usage of the bus has moved as a result of bikesharing. The options provide the respondent the ability to "opt out," by indicating that they never used the mode in the first place. It also allows the respondent to indicate that there was a change in mode use, but that the change was not credited to bikesharing usage. Figure 16 shows the distribution in responses to this question across all surveyed cities, probing the change in bus use resulting from bikesharing.

The results show an interesting split across cities that are consistent with previous research (Shaheen et al., 2013; Shaheen et al., 2012). The top of Figure 16 shows the response distribution for Minneapolis-Saint Paul and Salt Lake City. Respondents in both cities did not experience any change in bus usage. In total, 67% of respondents in Minneapolis-Saint Paul and 87% of respondents in Salt Lake City indicated that bikesharing had no impact on their bus usage. In terms of reducing bus use, 18% of respondents in Minneapolis-Saint Paul reported using the bus less often, while only 4% in Salt Lake City reported a similar change. In Minneapolis-Saint Paul, 16% noted increasing bus usage, and 8% reported increasing bus use in Salt Lake City.

While the share of respondents decreasing bus usage is slightly larger than those increasing it in Minneapolis-Saint Paul, the distribution is remarkably similar to that found in the Phase I survey. Salt Lake City on the other hand, is the only city to report any increase in bus usage as a result of bikesharing (previously, more members of Nice Ride Minnesota increased rail than decreased, but more members decreased than increased their bus usage) (Shaheen et al., 2013; Shaheen et al., 2012).

In Montreal and Toronto, the reported shift away from bus is more pronounced. Notably, these cities are even larger, with far greater bus ridership than the two American cities surveyed. Washington D.C. (included in our Phase I survey), a city more similar in size and public transit density to the two Canadian cities, reported a shift in bus usage that far more resembled Montreal and Toronto (Shaheen et al., 2013; Shaheen et al., 2012). Mexico City, which has about 9 million people, also presents a distribution exhibiting a broader shift away from bus (34% to 20%). Nevertheless, the difference between those increasing and decreasing bus usage is not as large as found in Montreal or Toronto nor as seen previously in Washington, D.C. (Shaheen et al., 2013; Shaheen et al., 2012).

Salt Lake City is the only city to report any increase in bus usage as a result of bikesharing.

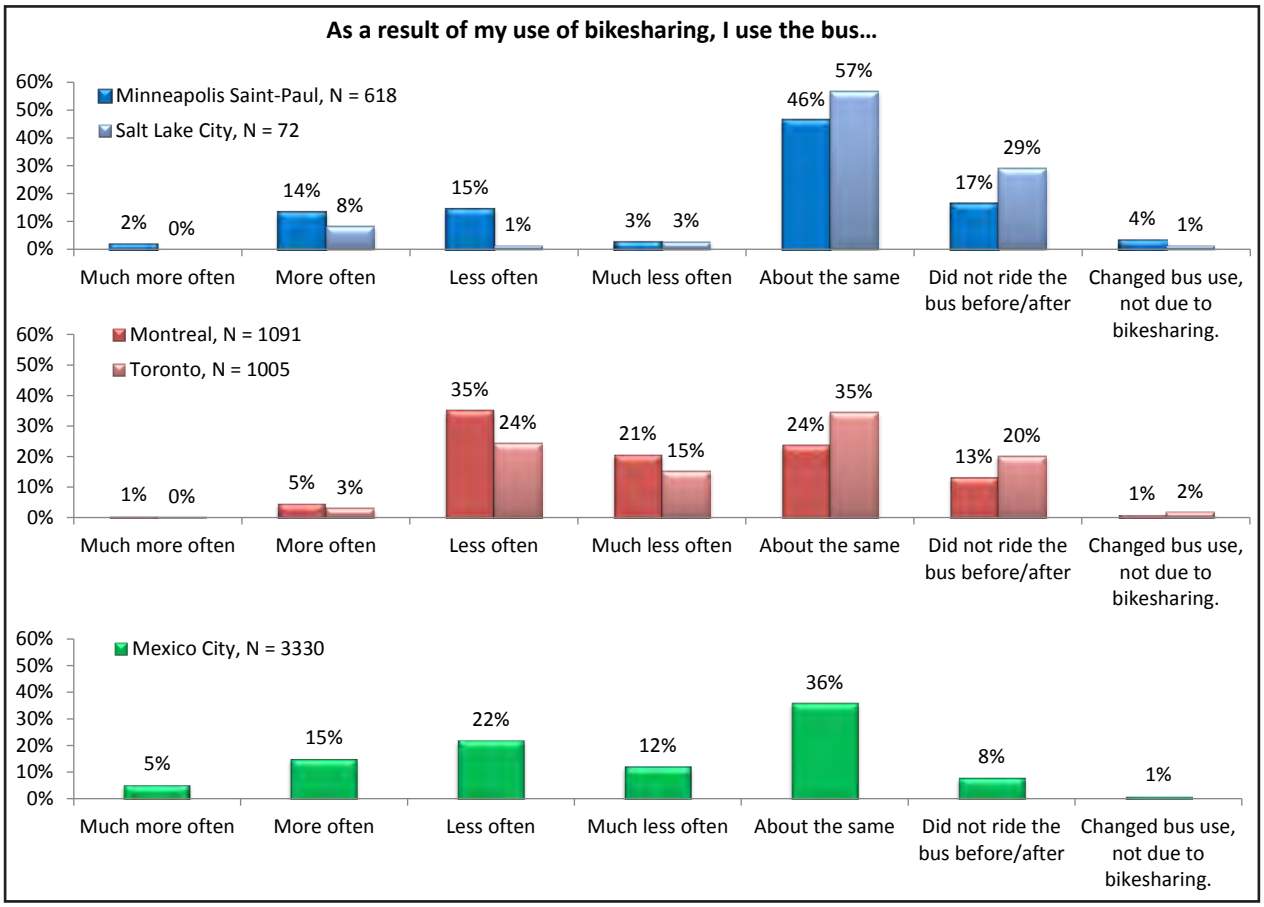

Figure 16. Change in in Bus Usage as a Result of Public Bikesharing

While these distributions inform the impact that bikesharing appears to have on bus usage, the underlying reasons why they occur is not clear without additional probing. In the Phase II study, the survey explored such shifts further by asking the primary reason that caused a member's decline in bus use. The results are summarized in Table 24. They show that the main reasons respondents in the larger cities are using the bus less are the reduced cost and faster travel offered by bikesharing. In addition, a sizeable minority stated that they used bikesharing over bus out of a desire to get exercise.

One answer not selected frequently as a reason for reducing bus trips was “crowded buses.” This result is counter to an earlier hypothesis of the Phase I study in which the authors suggested that bikesharing was preferred over buses in larger cities due to crowded vehicles. This turns out not to be the case in the U.S. and Canada. Crowded vehicles are cited as the second most frequent response in Mexico City, but even there, twice as many people cited “Lower cost and faster travel” as the main reason they used the bus less as a result of bikesharing.

Table 24. Primary Reason for Reducing Bus Usage as a Result of Public Bikesharing

What is the primary reason that you are using the bus LESS because of bikesharing?					
Response Categories	**Montreal**	**Toronto**	**Minneapolis-Saint Paul**	**Salt Lake City**	**Mexico City**
Lower cost and faster travel	30%	49%	22%	0%	36%
Just lower cost	3%	4%	3%	0%	2%
Too many connections (not have to transfer)	2%	1%	4%	0%	3%
Just faster travel	21%	23%	18%	33%	10%
Improve travel time reliability	8%	7%	8%	67%	5%
Want to get exercise	25%	6%	34%	0%	15%
Public transit vehicle is crowded	2%	3%	0%	0%	18%
No space for my bike, which I use to connect	0%	0%	1%	0%	2%
I consider it safer to travel with bikesharing	1%	0%	0%	0%	3%
Not applicable	1%	2%	3%	0%	2%
Other	7%	3%	8%	0%	4%
Total N	612	403	111	3	1149

A similar question was asked of respondents that reported increasing their bus use due to bikesharing. The response categories were different from those in Table 24 above. Respondents were asked whether bikesharing improved access to the bus, from bus, or both. The distribution of responses across the five cities is shown in Table 25.

The main reasons respondents in larger cities are using the bus less are the reduced cost and faster travel offered by bikesharing. A desire to get exercise was also noted.

Table 25. Primary Reason for Increasing Bus Usage as a Result of Public Bikesharing

What is the primary reason that you are using the bus MORE because of bikesharing?					
Response Categories	**Montreal**	**Toronto**	**Minneapolis-Saint Paul**	**Salt Lake City**	**Mexico City**
I have better access TO the bus line	8 (13%)	3 (9%)	8 (8%)	3 (50%)	229 (34%)
I have better access FROM the bus line	10 (16%)	6 (17%)	16 (17%)	1 (17%)	150 (22%)
I have better access BOTH TO and FROM the bus line	31 (49%)	21 (60%)	54 (56%)	1 (17%)	234 (35%)
Other	14 (22%)	5 (14%)	18 (19%)	1 (17%)	64 (9%)
Total (N)	63	35	96	6	677

Across all cities surveyed, the most common response was “better access BOTH TO and FROM the bus line.” In Mexico City, the second most common response was strictly “better access TO the bus line.” This was also the case in Salt Lake City, although the small sample size should be noted. Respondents were also allowed to give an “other” response, which was selected by a notable proportion of respondents in most cities. Among the common other responses were: “more flexibility to get around” and “allows more complex travel.” Several sample “other” responses are listed below.

Across all cities surveyed, the most common response to increasing bus use due to bikesharing was better access both to and from a bus line.

- “The bike allows me flexibility during the work day, so I don’t feel I need to bring my car to run errands.”
- “A greater awareness of alternative transportation options. Also, the bikes add an extra level of flexibility that allow me to more confidently leave my car at home and know I can get around with a bike/bus/train combo.”
- “Don’t have to worry about limited late night bus schedules. Can replace a cab ride home with a bike ride home after taking the bus downtown to go out.”
- “I can get home later at night when the buses run less frequently.”
- “Never really thought about public transportation before Nice Ride.”

The same modal shift question was asked of respondents regarding their rail usage, which is shown in Figure 17. The distributions in Figure 17 are in the same format as Figure 16 and demonstrate similar patterns in modal shift. There are some notable differences, however. In Minneapolis-Saint Paul and Salt Lake City, bikesharing is reported to increase rail use. In Montreal and Toronto, a modal shift pattern similar to bus is found, with 7% to 8% increasing rail and 50% to 60% decreasing rail. In Mexico City, more people are decreasing rail use than increasing it, but the difference is less: 17% to 13%, respectively.

The patterns shown in Figure 17 are similar to those found in the Phase I study (see Shaheen et al., 2013; Shaheen et al., 2012). Importantly, the patterns are not a reflection of the different countries in which bikesharing is evaluated. Rather, there is an emerging distinction of impact arising from the type of cities in which bikesharing is deployed. Both Minneapolis-Saint Paul and Salt Lake City are smaller cities with more limited light rail in contrast to the denser networks in Montreal and Toronto. Mexico City is similarly dense. As with the evaluation of bus, respondents that stated that they reduced their rail use were asked further questions about the main reasons for their shift.

Rail usage increased as a result of bikesharing in Minneapolis-Saint Paul and Salt Lake City. In contrast, a decrease in rail usage was found in both Canadian cities and Mexico City—most likely due to the larger population size and denser rail networks. The primary reasons for this shift away from rail is that bikesharing is sometimes able to get users to their destination more quickly, and it can be more cost effective.

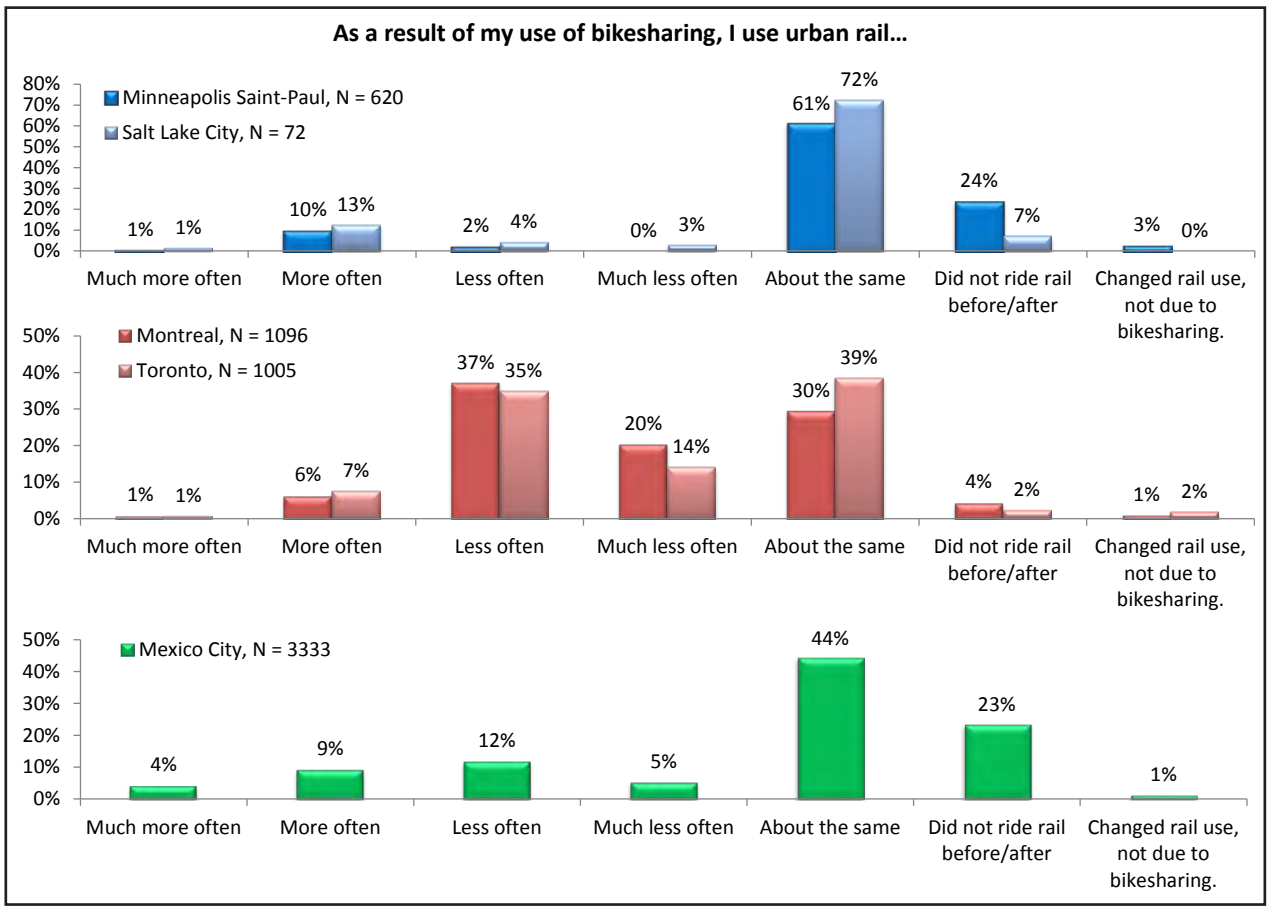

Figure 17. Change in Rail Use as a Result of Public Bikesharing

In Table 26, the distributions of responses to the primary reason for reducing rail use by city are shown. As with the change in bus usage, the primary answer selected in the cities with the most departure from rail were: “Lower cost and faster travel.” This response is notably not selected in Minneapolis-Saint Paul or Salt Lake City among those that did indicate a decline in rail use. The desire to get exercise was also cited as a main reason for reducing rail usage, particularly in Montreal and Mexico City. Again in Mexico City, crowded transit

vehicles were cited by a fifth of the respondents, but by less than 10% of respondents in Montreal and Toronto. Thus, the results of these follow-up questions demonstrate that reductions in public transit use as a result of bikesharing are most prominently happening in larger cities.

The primary reason for this shift is due to the fact that bikesharing is increasing travel speed and reducing costs for users to make the same trips. The shift toward rail in Minneapolis-Saint Paul was also observed previously in Shaheen et al, 2013 and Shaheen et al., 2012. But with this Phase II survey, Salt Lake City is now the second city found to exhibit an increase in rail usage as a result of bikesharing.

Table 26. Primary Reason for Reducing Rail Usage as a Result of Public Bikesharing

What is the primary reason that you are using the rail LESS because of bikesharing?					
Response Categories	**Montreal**	**Toronto**	**Minneapolis-Saint Paul**	**Salt Lake City**	**Mexico City**
Lower cost and faster travel	25%	48%	0%	0%	28%
Just lower cost	5%	9%	7%	0%	2%
Too many connections (not have to transfer)	3%	2%	7%	0%	6%
Just faster travel	14%	14%	14%	40%	12%
Improve travel time reliability	4%	7%	0%	60%	6%
Want to get exercise	31%	8%	50%	0%	17%
Public transit vehicle is crowded	6%	6%	0%	0%	18%
No space for my bike, which I use to connect	0%	0%	0%	0%	2%
I consider it safer to travel with bikesharing	1%	0%	7%	0%	2%
Not applicable	1%	2%	0%	0%	3%
Other	8%	5%	14%	0%	3%
Total N	631	491	14	5	577

As with the questions probing the modal shift in bus, a similar follow up question was asked of respondents who shifted toward rail as a result of bikesharing. In the same format, respondents were asked if they shifted toward rail due to better access or egress or whether or not improvements in both access and egress were the primary reason. The distribution of responses is shown in Table 27.

Table 27. Primary Reason for Increasing Rail Usage as a Result of Public Bikesharing

What is the primary reason that you are using the rail MORE because of bikesharing?					
Response Categories	**Montreal**	**Toronto**	**Minneapolis-Saint Paul**	**Salt Lake City**	**Mexico City**
I have better access TO the rail line	13 (16%)	9 (11%)	15 (23%)	3 (33%)	152 (34%)
I have better access FROM the rail line	9 (11%)	13 (16%)	8 (12%)	0 (0%)	114 (25%)
I have better access BOTH TO and FROM the rail line	44 (55%)	49 (62%)	40 (62%)	5 (56%)	159 (35%)
Other	14 (18%)	8 (10%)	2 (3%)	1 (11%)	26 (6%)
Total (N)	80	79	65	9	451

Table 27 shows that as with bus transportation, the most common response was “having access BOTH TO and FROM the rail line.” As with the question probing the reasons for increased bus usage, respondents increasing their rail usage also offered a number of “other” responses, though not in as high of frequency. Some responses included: “avoiding bike theft at rail stations” and “easy to combine bike with rail for errands.” Some examples of other responses include:

- “I can’t bike home if I drive to work, so I train in then bike home.”
- “I return from work when it’s raining.”
- “In order to complement exercise.”
- “I have better access to Ecobici from the metro.”

Bikesharing causes members to use personal automobiles less in approximately 50% of the membership in the programs surveyed.

The survey also evaluated the impact of bikesharing on other modes of travel outside of public transit. Most prominent among these questions were those assessing how their driving and walking had changed as a result of bikesharing in the same format as the public transit questions above. The results for driving are presented in Figure 18 and are rather clear; bikesharing reduces personal driving in all cities. The share of respondents who reported reduced driving ranged from 29% in Montreal and 35% in Toronto to over 50% in Mexico City, Minneapolis-Saint Paul, and Salt Lake City.

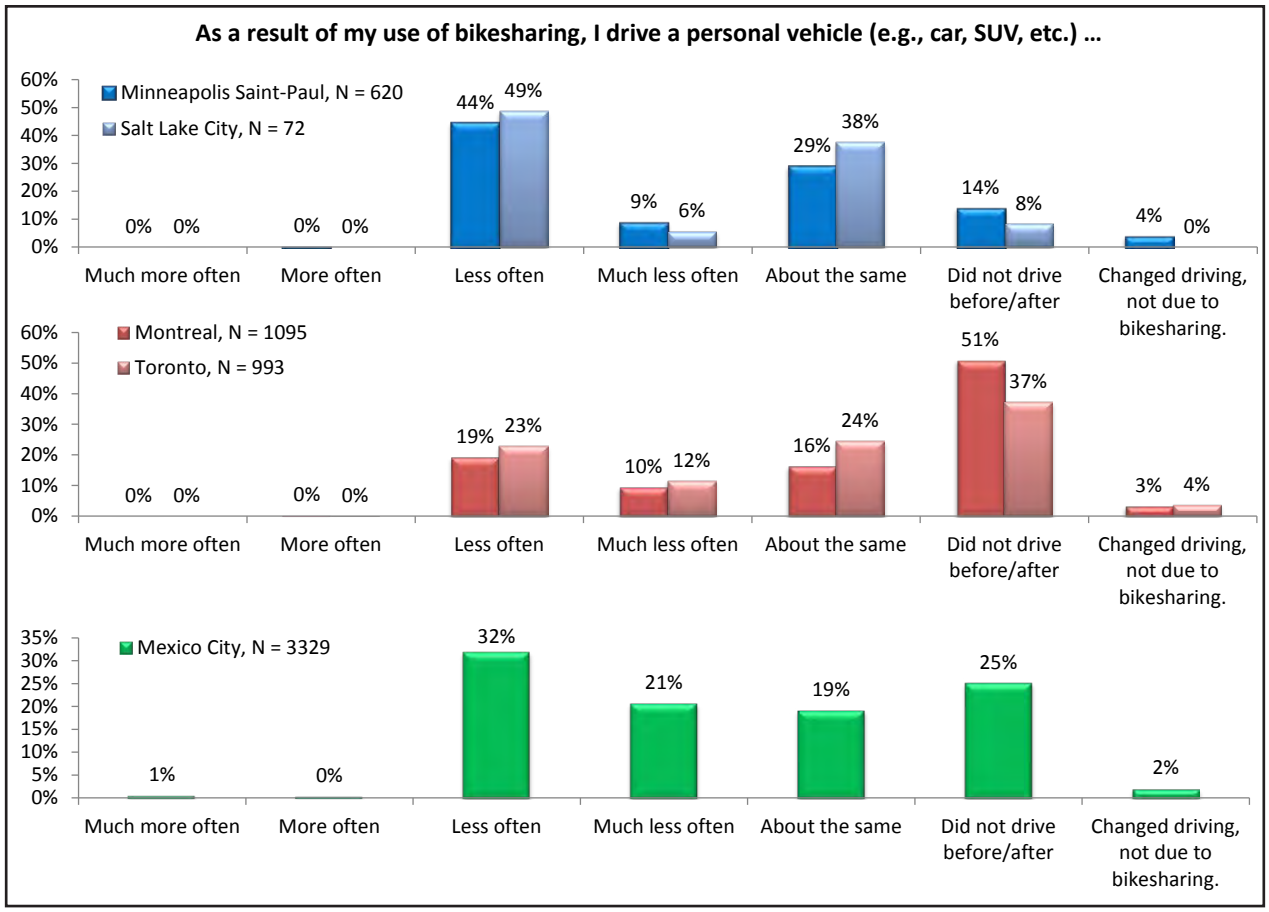

Figure 18. Change in Personal Driving as Result of Public Public Bikesharing

More respondents reported increasing their walking than decreasing it in the two U.S. cities and Mexico City. However, in the Canadian cities, the shifts away from walking due to bikesharing were greater overall.

In terms of the impact of bikesharing on walking, the results are more mixed. Figure 19 illustrates the distribution of modal shift in walking as a result of bikesharing. In Minneapolis-Saint Paul and Salt Lake City, more respondents reported increasing their walking than decreasing it. Notably, however, a sizeable share (20% to 24%) within these cities reduced their walking, which is larger than the reductions in public transit use observed in these cities. In Montreal and Toronto, 23% and 25% of respondents increased their walking, versus 34% to 39% decreasing their walking in the two cities, respectively. Finally, Mexico City departs from the patterns of the Canadian cities with a modal shift away from walking, as more people reported increasing their walking versus decreasing it (45% increasing to 27% decreasing). In terms of impacts on vehicle holdings, 239 (3.9%) of the study population stated that bikesharing was somewhat to very important in their decision to sell or donate a private vehicle. Among this subsample, 46% were in Mexico City (n=111), 19% were in Toronto (n=46), 19% were in Montreal (n=45), 15% were in Minneapolis-Saint Paul (n=36), and 0.4% were in Salt Lake City (n=1).

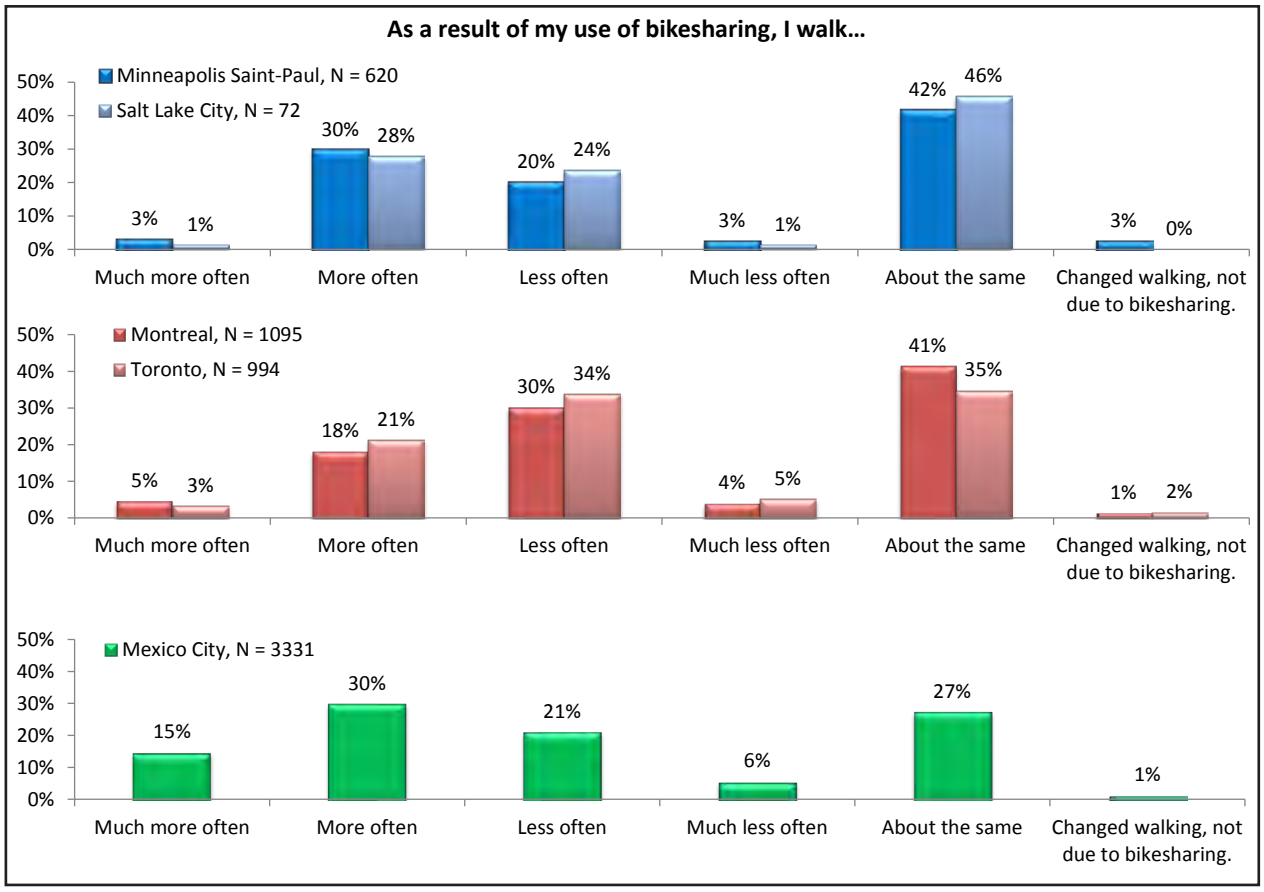

Figure 19. Change in Walking Due to Public Bikesharing

Overall, the modal shift results reported as a result of bikesharing appear to tell a story of distinct cities rather than distinct countries. The two U.S. cities are smallest in the study. Minneapolis and Saint Paul have a combined population of about 600,000 people, whereas Salt Lake City has a population of about 190,000 people. In contrast, Montreal has 1.6 million, Toronto has 2.6 million, and Mexico City has a population of almost nine million.

While population alone is likely not the driving factor, they correlate with existing public transit infrastructure and ridership. In the U.S. cities, there is less public transit ridership overall, and thus more opportunity to increase it than decrease it. Indeed, in the previous Phase I study of Shaheen et al. 2013 and Shaheen et al., 2012, Washington, D.C. exhibited modal shift patterns highly similar to Montreal and Toronto, as it has a population and transit ridership levels similar to those cities.

In the section that follows, the authors explore the safety dynamics of bikesharing, particularly as they relate to helmet use.

Safety and Bikesharing

The Phase II survey probed the degree to which bikesharing members felt comfortable riding a bicycle. The responses, given in Figure 20, show that most members surveyed across the five systems felt at least very agile and comfortable riding a bicycle. A minority

of respondents within all systems felt “Somewhat cautious” on a bicycle. Notably, few respondents—less than 10% in any system—felt uncomfortable or more cautious.

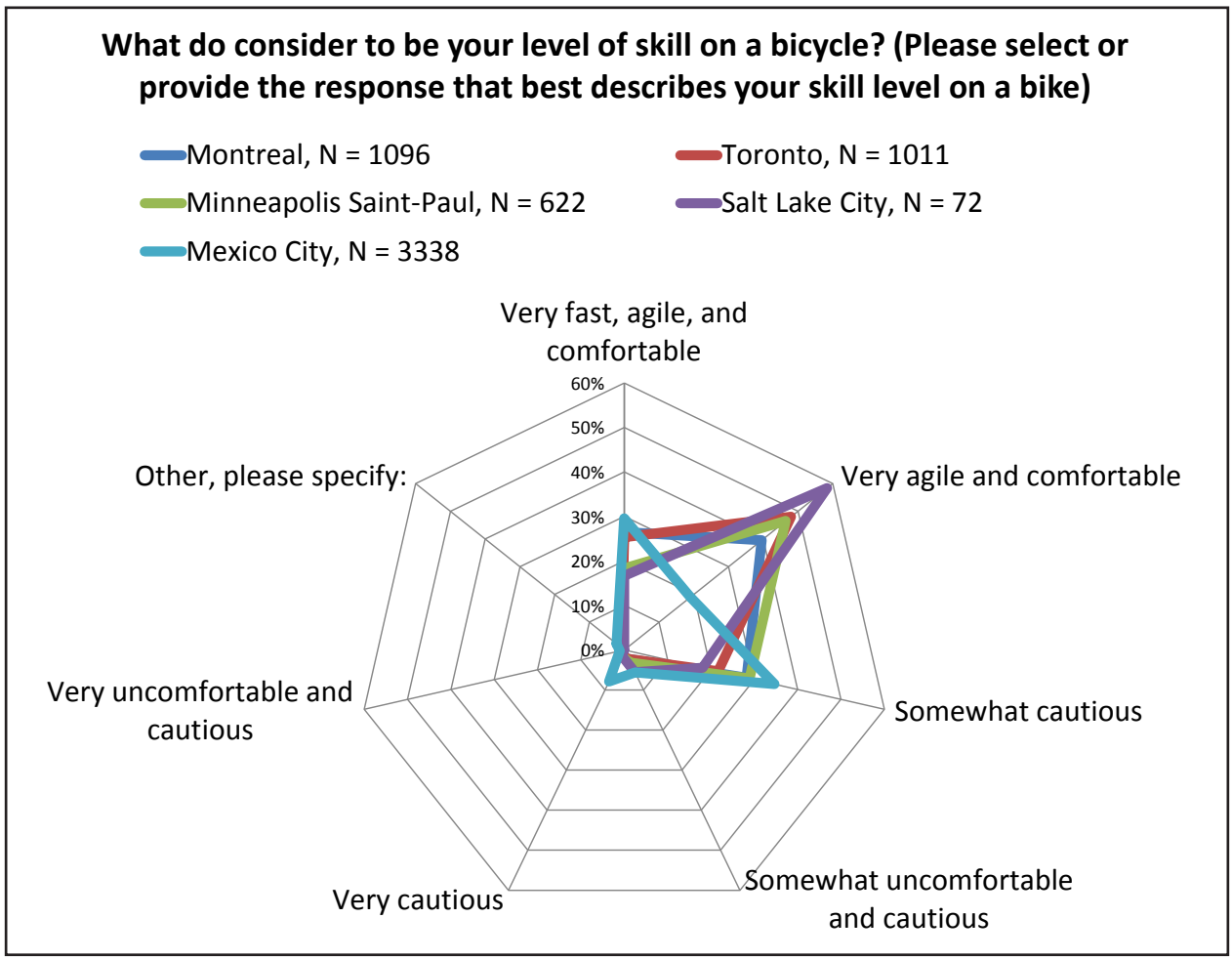

Figure 20. Comfort of Bikesharing Members with Bicycle Riding

In a related question with similar results, respondents were asked: “How safe do you feel riding bikesharing?” Figure 21 shows that most respondents in the Canada and the U.S. felt “Very safe” to “Somewhat safe.” Less than 10% felt “Somewhat unsafe” to “Very unsafe.” Among these cities, these unsafe sentiments were found to be the highest in Toronto at 7%. In Mexico City, feelings of insecurity were notably higher as 19% felt “Somewhat unsafe,” and another 2% felt “Very unsafe.”

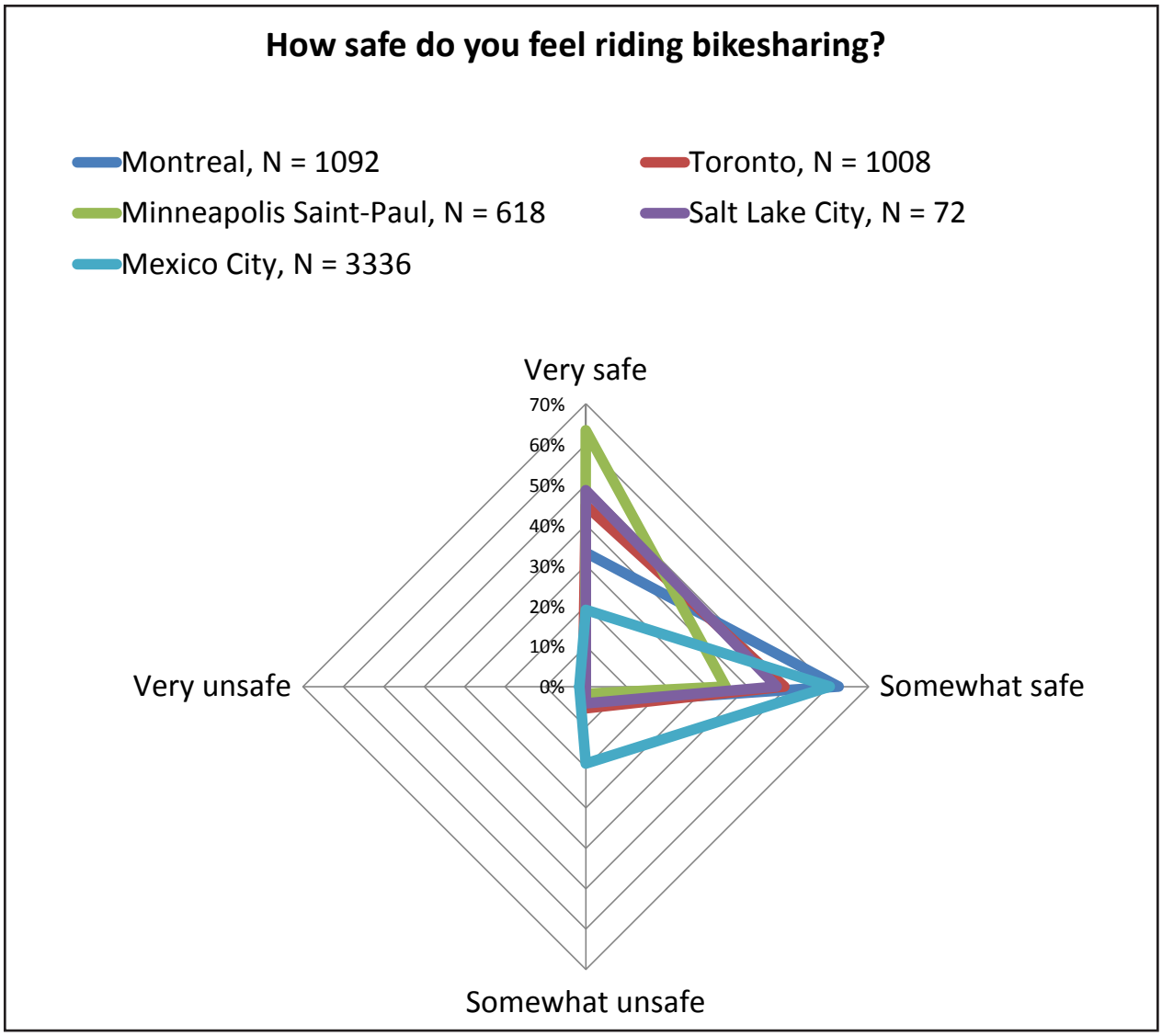

Figure 21. Feelings of Safety with Public Bikesharing

Not wearing a helmet while using bikesharing is relatively common in Mexico City (74%), Montreal (54%), Toronto (46%), and Minneapolis-Saint Paul (42%). In contrast, in Salt Lake City only 15% reported never wearing a helmet.

Bicycle safety and helmet use are generally discussed together. Among all the surveyed cities, a majority of respondents feel generally comfortable and safe riding bikesharing bicycles despite many reporting that they never wear helmets while riding. Respondents were asked about the frequency of their helmet use, with the results shown in Figure 22. In Mexico City, nearly three-quarters of respondents (74%) reported never wearing helmets. In Montreal, a majority of respondents (54%) also reported no helmet use. In Toronto and Minneapolis-Saint Paul, the shares of "Never" decline to the 40% range.

Within these cities, more respondents reported "Rarely" or "Sometimes" wearing helmets, while the share of those "Always" wearing helmets remained similar to levels observed

in Montreal. But members of GREENBike SLC in Salt Lake City exhibited a notably different distribution of helmet usage. Only 15% reported "Never" wearing a helmet, while 40% reported "Always" wearing a helmet.

Most members across the five programs surveyed felt at least very agile and comfortable riding a bicycle.

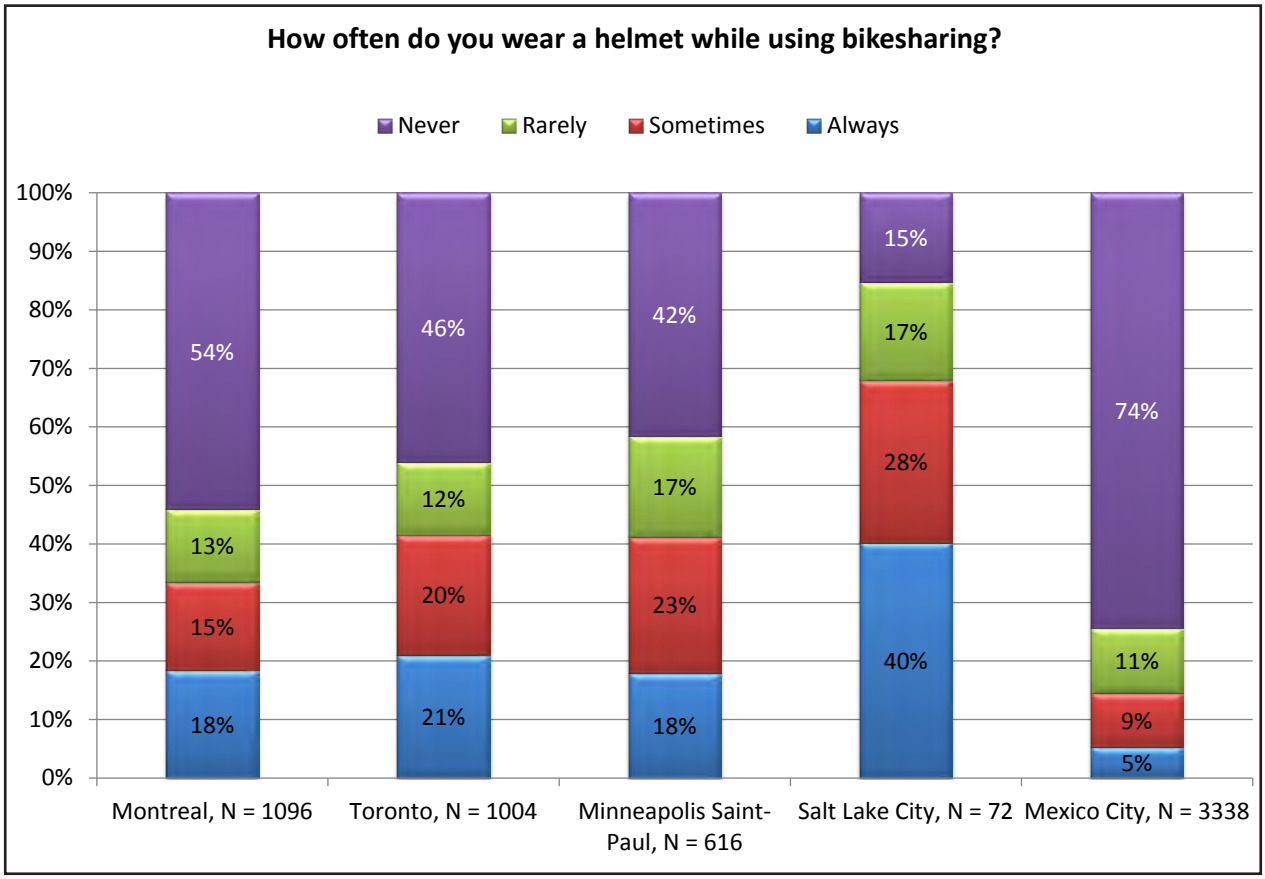

Figure 22. Helmet Use While Using Public Bikesharing

There is a clear relationship between the rate of helmet ownership and helmet use among the five cities surveyed, with Salt Lake City having the highest of both.

Low helmet usage was reported in the Phase I research, and the Phase II surveys suggest that it persists (Shaheen et al., 2012). To understand this issue further, the survey probed those that did not report "Always" wearing a helmet with additional questions to better understand why helmet usage was not higher. The first question asked respondents whether or not they owned a helmet. The responses showed distributions that may partially explain the relative magnitude of "Never" responses seen in Figure 22. Figure 23 shows the percentages of "Yes/No" responses for each city. Mexico City, where respondents reported the lowest helmet usage commensurately noted the lowest helmet ownership, where 34% of respondents stated owning a helmet. Montreal, which reported the second lowest relative helmet usage, noted the second lowest ownership rate of helmets at 66%. Toronto, with the third lowest helmet usage also reported the third lowest helmet ownership. Similarly, Minneapolis-Saint Paul exhibited just slightly higher helmet usage than Toronto and showed just higher helmet ownership rates. Finally, respondents in Salt Lake reported near universal helmet ownership. While it is clear that helmet ownership does not ensure helmet usage while

bikesharing, it is a necessary pre-requisite to regular use, and the results shown in Figure 22 and Figure 23 suggest a clear relationship between the rate of helmet ownership and the rate of helmet usage.

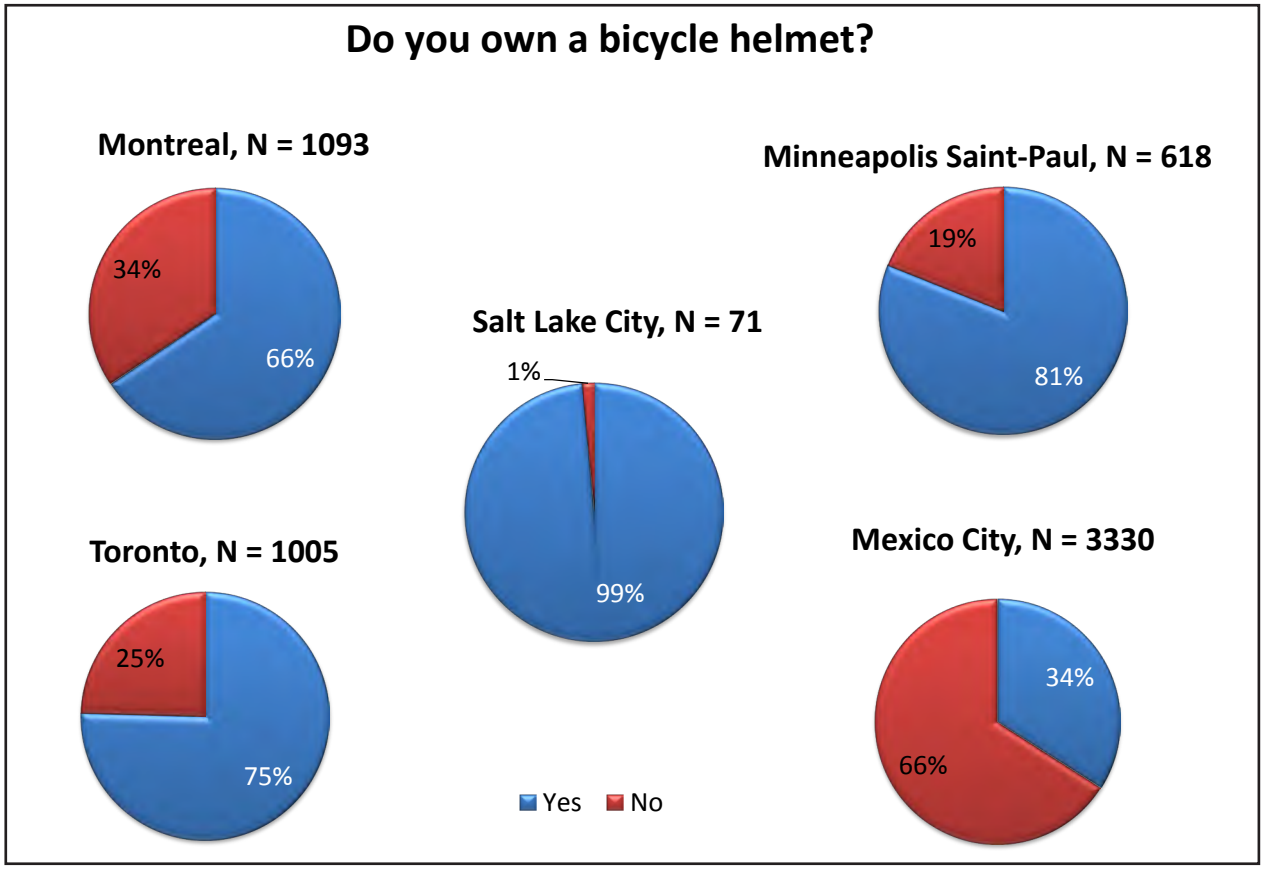

Figure 23. Helmet Ownership Among Those That Do Not Always Wear Helmets

Respondents that did not always wear a helmet were further asked to define the main reason why they did not. Respondents were asked: “What is the MAIN REASON you do not always use a helmet while using bikesharing? Select the circumstances that most often apply to you regarding helmet use.” Respondents were given four options, which covered the general responses of: “I never wear helmet;” “My bikesharing is not always planned…;” “I do not like carrying a helmet;” and “Other, please explain.” The breakdown of responses is shown in Table 28.

Table 28. Main Reason Why Respondents Do Not Wear a Helmet While Bikesharing

What is the MAIN REASON you do not always use a helmet while using bikesharing? Select the circumstances that most often apply to you regarding helmet use.

Response Options	Montreal	Toronto	Minneapolis-Saint Paul	Salt Lake City	Mexico City
I never wear a helmet while riding any bicycle.	23%	14%	13%	2%	29%
My use of bikesharing is not always planned and I do not have a helmet with me in such cases.	42%	47%	45%	53%	27%
I do not like to carry a helmet around, even though I generally know in advance when I am going to use bikesharing.	29%	32%	31%	26%	25%
Other, please explain:	5%	6%	9%	19%	6%
I do not own a helmet.	2%	1%	2%	0%	13%
Total	893	792	506	43	3145

Within the “Other” response, a common write-in response was: “I do not own a helmet.” These responses were identified as a fifth category within each survey and are listed separately. Respondents in four of five surveys indicated that the most common reason for not always wearing a helmet was due to the unplanned nature of bikesharing trips. The second most common response was that respondents did not like carrying helmets around. The categorical distribution in Mexico City was slightly different, with the top response: “I never wear a helmet,” followed by “unplanned use” and “do not like carrying a helmet.” Notably, 13% of respondents wrote that the lack helmet ownership was a key inhibitor to using one, whereas far fewer cited this in the other cities.

The most common reasons for not always wearing a helmet were the unplanned nature of tripmaking and that users did not like to carry a helmet around.

For those respondents that simply answered: “I never wear a helmet while riding any bicycle,” the survey probed even further to understand why. Respondents were asked to rank the top three reasons they never wore a helmet. The two most common responses that ranked number “1” were: “I am a very safe bicycle rider,” and “it is not necessary” and “I should probably get a helmet, but haven’t found the time to find one I like.” Overall, most responses indicated that people who never wear helmets, do so more by choice rather than constraint. Other responses available included: “helmets are uncomfortable,” “helmets mess up my hair,” and “helmets do not look good on me.” When aggregated together, these “choice-based” responses comprised over 60% of the selections by respondents in the U.S. and Canada, and 45% of respondents in Mexico City. Responses based on helmet availability encompassed between 15% to 30% of responses in the U.S. and Canada and 42% in Mexico. The responses are summarized in Table 29.

Table 29. Ranked Reasons Why Respondents Never Wear a Helmet

Which of the following best describes why you do not wear a bicycle helmet?
Please rank the top three reasons, with one being the most important and three the least of your top choices.

Rank	Montreal	Toronto	Minneapolis-Saint Paul	Salt Lake City	Mexico City
I am a very safe bicycle rider, and it is not necessary.					
1	27%	37%	35%	0%	22%
2	17%	21%	20%	100%	20%
3	15%	14%	9%	0%	14%
Bicycle helmets are uncomfortable.					
1	17%	13%	11%	0%	14%
2	19%	23%	26%	0%	21%
3	19%	13%	12%	0%	19%
Bicycle helmets mess up my hair when I wear them.					
1	9%	15%	8%	100%	6%
2	10%	14%	18%	0%	11%
3	18%	14%	18%	0%	22%
Bicycle helmets do not look good on me.					
1	8%	1%	6%	0%	2%
2	11%	7%	5%	0%	4%
3	18%	10%	5%	100%	15%
I cannot afford a bicycle helmet.					
1	5%	0%	3%	0%	6%
2	7%	7%	0%	0%	9%
3	11%	0%	3%	0%	13%
I should probably get a helmet, but I haven't found the time to find one I like.					
1	22%	15%	22%	0%	36%
2	18%	8%	9%	0%	17%
3	16%	12%	17%	0%	14%
Other					
1	12%	19%	15%	0%	12%
2	4%	7%	12%	0%	5%
3	7%	9%	14%	0%	8%
N	204	107	65	1	868

On-Street Intercept Survey Results

The authors developed an on-street survey experimental survey in an attempt to better understand the behavior of members and casual users based on data collected immediately after a trip. Both members and casual users completed the survey. The survey was implemented through QR codes posted at kiosks that brought the user to a survey link that they could take on their smartphone. The text of the URL was also provided, if respondents wanted to type it in or take it later. The application of the survey in its on-street application required that the user possess a smartphone. Three U.S. operators deployed the on-street survey. They included Hubway in Boston (N = 191), B-cycle in San Antonio (N = 14), and GREENBike SLC in Salt Lake City (N = 1). The distribution of membership from the three surveys is shown in Table 30.

Table 30. On-Street Survey Respondent Distribution by Membership Type

	Annual Member	Monthly Member	7-Day Pass	3-Day Pass	24-Hour Pass	Visiting Member Using B-connected	Non-response	Total N
Greenbike LLC	100%	N/A	0%	N/A	0%	0%	0%	1
San Antonio B-cycle	29%	N/A	7%	N/A	57%	0%	7%	14
Hubway	72%	4%	N/A	4%	19%	N/A	1%	191

Note: "N/A" denotes that a particular membership type was not offered by that operator.

The distribution of the surveys shows limited success in this experimental method for surveying casual users. In Salt Lake City, where the membership base was small at the time of the survey, only one valid respondent was collected via the on-street survey. Because GREENBike had a sample size of 1, the authors did not include it in the distributions that follow. San Antonio features a bigger system and had additional respondents. Finally, Hubway, which is the largest of the systems, had the greatest number of respondents. San Antonio had a majority of casual members responding to the survey (64%), whereas about 20% of Hubway respondents were casual members.

Respondents to the survey were asked a short number of questions related to their bikesharing use immediately following their trip. One of the first questions was related to trip purpose, which was asked of all respondents. The cross-tabulation of trip purpose by membership type is shown in Table 31 for both Hubway and San Antonio.

Table 31. Cross-Tabulation of Membership Type by Trip Purpose

	Trip Purpose Type of Membership	Go to/from work	Go to/from school	Go to a meeting	Go to a restaurant / meal	Go shopping	Social / entertainment / visit friends	Run errands	Exercise / recreation	Other
Hubway	Annual Member	40%	3%	4%	3%	1%	6%	9%	4%	3%
	Monthly Member	2%	0%	0%	0%	0%	1%	0%	2%	0%
	3-Day Pass	0%	0%	2%	0%	1%	2%	0%	0%	1%
	24-Hour Pass	2%	1%	2%	1%	1%	5%	2%	5%	4%
	Total N	83	6	13	6	3	25	20	20	15
San Antonio	Annual Member	0%	0%	0%	0%	0%	8%	0%	23%	0%
	Monthly Member	0%	0%	0%	0%	0%	8%	0%	0%	0%
	3-Day Pass	0%	8%	0%	0%	0%	0%	0%	38%	15%
	24-Hour Pass	0%	0%	0%	0%	0%	0%	0%	0%	0%
	Total N	0	1	0	0	0	2	0	9	2

The cross-tabulation shows that members in Boston, which were predominantly Annual Members, used bikesharing for commuting to work, meetings, and other practical daily purposes. Fewer respondents in Boston listed social/recreational trips compared to San Antonio. In San Antonio, a sizable proportion of respondents who had a 3-day pass or an annual member pass used B-cycle for recreational purposes. This is not surprising given the focus of the San Antonio program on promoting public health.

Finally, the on-street survey asked a direct question about modal substitution, asking, if the user had not used bikesharing, how they would have made their most recent trip. The distribution of responses for Boston and San Antonio are shown in Figure 24. Please note that the one survey respondent from Salt Lake City stated he/she would not have made the trip in the absence of bikesharing. The distribution below supports findings from the member survey. Considerable substitution of bus and rail is observed in Boston, along with small shares of "Drive Alone" and "Taxi." San Antonio, although the sample size is far smaller, shows a more auto-centric substitution. This result, nevertheless, should be verified with a larger sample.

In San Antonio, a sizable portion of respondents who had a 3-day pass or an annual member pass used B-cycle for recreational purposes.

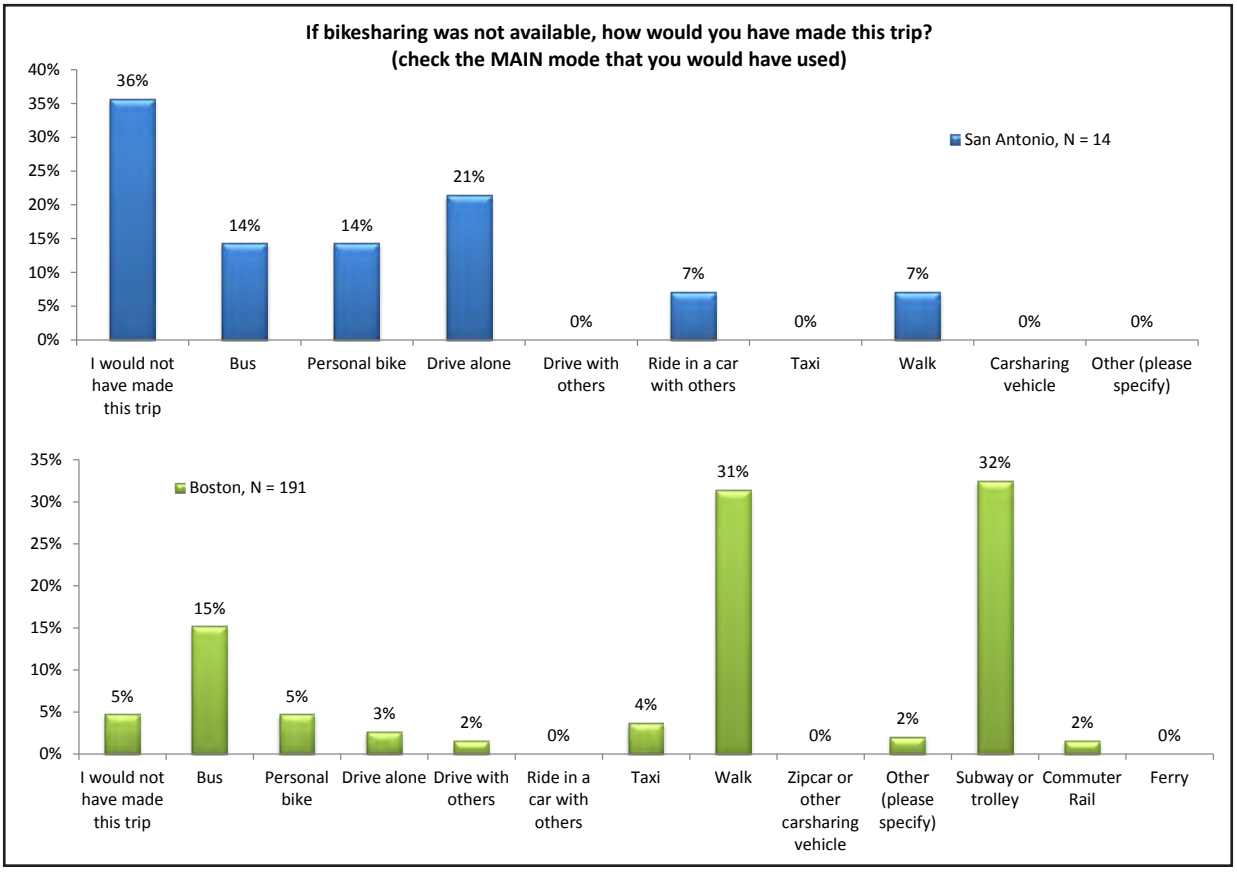

Figure 24. Modal Substitution of Public Bikesharing from On-Street Survey

The on-street survey was an experimental survey method to “passive” recruitment, which aimed to achieve two objectives. First, it was designed to survey casual bikesharing users, which are not otherwise contactable. Second, it aimed to obtain information about trip purpose and substitution at or near the time of the trip. However, the on-street survey implementation was only marginally successful and encountered a few challenges. As an entirely passive survey, it lacked any human engagement and relied upon the attention and initiative of the respondent.

Although the QR was prominently displayed, the posting also had a short URL that respondents could use to access the survey, so a QR code was not required. Despite these limitations, a reasonable sample size was obtained in Boston, but it was less effective in producing a large sample (>30) in San Antonio or Salt Lake City. These lessons learned, as well as the data obtained from the existing sample, can be used to further improve research on casual users and to develop cost-effective methodological approaches for collecting data on this population.

Analysis of Activity and Survey Data

Collaboration with one public bikesharing operator (Nice Ride Minnesota) in this study permitted the anonymous linking of survey data to annual activity data for the year. The data provide unique possibilities for new analyses to understand how respondents use the bikesharing system in specific ways. The link occurred through a de-identified parameter, which contained no information about the respondent’s identity, but contained enough information to be matched to the survey and activity data of Nice Ride Minnesota. The cross-tabulation of the survey and activity data can help to verify that actual usage frequencies are at levels similar to those reported in the survey.

These data allowed researchers to analyze how modal shift correlates with use. For example, the researchers can investigate the distribution of modal shifts toward and away from driving and public transit at a regional level by combining the activity and survey data. An example of this kind of analysis is presented below. Figure 25 shows the average count of trips taken during a single year (2013) by respondents, as correlated with their “stated” modal shift in bus, rail, walking, and driving. Please note that the sample size for each mode is provided in the legend. The sample sizes are slightly smaller than the survey responses reported earlier due to missing observations (~15 to 20) in the activity data.

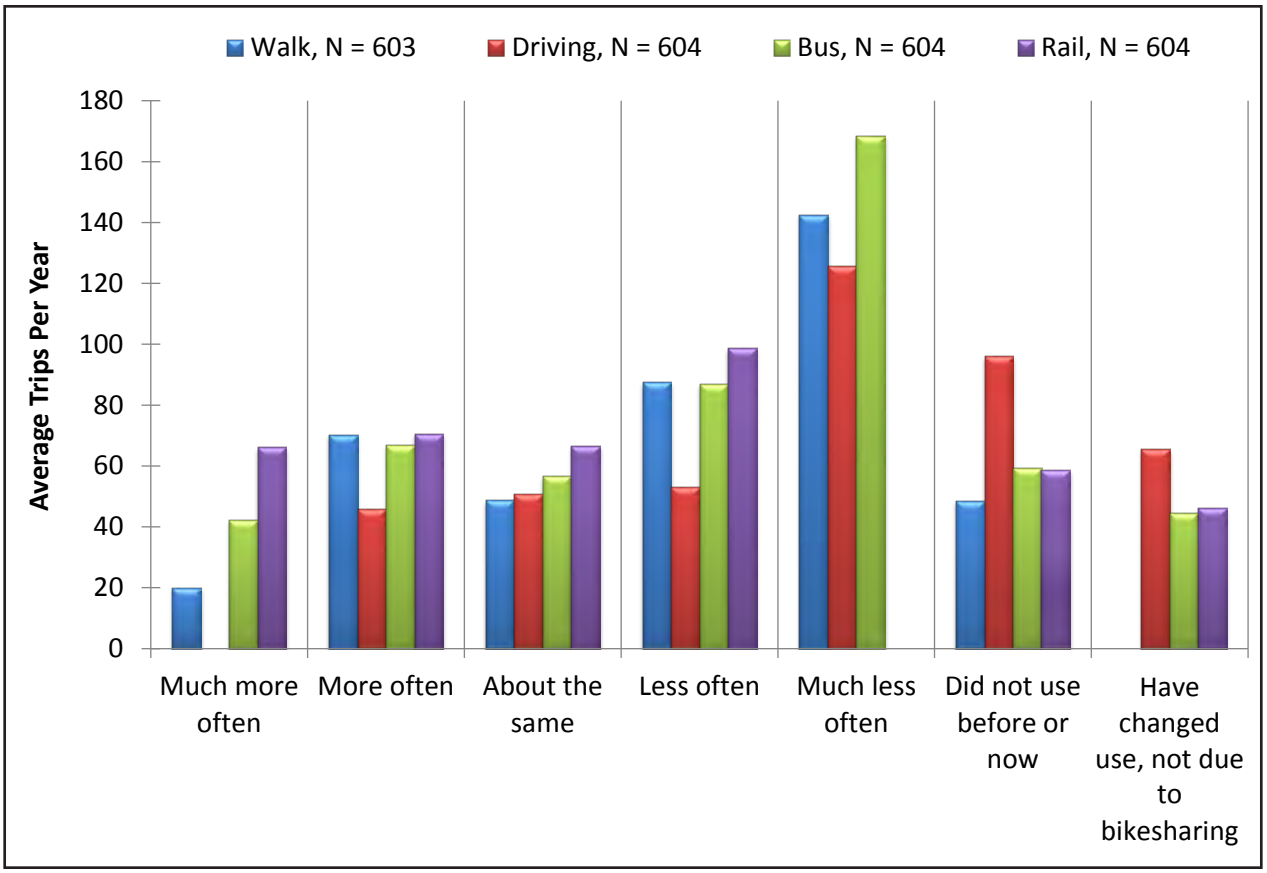

Figure 25. Average Number of Bikesharing Trips by Modal Shift

The data in Figure 25 represent the average number of annual bikesharing trips of respondents by modal shift. It shows that those shifting away from all modes tended to use bikesharing with greater frequency. This makes sense, as frequent bikesharing users find the system attractive and substitute their previous travel modes with higher bikesharing use. The data also suggest that those shifting toward certain modes are somewhat regular users, using bikesharing between an average of 42 to 71 times per year. These connections may be useful in yielding new understanding about the dynamics of bikesharing impacts, activity, and behavior in the future.

VIII. CONCLUSION AND LESSONS LEARNED

Public bikesharing systems offers users access to bicycles on an as-needed basis for first- and-last mile trips connecting to other modes, as well as for both short- and long-distance destinations in an urban environment. Between 2007 and December 2013, there were 44 IT-based public bikesharing startups, three program suspensions, and three program closures in North America. A number of public bikesharing business models have evolved in North America with the advent of IT-based systems including: 1) non-profit, 2) privately owned and operated, 3) publicly owned and operated, 4) public owned/contractor operated, and 5) vendor operated. In the 2012 season, there were 28 IT-based public bikesharing programs with approximately 1.1 million users sharing 17,344 bicycles at 1,599 locations in North America. In North America, casual (short-term) users accounted for 85% of all bikesharing users during the 2012 season. Globally, as of June 2014, public bikesharing programs existed on five continents, including 712 cities, operating approximately 806,200 bicycles at 37,500 stations (Russell Meddin, unpublished data, June 2014).

This study examined public bikesharing from several angles including: 1) current operational practices, 2) business models, 3) membership demographics, and 4) environmental and social impacts in North America. A combined 70 interviews were conducted with local government representatives and operators during Phase I and Phase II of this study. In addition to expert interviews, five operators participated in a member survey with 6,373 individual responses, and three operators participated in a survey of casual users with 205 individual respones. The recent proliferation of IT-based public bikesharing operations have led to a range of critical observations and lessons learned. This study revealed the following key findings as summarized below.

Bicycle Theft and Vandalism

Early bikesharing programs learned that user anonymity created systems prone to theft. The world's first documented bikesharing program, Amsterdam's *Witte Fietsenplan*, commonly referred to as "White Bikes," saw the majority of the system's bikes disappear just days after its launch in Summer 1965. Many of the bikes, which were left unlocked for anyone to use, were either confiscated by the police, stolen, or thrown into local bodies of water. Other first-generation systems, such as the "Yellow Bike Project" of Portland in 1994 and the "Purple People Movers" of Phoenix in 1997, succumbed to similar fates as the majority of bikes were stolen within a few months of each system's launch.

To address this issue of user anonymity, the next generation of bikesharing programs employed technology that required users to supply a small deposit that would be returned to the user once the bicycle was returned (e.g., second generation systems). While some second-generation systems are still in use, the deposit values are generally significantly less than the value of the bicycle; therefore, theft and vandalism remain a prevalent issue in second-generation systems. To address this, IT-bikesharing systems introduced electronic smartcards to record user information, access bicycles, and track usage. These features, which mark the third generation of bikesharing equipment, maintain accountability as users can face fines of at least US$1,000 for bicycles lost while in their possession. Vandalism and theft are both reported to be very low in systems featuring third-generation technology.

Bicycle Redistribution

Bicycle redistribution or “rebalancing” remains a daily challenge for operators. In any bikesharing program, the operator must be able to effectively manage bikesharing bicycles and available docks to prevent scenarios in which a station is entirely full or empty. Rebalancing requires real-time information on the location of bicycles and operational equipment and labor to rebalance bicycles. Using natural gas-powered vans, trucks, or trailers, rebalancers move bicycles from areas of high-bicycle density to areas of low-bicycle density, depending on daily usage patterns and forecasts.

In some cases, rebalancing requirements are written into contracts between the relevant governmental agency and the program operator, requiring that a full or empty station not remain as such beyond a certain time period. It also remains a primary customer service issue and one of the highest costs relating to operations, especially for programs with high bicycle use.

Helmet Considerations

Helmet laws also present a concern for bikesharing programs. Compulsory all-age helmet laws have been reported to restrict a bikesharing system’s use as a vast majority of bikesharing users report “rarely” or “never” wear a helmet while using bikesharing. Furthermore, reported bikesharing crash statistics show that bikesharing may be safer than regular cycling, as reported in Chapter 5, “Public Bikesharing Operations.” This is likely attributed to the considerable weight of the bicycle, the presence of reflectors and lights, the bicycle’s low center of gravity, and the gear ratio, which generally prevents cyclists from riding at high speeds.

The City of Dallas, Texas, which is currently planning a bikesharing program, recently revoked its compulsory helmet law in light of the poor performance of bikesharing programs subject to such regulations. In other cities with compulsory laws, such as Seattle and Vancouver, further development of helmet dispensing and sanitizing systems could increase helmet usage and possibly the number of bikesharing participants.

Role of Supportive Infrastructure and Partnerships

Many program operators have cited that establishing partnerships within local government and with community stakeholders is imperative to successful bikesharing operations. Prior to a system’s launch, operators should work with relevant city agencies and staff to improve bicycle infrastructure that will be necessary to support the increase of cyclists generated by the bikesharing program.

An operator should have a keen understanding of city policies and agencies so that prospective hurdles in planning and implementation can be addressed effectively. Additionally, establishing relationships with local cycling advocates is also imperative in generating strong support for the bikesharing program. Other relevant community groups should also be contacted for purposes of outreach, system planning, and marketing the program to the local population.

Prelaunch Considerations

Successful public bikesharing programs are those that address the specific needs of their users and market segments prior to and after deployment. Appropriate spatial analysis to properly locate bikesharing stations is imperative to system use, in addition to employing station technology that is mobile and can be relocated according to usage patterns. Operators should also allow for proper public engagement through both public forums and Internet "suggest-a-station" platforms.

Additionally, cities can alter cycling infrastructure and policies prior to a bikesharing program launch, including those that require all-age helmet use. Furthermore, prelaunch marketing and general outreach is critical for success.

Different Users Account for Different Usage and Revenue

While having a strong foundation of annual members is important to a system's success, tailoring components of the system to encourage use by the casual user is imperative for a system's long-term economic viability, especially in lieu of public subsidy. This finding has been further emphasized by recent developments relating to New York City's Citi Bike program and its apparent revenue shortfall. At present, Citi Bike has a considerably lower proportion of casual to annual users in contrast to cities, such as Washington, D.C.

The Need for Social Equity Planning, Incentives and Marketing

Data have shown that bikesharing users are more likely be male, Caucasian, wealthier, younger, and have attained higher educational degrees than the general population in which a given bikesharing program resides. As a form of public transportation, it is pivotal that bikesharing serve all socio-economic classes and ethnicities in an urban area. This requires that appropriate outreach, public subsidies, and system deployment be focused on low-income and minority communities. Operators should encourage public investment in their system to ensure that the system is able to meet the needs of disadvantaged communities without compromising the program's ability to generate revenue.

User Survey and Transportation Impacts

The Phase II member survey results show that bikesharing is causing a diverse array of modal shifts within the different cities surveyed. Bikesharing was found to reduce the number of respondents using the bus in four of the five cities. Salt Lake City was the only system where increased bus usage out-numbered a decrease in bus use.

In terms of rail shifts, more members in Salt Lake City and Minneapolis-Saint Paul increased their use of rail than decreased it. In Montreal and Toronto, the majority reported decreasing rail usage, while the minority reported increasing rail use. Finally in Mexico City, 4% more reported decreasing rail than increasing rail. The remaining percentages in all cities reported no change in use. These modal shifts in public transit are likely due to the differences in public transit networks within the respective cities. Mexico City, Montreal, and Toronto are all large cities with dense public transit networks. In contrast, Minneapolis-

Saint Paul and Salt Lake City are relatively smaller, with less intensive transit systems. The most common reasons for reducing public transit use were that bikesharing provided "faster travel and lower cost."

The survey also found that bikesharing reduced respondents driving by large amounts in all cities. In Montreal and Toronto, 29% and 35% reported driving less. In Minneapolis-Saint Paul and Salt Lake City, 53% and 55% reported driving less, and in Mexico City, 53% reported driving less. Very few respondents reported driving more. In terms of walking, more respondents in Mexico City, Minneapolis-Saint Paul, and Salt Lake City increased walking than decreased it. In Montreal and Toronto, more reported walking less often than more.

The member survey also asked questions about bikesharing safety, particularly focusing on helmet use. Respondents in all cities generally felt safe and comfortable with bikesharing bikes. Helmet use by members while using bikesharing bicycles varied widely across cities, however. For example, approximately 75% of respondents in Mexico City reported never wearing a helmet while bikesharing. In Montreal, Toronto, Minneapolis-Saint Paul, and Salt Lake City, the percentage of respondents never wearing a helmet was 54%, 46%, 42% and 15%, respectively. Helmet use was highly correlated with helmet ownership. Interestingly, Mexico City had the lowest rate of helmet ownership, while Salt Lake City had the highest. Reasons for a lack of helmet ownership included that bikesharing use is often unplanned, and helmets are difficult to carry.

The casual user survey—an experimental method in this study—found that most respondents were actually members in Boston, while the majority were 24-hour pass holders in San Antonio. (Salt Lake City had only one annual member respond.) The most common trip purpose in Boston was "go to/from work," whereas the most common in San Antonio was "exercise/recreation." Respondents were asked how they would have made their most recent trip, if bikesharing was not available. The most common response in San Antonio was "I would not have made this trip," whereas the most responses in Boston were split between "Subway or trolley" and "Walk."

Finally, data from the survey conducted in Minneapolis was anonymously linked to bikesharing activity data from that operator. These data were used to explore how information from the surveys could be overlaid with activity data to yield further understanding about bikesharing impacts. The cross-tabulated data of bikesharing trip counts overlaid with the modal shift data showed that respondents who used bikesharing to substitute for other modes employed bikesharing more frequently, taking more trips (on average) than those who used bikesharing as a complement to other modes. Interestingly, this result cuts across all modal shifts reported by respondents and suggests that those who employ bikesharing frequently use it in substitution of most every mode. It also suggests that those using bikesharing as a complement to other modes still employed the service often but not as much as those substituting all modes with bikesharing.

Lessons Learned

In this study, operators were asked to provide one suggestion to improve bikesharing, along with their top lessons learned. The authors identified a number of improvements and

lessons learned in the areas of: marketing and outreach, operations and equipment, and system planning and scale. Suggested improvements and lessons from North American operators include the following highlights.

To improve bikesharing, our program would:

- Have more docking points to lower the cost of bike redistribution.
- Expand the system with more stations and bicycles.
- Change public perception so that people view bikesharing as ‘sharing’ and not a ‘rental.’
- Improve the balance of stations between downtown and residential neighborhoods.
- Get more people to use bikesharing.
- Add wayfinding signs to show where stations are located and what direction to go in to return your bike.
- Building awnings to protect kiosks from the elements.
- Develop ways to minimize and ease re-balancing.
- Reduce the cost of bikesharing.
- Enhance accessibility into under-served communities.
- Build stronger partnerships between users, sponsors and local government.
- Build stronger relationships between bikesharing programs.

One lesson our program has learned:

- Stations placed at the right location will be successful.
- Work with local partners first.
- Funding by local sources enhances community partnerships.
- Not to under estimate the importance of the ‘casual user’ in terms of revenue.
- Greater density of stations is needed at program launch.
- Remembering that we are a commuting option and people depend on us. If we make mistakes, we can really mess up someone’s day.

- Training our technicians locally to move stations; opposed to flying technicians in to do this service.
- Place our stations farther apart.
- Determining the number of users and rides our system can support.
- Work with municipal public works departments early on.
- If you provide a quality service, people will use it.
- Remembering that we're selling a 'culture.'
- Friendly competition – sharing success stories with other programs to make bike-sharing better.

In Spring 2014, public bikesharing operators joined together to form the North American Bikeshare Association (NABSA) to encourage collaboration and best practices among bikeshare system owners, managers, operators and service vendors. In the future, bikesharing will continue to evolve with business model developments and new entrants. Further research is needed on business methods to support economic sustainability; casual user behavior; impacts on public transportation (e.g., GIS analysis) and the environment; land use interactions; equity effects; and bicycle safety.

APPENDIX A – BIKESHARING AND GEOGRAPHIC INFORMATION SYSTEMS: A CASE STUDY OF HUBWAY

Joseph Michael Pogodzinski, Ph.D.

Introduction

In this appendix, the author approached the issues addressed in the main report from a different perspective: examining in detail a single bikesharing program (Hubway in Boston) and employing geographic information systems (GIS) software and analysis. This approach complements the earlier analysis, but it also raises new questions. The GIS analysis supports the user and operator surveys by grounding those responses in terms of actual observed outcomes in terms of rentals and potential shortages (of bikes or docks). The GIS analysis highlights the important issue of rebalancing—and how this impacts both users and operators. Hubway was selected as a case study for this analysis because there was a recent data "visualization" competition conducted with the data. This visualization competition resulted in images that showed how the bikes were used and distributed among the stations over time. The author compared this analysis with some of the visualizations for validation.

The Hubway data used in this analysis distinguish two categories of users: annual or monthly members and casual users (72-hour or 24-hour). Members are mostly residents, whereas most tourists are casual users. More detailed data are available for members than for casual users.

This appendix examines several related questions. First, the author identified the location (based on the billing zip code) and age of registered bikesharing users—the only group for whom we know the age and location. Second, the author examined the usage of bikes by station and analyzed the characteristics of the neighborhoods, which surround the stations to determine neighborhood factors that may account for usage. The author then determined whether statistically significant clustering is present in usage patterns, and, if so, where the clusters are located.

Finally, the author concluded the analysis with a model of the determinants of bikesharing usage. The demand for and supply of bikes at each station is examined separately. Demand for bikes at a particular station was determined by counting departures from that station and the supply of bikes to that station by arrivals at that station.[2]

This distinction between demand and supply is important for the management of a bikesharing program and the assessment of the social impacts of bikesharing. Many bikesharing trips are one-way; some stations are more popular for departures, and other stations are more prevalent as destinations. In these circumstances, if one starts with a perfectly balanced system, it will become unbalanced, necessitating the transportation of bikes from stations that are popular destinations to stations that are common departure points.

To operate successfully, one-way bikesharing programs have to maintain a proper balance between the number of bicycles at a station and the number of docks. There are two

"worst-case" scenarios: all stalls are empty, meaning that no bikes are available to rent at that station or all stalls are full, meaning that no bike can be returned to that station.

The difference between the demand for and the supply of bikes at a particular station is the excess demand, which may be either positive or negative. If the excess demand is positive—if more bikes are demanded at a particular station than are supplied to that station—additional bikes must be brought to the station in a timely fashion. The station must be replenished with bikes via "rebalancing." Positive excess demand means that rebalancing through the relocation of bicycles to a station must take place for the station to function.

Conversely, if the excess demand at a particular station is negative—if more bikes are dropped off at a station than are rented from that station—the excess bikes must be removed in a timely fashion or there will not be enough docks to accommodate the additional bikes. Again, the adjustment is made via "rebalancing." Negative excess demand means that rebalancing by removing bicycles from that station must take place for the station to function.

Rebalancing is typically the highest cost element in operating a bikesharing program (see Chapter IV, "The Business of Bikesharing"). Typically, rebalancing is accomplished by transporting bikes from stations with an excess number of bikes to stations with a bike deficit by truck. The cost of truck transport, the emissions associated with it (note many trucks used for rebalancing use alternative fuels, such as compressed natural gas), and the costs of loading and unloading bikes are major expenses faced by bikesharing programs. The occurrence of excess bikes or not enough bikes should be minimized. Some bikesharing program operators are penalized for stations that are empty beyond a certain time limit based on their contracts.

The data analyzed do not allow us to determine "real time" status of each station, but the author could determine the aggregate departures from and arrivals to a given station over the three-month period covered by the data. This allowed the author to pinpoint stations that are chronically in positive excess demand and negative excess demand.

Data Used in the Analysis

Three main sources of data were used in the GIS analysis. Data on population demographics were obtained from the 2007-2011 American Community Survey (ACS) for both census block groups and census tracts. Economic data about the number of firms, employment, and payrolls were obtained from the County Business Patterns of the Economic Census for 2011 (the most recent that has been published). The analysis employed Hubway data on users, stations, Hubway municipalities, and related geographic data. The analysis focused on the third quarter of 2012.

Data Manipulation

As noted above, the Hubway data on rentals distinguished members from casual users. For members, data on birth year, zip code (of the billing address), and gender were available. Starting with 209,691 records related to rentals in the third quarter of 2012, looking only at

registered users gives 128,270 records. Of these, 127,432 have a valid zip code and birth year recorded. The descriptive statistics of this sample are given in Table A-1 below.

Figure A-1 displays the age distribution of Hubway members.

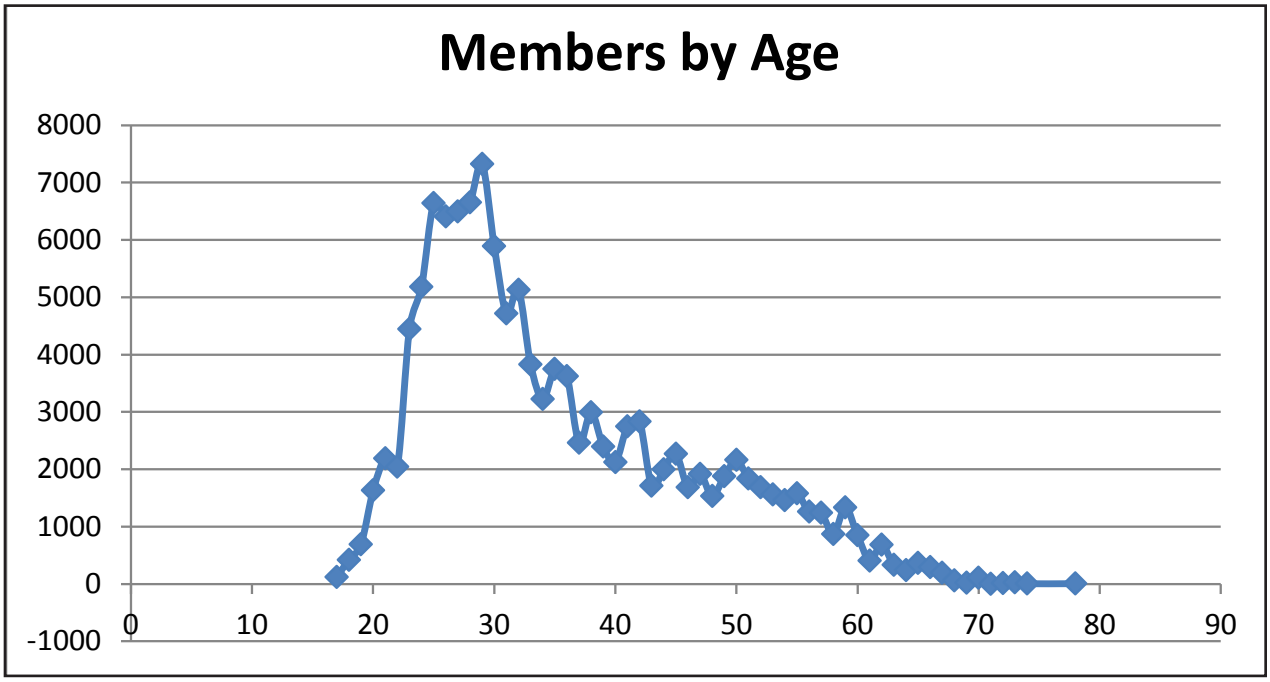

Figure A-1 Members by Age, Third Quarter of 2012

The use-weighted mean age is 35.37.The youngest users are 17, and the oldest users are 78. Almost 73% of members are male.

Table A-1 Descriptive Statistics of Members

Birth Year Descriptive Statistics	
Mean	1976.625
Standard Error	0.030926
Median	1980
Mode	1983
Standard Deviation	11.03999
Sample Variance	121.8815
Kurtosis	-0.22668
Skewness	-0.80632
Range	57
Minimum	1938
Maximum	1995
Sum	2.52E+08
Count	127432

The members are concentrated spatially. Figure A-2 shows the distribution of numbers of trips by members by zip code tabulation areas (ZCTAs).

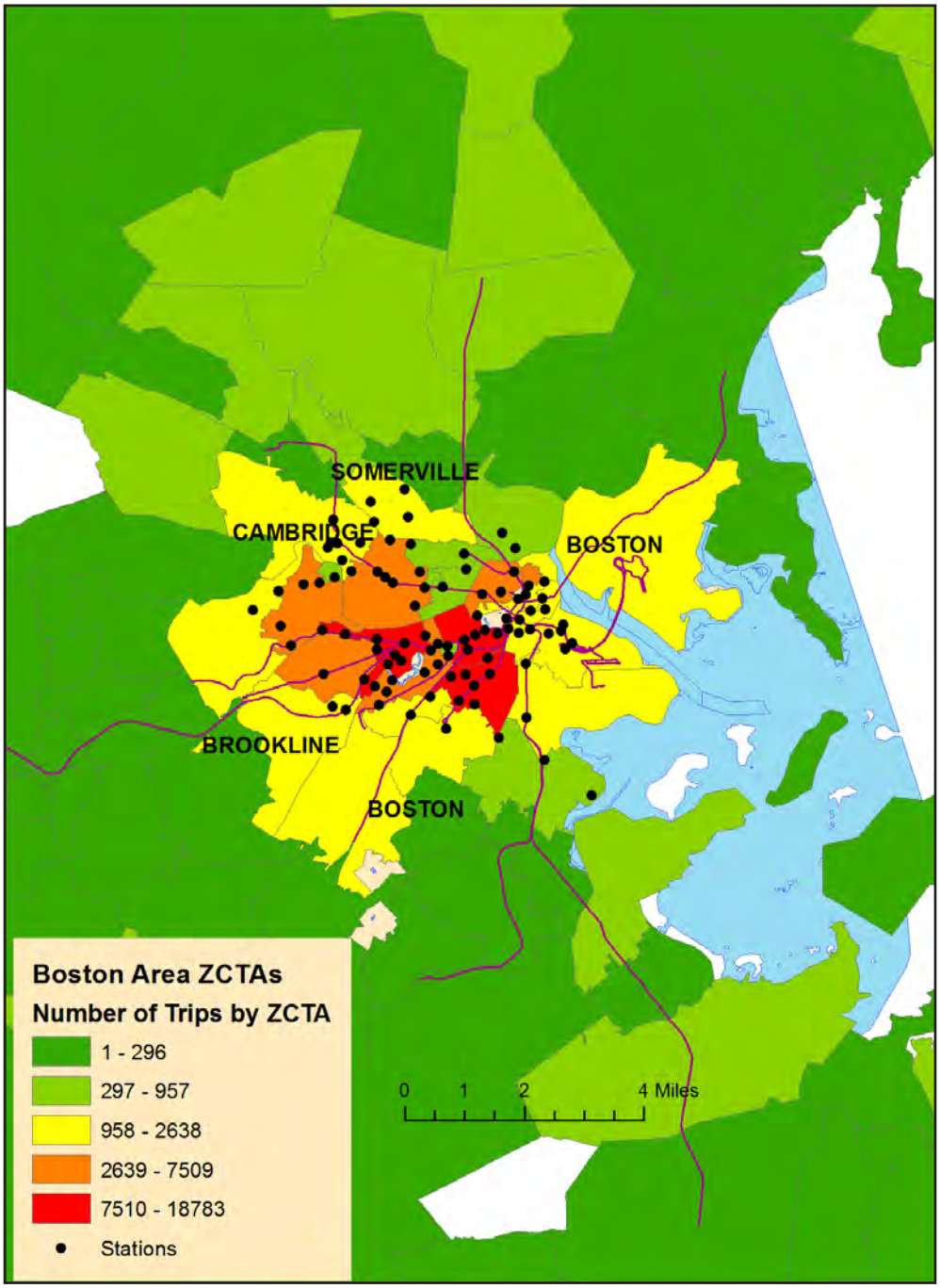

Figure A-2 Concentration of Number of Trips by Member Zip Code

More than 50% of all trips by members are from one of the seven zip code tabulation areas in Central Boston.

In the period covered by the study, 95 stations were in operation in the Hubway system. The capacity of the 95 stations in the study varied from 11 to 47 stalls. The larger the capacity of a station, other factors equal, the lower is the rebalancing frequency. From a

planning perspective, it is obviously desirable to have high-capacity stations where the expected usage is the greatest. However, physical constraints may put some relatively low-capacity stations in high usage locations, necessitating more frequent rebalancing.

Figure A-3 shows a map of stations by capacity. Table A-6 at the end of this appendix provides the figures for station usage and station capacity, and the descriptive statistics of use by station are included at the end of the appendix (Table A-7), as well.

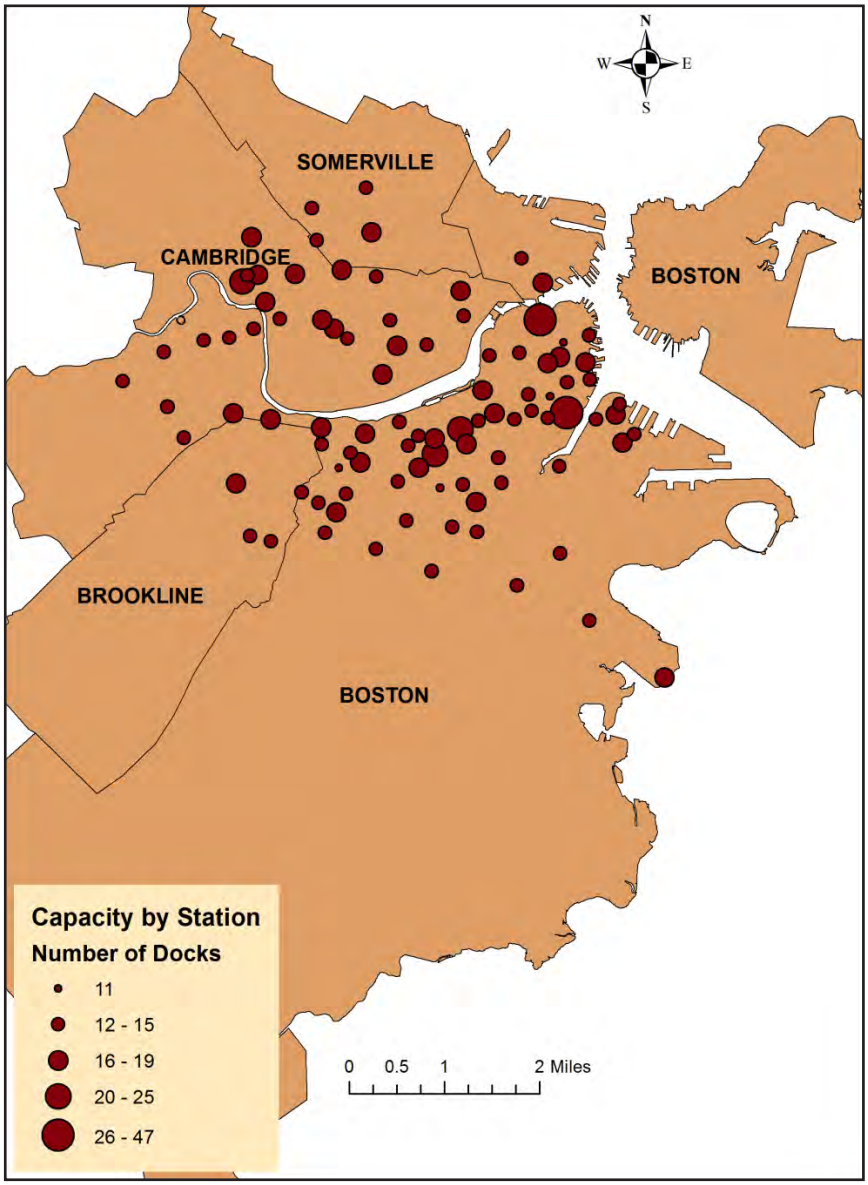

Figure A-3 Capacity by Station

Bikesharing usage can be defined in several ways. For this analysis, usage is defined as the number of departures from and arrivals to each station over the data set's three-month period.

Figure A-4 shows the distribution of the number of departures from stations.

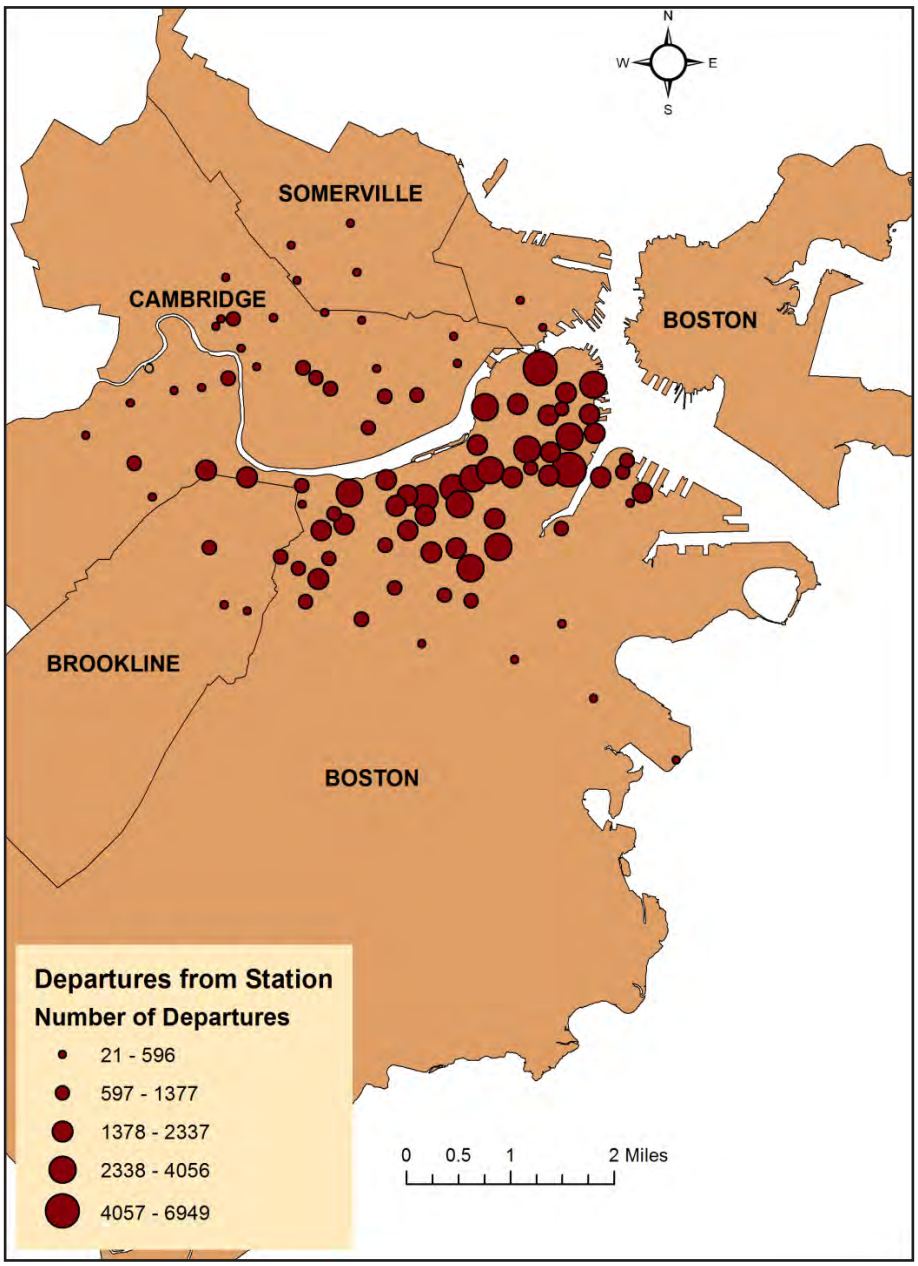

Figure A-4 Number of Departures from Each Station

The pattern of destinations is seen in Figure A-5.

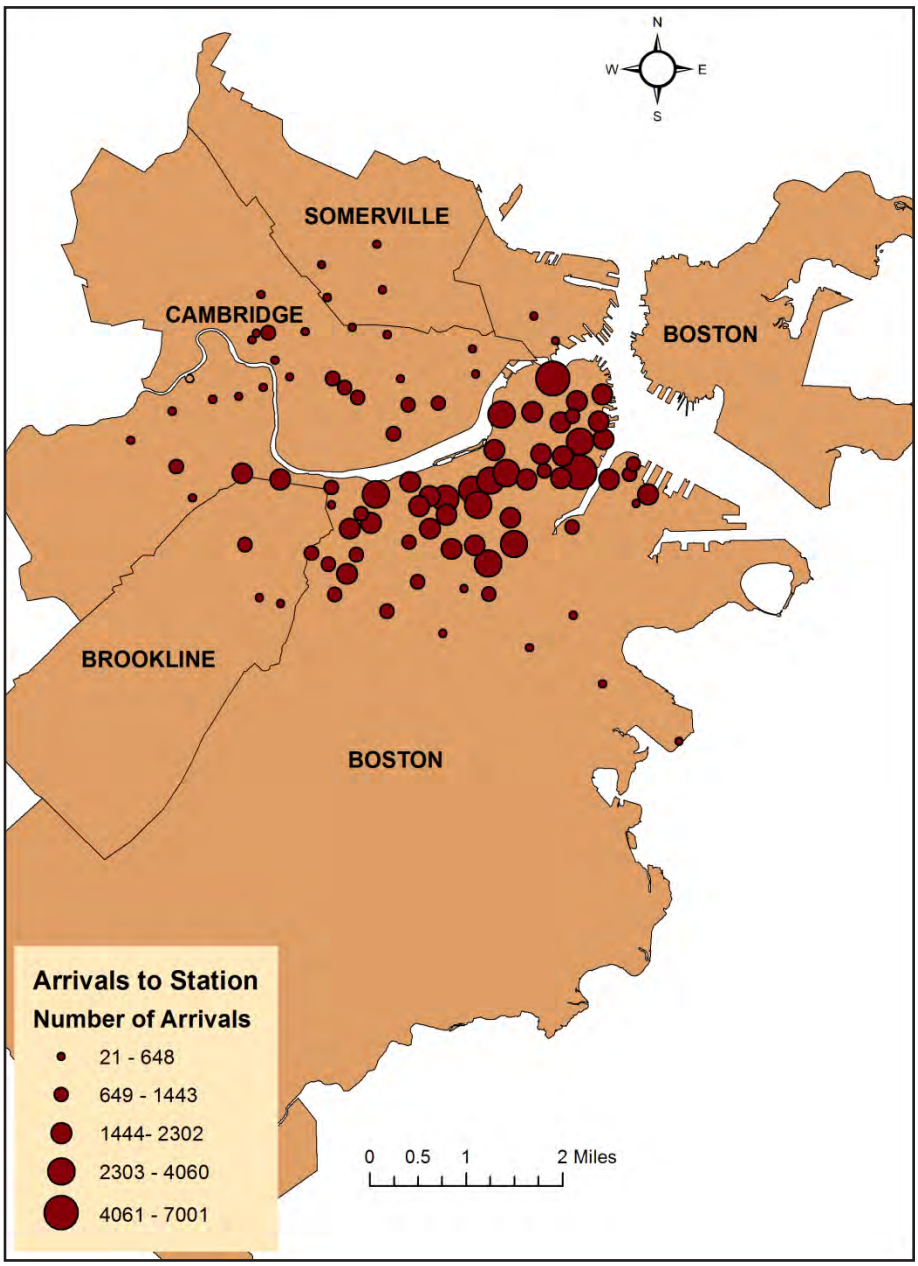

Figure A-5 Number of Arrivals at Each Station

The correlation coefficients between station capacity and three measures of station usage: 1) departures from, 2) arrivals to, and 3) excess demand (departures from minus arrivals to) are provided in Table A-2.

Table A-2 Correlations Among Variables

	Departures	Arrivals	Excess Demand	Capacity
Departures	1			
Arrivals	0.997109227	1		
Excess Demand	-0.008740697	-0.084694033	1	
Capacity	0.616167216	0.625907798	-0.157019238	1

As one would expect, there are fairly high correlations between capacity and arrivals and departures. The availability of bikes and docks at high capacity stations supports departures and arrivals.

Many bikesharing stations are close to Massachusetts Bay Transportation Authority (MBTA) stations. In fact, accessibility to MBTA stations is a critical variable in explaining bikesharing usage. Figure A-6 shows MBTA stations and bikesharing stations. One can correlate station capacity with proximity to MBTA stations, and the correlation coefficient is -.10015

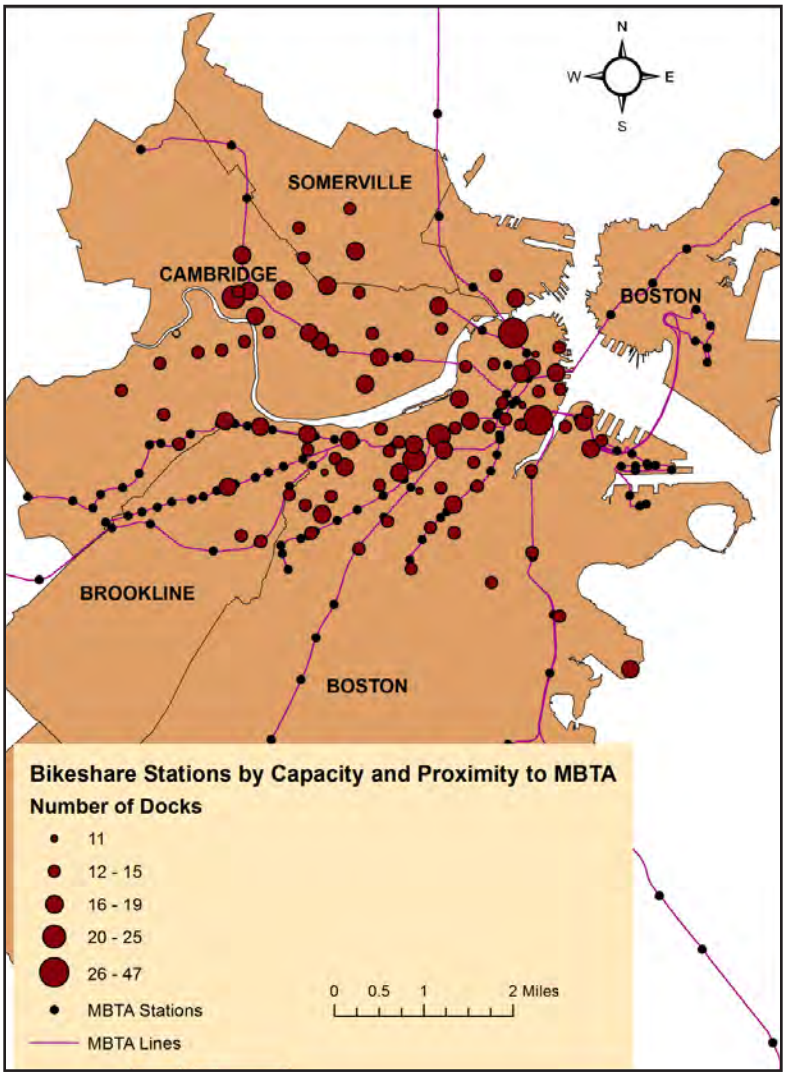

Figure A-6 Bikesharing Stations and MBTA Stations

The absolute number (count) of departures and arrivals is the critical figure. Figure A-7 shows this absolute number. The horizontal axis is the number of the station.

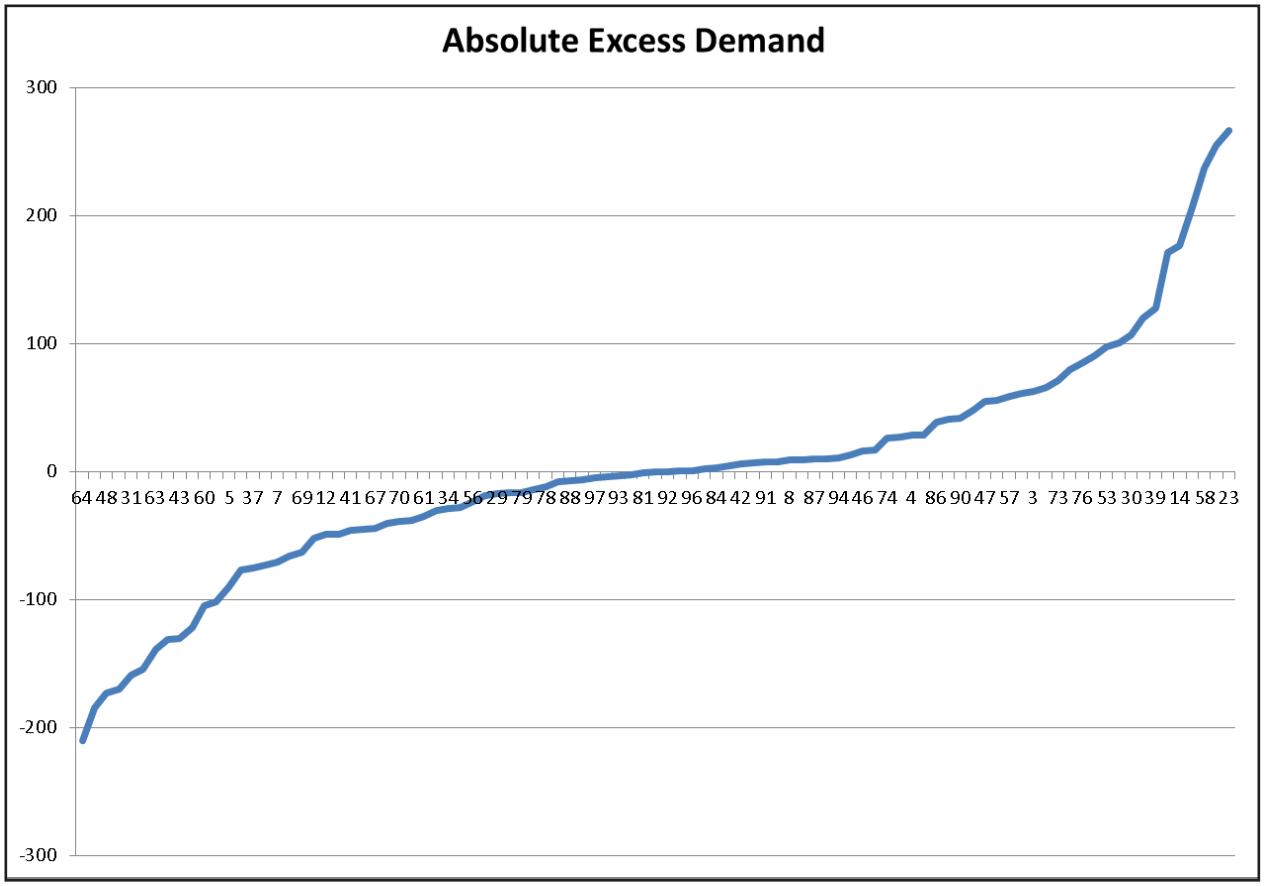

Figure A-7 Absolute Excess Demand in Numbers of Bicycles, Third Quarter 2012

The maximum positive excess demand is 268 (for station 23), and the lowest negative excess demand is -211 (for station 64).

A different picture of excess demand can be obtained by looking at the percentage that excess demand is of use. To compute the percentage, the author used the average of departures and arrivals as the base for computing the percentage. Figure A-8 shows the percentage of excess demand.

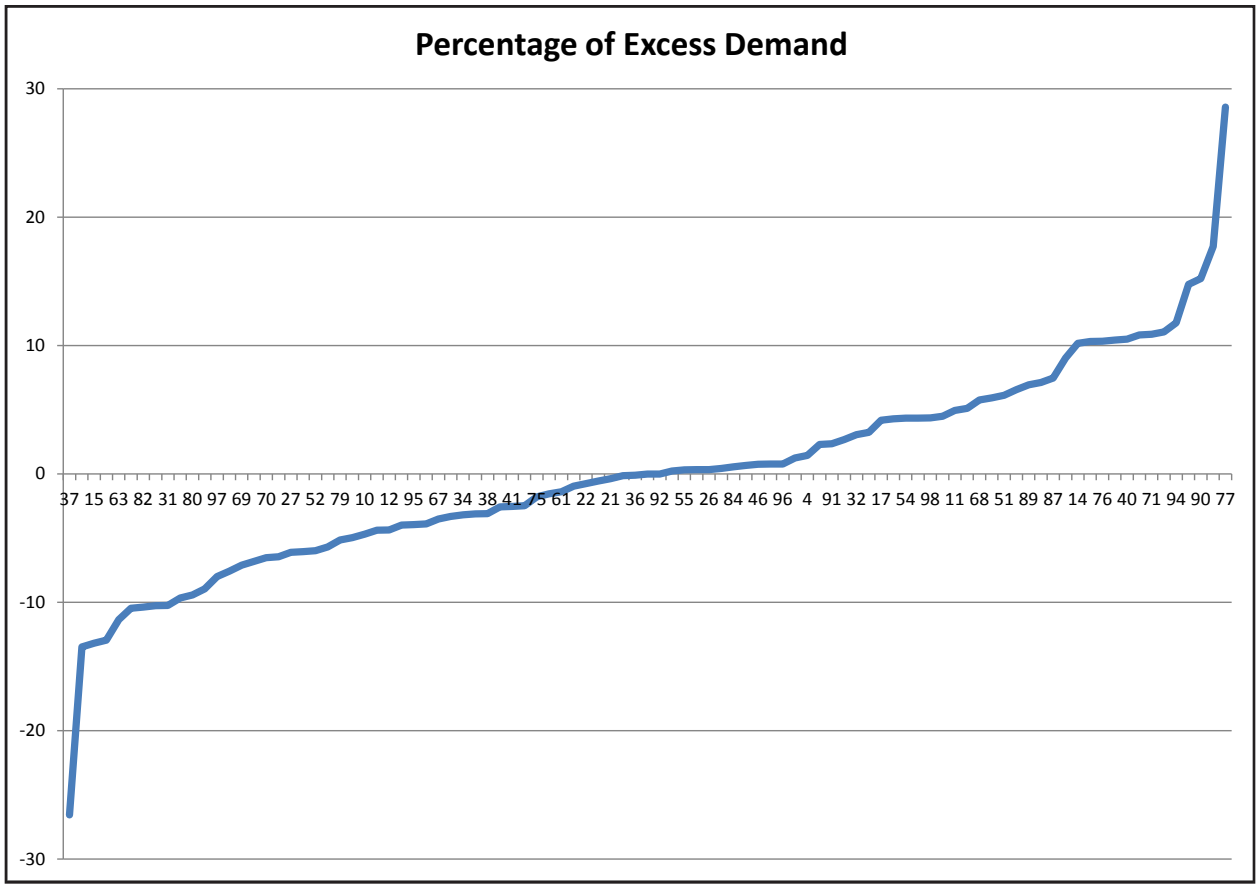

Figure A-8 Percentage of Excess Demand, Third Quarter of 2012

The greatest positive percentage of excess demand is 28.57% (for station 77), and the lowest negative percentage of excess demand is -26.55% (for station 37).

The excess demand figures provide an idea of which stations are preferred for departures relative to user arrivals. Likewise, the percentage of excess demand presents the relative preference for typical use at the stations.

If all users are included, both members and casual users, the absolute number of positive excess demand increases slightly and negative excess demand decreases slightly. Including all the users, the greatest percentage of positive excess demand falls to 17.89%, and the lowest percentage of negative excess demand increases to -24.24%. In the relative sense, casual users act to create a greater balance, but in the absolute sense, casual users cause more movement of bicycles via rebalancing.

Where Is the Excess Demand?

Figure A-9 is a choropleth map of stations by the absolute excess demand. This choropleth map shows Hubway stations by absolute excess demand—positive and negative.

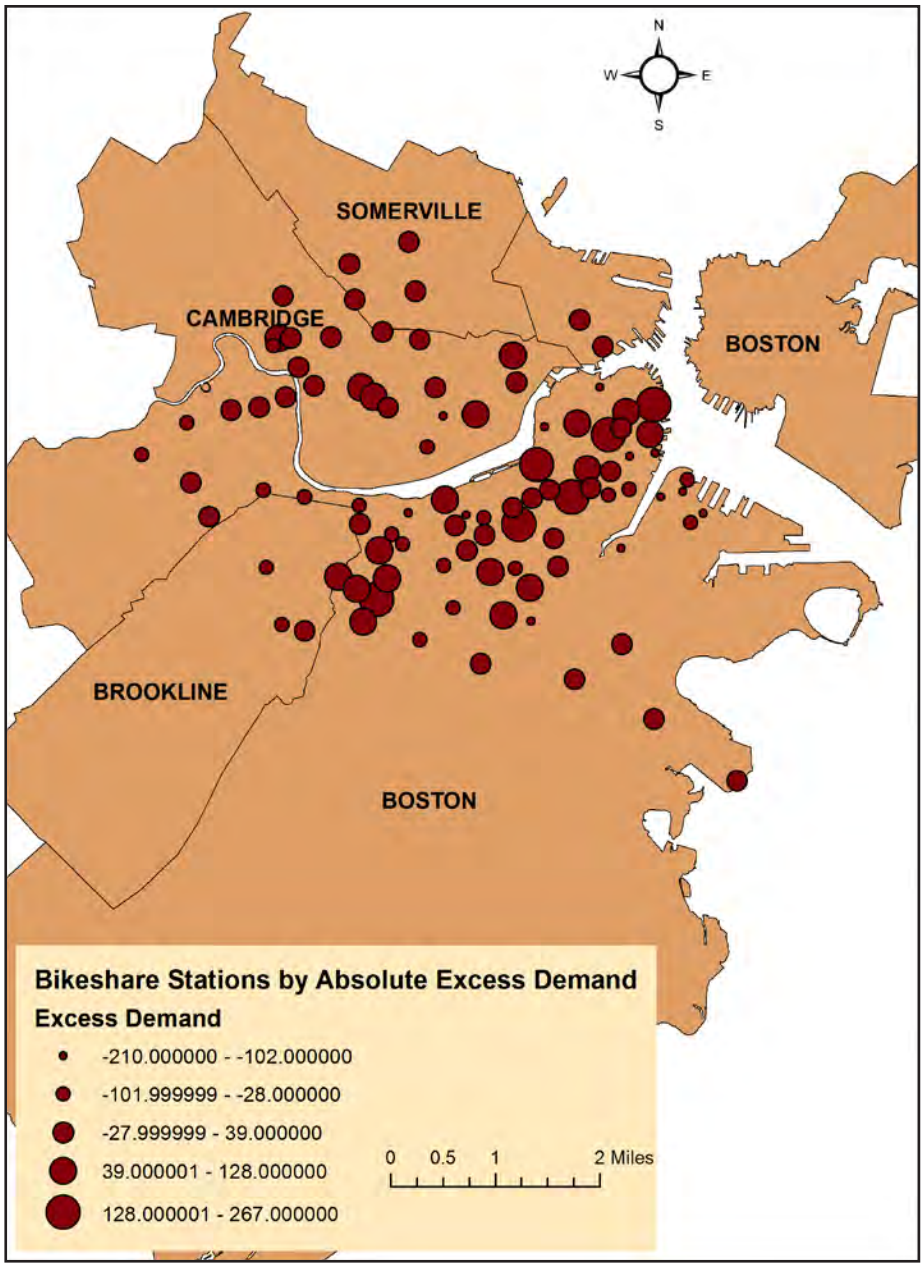

Figure A-9 A Choropleth Map Showing Stations by Absolute Excess Demand

The spatial distribution of excess demand and excess supply in the bicycle count is of great practical significance. Although rebalancing must be done daily (or even more frequently), the pattern displayed in Figure A-9 indicates over the three-month period that the data refer to where excess demand and supply are likely to occur. One strategy for addressing the rebalancing problem is to rebalance based on the proximity of an excess demand station to one or more excess supply stations. That is, in order to rebalance, the operator should add bikes from an excess supply station to the nearest excess demand station. In colloquial terms, we are interested in where the blue dots are in relation to the red dots in Figure A-9.

It appears from that there is spatial clustering of excess demand; however, a statistical test is needed to understand the correlation of both positive and negative excess demand. It is important in applying this test to specify what “close” is. The author examined the distribution of absolute and the percentage of excess demand by applying a test for spatial autocorrelation, Moran’s I, to ascertain whether there is (statistical) clustering of the absolute and percentage of excess demand. Moran’s I requires the specification of a “distance band”—that is, the specification of a neighborhood within which to look for similar values of excess demand.

Different neighborhoods yield potentially different values of Moran’s I and different answers to the question of whether or not excess demand, positive or negative, is clustered. For Moran’s I to be applied properly, the distance band selected must ensure that each station has at least one neighbor. Using an ArcGIS tool, it is possible to determine distance bands for any number of neighbors. In applying Moran’s I to the excess demand at stations, a distance band of 5,250 meters will assure that each station has at least one neighbor.

For the absolute excess demand, the result, as indicated in Figure A-10, shows that there is spatial autocorrelation in excess demand.

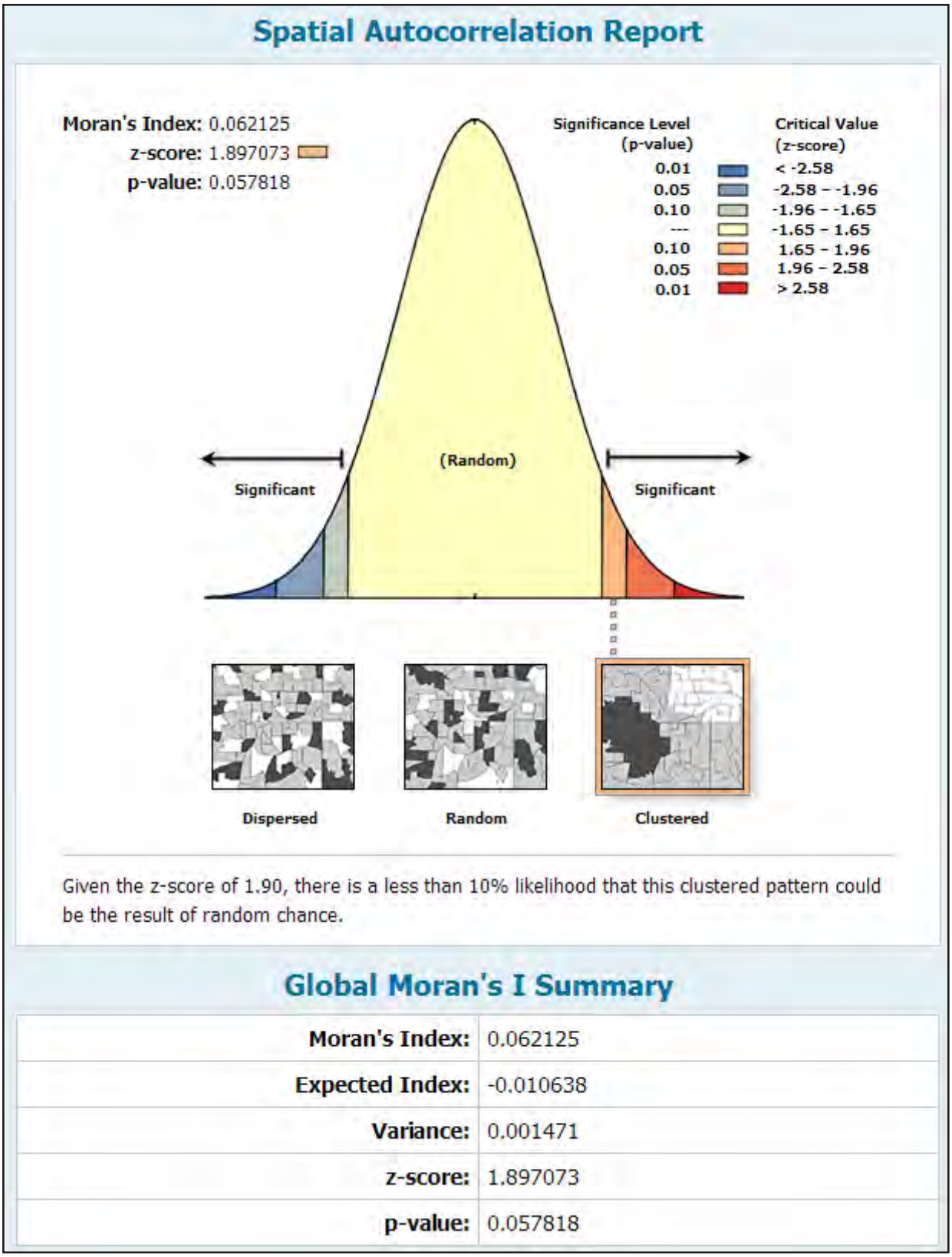

Figure A-10 Results of Moran's I Test for Spatial Autocorrelation in Absolute Excess Demand

Moran's I addresses whether or not there is clustering. Since the authors established that there are clusters, the next question is where are the clusters? To address this question, the author applied hot spot analysis.

Hot Spot Analysis

Hot spot analysis has been applied for many years to crime statistics to identify areas where crimes of a certain type are prevalent. For instance, the results of the hot spot analysis have been used to focus police resources to certain areas at certain times.

Similarly, with public bikesharing, the author used hotspot analysis to identify clusters of high and low excess demand stations to formulate a strategy that will minimize rebalancing costs. The hot spot analysis differs from the choropleth map in two ways. First, a hot spot is not just associated with a large value of the variable (percentage of excess demand), but the value of the variable must be large in terms of standard deviations from the mean of the distribution of this variable. Note that hot spots are typically identified as places more than two deviations above the distribution mean, while cold spots are typically identified as places more than two standard deviations below the mean. Second, hot spots are not isolated high values of the variable; they must also be close to other locations that are likewise associated with high values of the variable. A similar condition applies to cold spots.

Traditionally, hot spots are colored red, and cold spots are colored blue. Spots that are neither hot nor cold are colored in a neutral color. Figure A-11 is a hot spot map of excess demand following this traditional color scheme. There are three blue or "cold" spots and one red or "cold" spot. The majority of the spots are neutral.

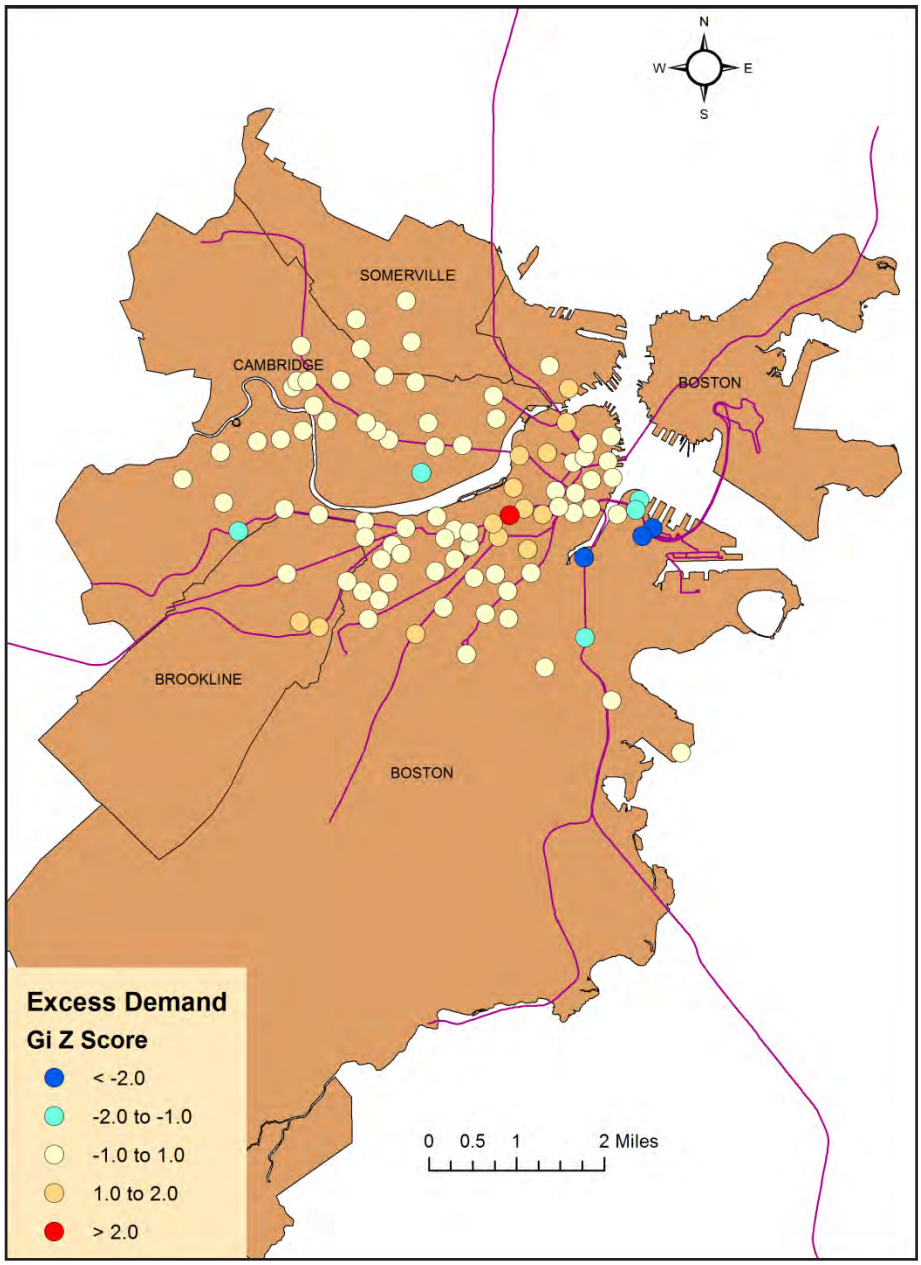

Figure A-11 Hot Spot Map of Percentage of Excess Demand

Regression Results

The goal of this section is to determine the factors that are important in residential demand for public bikesharing. In the analysis, the author focuses on residential demand because there are more detailed data for members who are predominantly residents, and it was possible to use data about neighborhoods where stations are located as determinants of demand. The author examines each of the usage variables: 1) departures, 2) arrivals, and 3) excess demand.

The models developed are based on the determinants of components of excess demand. Bikesharing usage may be correlated with age (as suggested by the age distribution in

Figure A-1); gender; family structure (i.e., the absence of family relationship—proxied, for example, by the number of non-family households); income; tenure status (renter or owner-occupier); and proximity to an MBTA station. The supply side is represented by the station capacity. The demographic characteristics of the area in a 200-meter radius around each station are used.

A regression model examining departures from a station by members is reported in detail. The model employs the following explanatory variables (see Table A-3 below):

Table A-3 Definition of Explanatory Variables

Variable	Technical Denotation	Definition
JOBS PER AREA	(HUBWAYSTATIONZCTAS_ JOBSPERAREA	From the County Business Patterns Census data, we obtained data for jobs by ZIP Code Tabulation Area. The JOBS PER AREA variable is the job density in the ZIP Code Tabulation area containing the Hubway station
DISTANCE TO JOB CENTER	(HUBWAYSTATIONSZCTAS_ NEAR-DIST)	The distance from the Hubway station to the centroid of the ZIP Code Tabulation Area
NONFAMILY HOUSEHOLDS	(AVG_B11001E7)	The average number of non-family households in Census Block Groups within 200 meters of a Hubway station based on American Community Survey data
MEDIAN HOUSEHOLD INCOME	(AVG_B19013E1)	The average of median household income figures for Census Block Groups within 200 meters of a Hubway station based on American Community Survey data
RENTER HOUSING UNITS	(AVG_B25003E3)	The average number of renter housing units in Census Block Groups within 200 meters of a Hubway station based on American Community Survey data
POP2244		The number of people in the age range 22 to 44 in Census Block Groups within 200 meters of a Hubway station based on American Community Survey data
CAPACITY		The station capacity

The detailed results of the regression are given in Table A-4 below.

Table A-4 Summary of Hubway Regression Results

Summary of OLS Results - Model Variables								
Variable	**Coefficient [a]**	**StdError**	**t-Statistic**	**Probability [b]**	**Robust_SE**	**Robust_t**	**Robust_Pr [b]**	**VIF [c]**
Intercept	-721.582504	397.342645	-1.816021	0.072855	408.072772	-1.768269	0.080566	--------
HUBWAYSTATION	12031.077154	3413.860029	3.524186	0.000689[a]	4194.462398	2.868324	0.005190[a]	1.390939
HUBWAYSTATION	-0.201832	0.075818	-2.662057	0.009265[a]	0.051284	-3.935569	0.000172[a]	1.554054
AVG_B11001E7	1.692942	1.275394	1.327388	0.187897	1.024124	1.653063	0.101971	7.585523
AVG_B19013E1	0.001105	0.003848	0.27236	0.774627	0.003708	0.298007	0.766421	1.778611
AVG_B25003E3	-0.465642	1.220430	-0.381540	0.703751	0.923811	-0.504045	0.615523	6.768074
POP2244	-0.824797	0.748314	-1.102208	0.273443	0.580354	-1.421198	0.158881	5.075770
CAPACITY	120.941433	15.963846	7.575959	0.000000[a]	21.756475	5.558871	0.000000[a]	1.088131

[a] Statistically significant at the 0.01 level.

The adjusted R^2 is 0.58. Three of the variables are strongly statistically significant (robust t-statistics in parentheses): 1) JOBS PER AREA, with coefficient of 12,031.08 (2.87); 2) DISTANCE TO JOB CENTER, with a coefficient of -0.2 (-3.94); and 3) CAPACITY, with a coefficient of 120.94 (5.56).

This result suggests that among the main factors motivating registered users to public bikesharing is employment-related transportation.

Table A-5 Figures for Usage by Station and Station Capacity

Station Number	Departures	Arrivals	Excess Demand	Capacity
3	915	852	63	15
4	2029	2000	29	15
5	832	922	-90	15
6	2140	2049	91	15
7	901	972	-71	15
8	732	723	9	15
9	1542	1582	-40	19
10	1377	1443	-66	19
11	1370	1304	66	15
12	1099	1148	-49	15
13	1113	1267	-154	15
14	1830	1653	177	17
15	319	364	-45	15
16	3257	3050	207	19
17	658	631	27	14
18	506	522	-16	15
19	596	594	2	15
20	2083	1963	120	19
21	2108	2116	-8	25
22	6949	7001	-52	47
23	1943	1676	267	19
24	1291	1422	-131	19
25	1915	1945	-30	14
26	2670	2661	9	15
27	779	828	-49	15
29	290	307	-17	15
30	1238	1131	107	15
31	1472	1631	-159	15
32	2028	1967	61	11
33	2554	2724	-170	19
34	898	927	-29	15
35	2226	2209	17	11
36	4056	4060	-4	25
37	245	320	-75	15
38	5880	6065	-185	47
39	2908	2780	128	19

Station Number	Departures	Arrivals	Excess Demand	Capacity
40	2557	2302	255	15
41	1791	1837	-46	19
42	2546	2540	6	19
43	2081	2211	-130	14
44	1070	1063	7	19
45	1893	1970	-77	19
46	2145	2129	16	19
47	2080	2025	55	11
48	2453	2626	-173	15
49	1727	1556	171	15
50	2566	2580	-14	15
51	689	648	41	15
52	1979	2101	-122	14
53	2337	2239	98	15
54	2378	2277	101	15
55	1569	1564	5	14
56	452	475	-23	15
57	1855	1796	59	11
58	2307	2070	237	19
59	1632	1705	-73	15
60	3123	3228	-105	15
61	2510	2545	-35	19
62	816	736	80	15
63	1156	1295	-139	15
64	1902	2112	-210	15
65	263	301	-38	19
66	567	567	0	15
67	1230	1274	-44	19
68	1000	944	56	19
69	856	919	-63	19
70	578	617	-39	23
71	126	113	13	15
72	963	915	48	15
73	436	365	71	14
74	1147	1121	26	18
75	1055	1074	-19	15
76	865	780	85	17
77	116	87	29	15
78	303	315	-12	19
79	303	319	-16	15
80	1032	1134	-102	17
81	722	723	-1	15
82	256	284	-28	15
83	211	213	-2	15
84	551	548	3	15

Station Number	Departures	Arrivals	Excess Demand	Capacity
85	232	231	1	15
86	372	333	39	14
87	139	129	10	15
88	279	286	-7	17
89	149	139	10	19
90	297	255	42	18
91	344	336	8	15
92	21	21	0	18
93	32	35	-3	14
94	99	88	11	15
95	149	155	-6	15
96	129	128	1	19
97	60	65	-5	17
98	187	179	8	19

Table A-6. Descriptive Statistics by Station

	Departures	Arrivals	ExcessDemand	Capacity
Mean	1341.389	1341.389	0	16.88421
Standard Error	120.7168	121.1475	9.205322	0.525042
Median	1070	1121	0	15
Mode	303	723	29	15
Standard Deviation	1176.602	1180.8	89.72239	5.117478
Sample Variance	1384393	1394288	8050.106	25.18858
Kurtosis	6.163758	6.658306	1.266033	24.375
Skewness	1.903113	1.981094	0.465455	4.445634
Range	6928	6980	477	36
Minimum	21	21	-210	11
Maximum	6949	7001	267	47
Sum	127432	127432	0	1604
Count	95	95	95	95

APPENDIX B – EXPERT INTERVIEW SCRIPT

1) **Introduction**

I am contacting you per our previous arrangement to ask you some questions about your experience with public bikesharing. I am interested in your opinions about bikesharing and what infrastructure and policy changes would maximize the benefits of bikesharing. Before we begin the interview I would like to read you this consent form to you and confirm that you agree to participate in this research. (If you have previously sent them the consent form, just ask if they have any questions and confirm that they consent).

2) **Preliminary Information**

a) Identify name, position, and organization of interviewee.

b) Determine how interviewee's job tasks pertain to public bikesharing.

c) Date and time at which the interview took place.

3) **Basic Metrics**

a) What is the primary business model of your program?

b) What was the original number of bicycles and stations for the current scheme at the time of launch? (Date of Launch if a New System)

c) Is the current/proposed bike hire scheme in your city the original scheme or a replacement for a previous scheme?

   i) If this was a replacement program, what was the name of the previous bike scheme and when was it opened? (MM/YYYY)

   ii) What was the original number of bicycles and stations?

d) Current Technology

   i) Please indicate which of the following technologies your system currently uses:

      (1) Mobile phone access

      (2) Key fobs

      (3) Smartcards

      (4) Online registration

      (5) Available for casual users (no online account needed)

   ii) Are individual bicycles tracked with GPS or have any telematics equipment on them?

   iii) What telematics equipment do stations have?

      (1) Do stations require any grid power (or are they solar powered?)

      (2) Do bikesharing users in your region have access to real-time information (i.e., bike station parking, availability, etc.)?

   iv) In terms of information technology, have you implemented any technological changes or updates since April 2012 (e.g., GPS, smart apps, other)?

      (1) Front-end (User)

      (2) Back-end (Operator)

   v) Do you plan to implement any in 2013?

(1) Front-end (User)

(2) Back-end (Operator)

vi) Do any of your kiosks ever get completely full or empty?

(1) How often does this happen (number of kiosks per day, week, or month)

vii) Do you ever have to reshuffle bicycles within the system?

(1) How do you manage bicycle over-supply or under-supply at specific stations?

(2) How often do you have to shift bicycles around?

(3) How much per month do you estimate your system spends on reshuffling bicycles? (This would be the additional cost that would not be incurred if the system were perfectly balanced)

4) **Detailed Metrics**

a) Program Specifics

i) What is the difference in overall patronage levels between residents and tourists (e.g., in percentages)? Difference in trip share among these groups?

ii) What is the difference in overall patronage levels between casual users and annual members (e.g., in percentages)? Difference in trip share among these groups?

iii) Are you doing any type of intercept survey with casual or walk-up users? If so, can we get a copy?

b) Supporting Infrastructure:

i) Local Roadways and Infrastructure

(1) Did you work with local/regional governments to improve bicycle infrastructure prior to launching bikesharing in your region? Please describe.

(2) Are you working with local/regional governments to improve bicycle infrastructure now? Please describe.

(3) How do you think bicycle infrastructure impacts your program (e.g., ridership, safety)?

(4) Can you please provide us with public agency contacts to complete local stakeholder interviews?

ii) Affiliations:

(1) Has your program launched any new or innovative partnerships or sponsorships since April 2012?

(a) Any plans for future partnerships/sponsorships in the next two to three years?

(b) What types of benefits/perks do sponsors receive?

(c) What criteria do you employ in selecting sponsors/advertising (e.g., social good, recreational image, etc.)?

c) Land Use and Station Locations

i) Links to Public Transit:
   (1) Is there a link between public bikesharing and any of the public transit systems in your region?
      (a) If so, please explain.
      (b) If not, do you know why not?
   (2) Are there additional ways bikesharing could be linked to public transit that would improve both public bikesharing and transit?
   (3) What do you consider to be the optimum distance to place bicycle stations from a rail transit stop to target rail transit riders and/or encourage multi-modal crossflow? Why?
      (a) Do you feel this rule applies to bus stops as well?

ii) What do you consider to be the optimum distance between kiosks/stations?
   (a) Is this optimum distance determined by spacing that is best for public bikesharing users or is it determined by an area that you want to cover at a given fixed cost? In other words, when you define "optimum distance" are you thinking about user travel or about minimizing system deployment costs or both?
   (b) Do you believe that the spacing of kiosks/stations is currently optimal? If not, how would you change it?

iii) In our 2012 bikesharing study, the majority of public bikesharing stations were on public land. Are the majority of your bike stations on public or private land or both? Has anything changed since April 2012?
   (a) Does your bikesharing organization pay for the use of the land?
      (i) If so, how are fees determined?
   (b) Did other uses for the land get moved to make room for the bike stations? (i.e., relocating parking, loading zones etc.)

d) <u>Supporting Policy:</u>

i) Local government:
   (1) What local governmental policies impact your program's operations (e.g., advertising revenues, encroachment permits, helmet laws, supportive infrastructure)?
   (2) Did local government need to change any local policies for public bikesharing to come to into your region (e.g., advertising)?
      (a) If so, please explain
   (3) Are there other local government policy changes that you think would improve public bikesharing in your region?
      (a) If so, please explain

ii) Are there any policies related to signage?

iii) Are there any policies related to taxation?

iv) Local public transit:
   (1) What public transit policies impact your program's operations?

(2) Did local public transit need to change any policies for public bikesharing to come to your region?

(a) If so, please explain

v) Are there other public transit policy changes that you think would improve public bikesharing in your region?

(1) If so, please explain

e) Accidents, Safety, Insurance, Theft, and Vandalism

i) How many accidents did you have in 2012? Can you estimate the accident rate (in terms of trips / accident)?

(1) Were any of these accidents fatal?

(2) Did any of these accidents result in serious injury (hospitalization)? Insurance claims?

ii) Helmet usage

(1) Are there helmet laws where your system operates?

(2) Does your system offer helmets for people to access on-site? Please describe.

(3) Does your system require helmet use?

(4) Does your system endorse or encourage helmet use? If so, how?

(5) Have you done any studies on helmet usage in your system?

(6) What would you estimate is the helmet usage rate of your system (helmet worn trips / total trips); have you done any studies of this?

iii) What types of insurance do you have (e.g., general/commercial, liability, etc.)? Can you please describe the nature of your coverage (e.g., $1 million liability policy/rider)?

(1) Does your policy cover stations/bicycles against theft and vandalism?

(2) Is there a deductible? If so, how much?

iv) Who is your insurance provider?

(1) Could we talk with your provider to get general information about bikesharing insurance?

(2) How many providers did you have to work with before finding a policy?

(3) Was finding a policy difficult?

(4) How are your premiums determined (e.g., Cost per user, cost per bicycle, flat rate)?

v) Have you changed your insurance since April 2012? If so, how?

(1) Have there been any other insurance-related developments (e.g., change in cost, underwriter, change in coverage, etc.)

vi) What percentage of your operating costs is for insurance?

vii) How many bicycles were stolen from your system in 2012?

(1) Does this represent an increase or decrease from 2011, as appropriate, based on length of operations?

viii) How many instances of vandalism did your system experience in 2012? (not including bicycle theft)?

(1) Does this represent an increase or decrease from 2011, as appropriate, based on length of operations?

ix) Are either theft and/or vandalism covered under your insurance policy? Have you had any insurance claims for either of these?

f) Business Model and Economic Sustainability:

i) Seasons and hours of operation

(1) Have you reconsidered or changed seasonal vs. year round operations since April 2012 (our last interview)?

(2) Have you reconsidered or changed your program's hours of operations since April 2012 (our last interview)?

ii) Revenue

(1) What percentage of your revenue comes from long-term (annual/seasonal) regular users? Casual users (i.e., 24 hours to 29 days)? Intermediate users (i.e., monthly)? Recreational users?

(a) Can users pay through a payment plan (monthly or quarterly payments etc.)?

(2) What percentage of revenue comes from trips made beyond the 'free period'? Does this vary by user group, if so how?

(3) What percentage of memberships are sold at a discount?

(a) What is the average discount?

(4) Do you offer a corporate or business membership?

(a) Is this designed for business use, or personal use for members of a business? (Please describe operationally, shared-keys, individual keys etc.)

(5) What percentage of your revenues come from sponsorships or donations?

(a) What is your sponsorship turnover? Has it increased/decreased since program deployment?

(6) Do you have any other sources of revenue?

(a) What percentage of your revenues come from advertising?

(7) Do you have any plans to introduce new revenue streams this year? If so, what?

iii) Locations

(1) What type of locations attract the greatest ridership?

(2) What type of locations attract the greatest membership/use?

(3) What type of locations attract the greatest revenue?

iv) Can you estimate your membership retention since you launched?

(1) How does your organization measure member retention?

(2) How many members remain members after joining?

v) Do you differentiate between active and inactive members? Can you estimate

or calculate your active member rates (members who have used the system within the last 3, 6, 12 months)?

vi) Does your program have any reciprocity agreements with other programs to allow visiting-usage? If not, are you considering this?

vii) Do you subsidize any existing locations for equity reasons (e.g., low-income access, low-density access, etc.)? Please describe.

g) Growth Plans

i) Do you have any future growth plans?

(1) Do you expect there to be any changes in the bicycle numbers for your scheme in the next 12 months?

(a) Increase?

(b) About the same?

(c) Decrease

(d) If possible, please provide an estimated figure.

(2) Do you expect there to be any changes in the bicycle numbers for your scheme in the next 3 years?

(a) Increase?

(b) About the same?

(c) Decrease

(d) If possible, please provide an estimated figure.

(3) Do you expect there to be any changes in the number of stations for your scheme in the future (next 12 months and next three years)?

(a) Increase?

(b) About the same?

(c) Decrease

(d) If possible, please provide an estimated figure.

ii) How does your program measure success (performance metrics)? (impacts, revenue, usage, equity, access, etc.)?

iii) How do you analyze/optimize your network (GIS/Database/excel)?

(1) What type of data do you use? (# of transactions; transactions per docking points; # of members per station)

(2) What criteria do you use to determine station placement, station re-location, and bicycle redistribution?

iv) Do you have any methods for scaling your system's growth and expansion? Do you have any formulas and/or methodologies for assisting with system expansion?

(1) Do you have any models to predict membership/use?

(2) Do you have any models to predict ridership?

(3) Do you have any models to predict revenue?

(a) Are these models membership based, trip based, station based, bicycle

based, a combination, or some other factor?

(4) Do you have fleet density targets? (Population, land area or both)

(5) How do you determine needs for fleet balancing? Do you base it on geography, fleet size, or some other metric?

v) Can you estimate the cost of expansion?

(1) Per kiosk?

(2) Per dock point?

(3) Per bike?

(4) Per member/user?

vi) What do you estimate the growth potential of public bikesharing to be in your service area --e.g., 5% of the population over 16 years of age within a half-mile of a station)

h) Disparity, Equity and Community Outreach

i) Do equity considerations factor into your system's expansion? If so, how?

ii) How does one surpass the need for a credit or debit card deposit in order to use the bikesharing services, as many members of low-income communities do not have credit or debit cards?

iii) To what extent, if necessary, do bikesharing programs need to be subsidized in low-income communities as to make bikesharing an economically feasible transportation option for community members?

iv) Please describe your program/experiences serving lower-income populations with public bike sharing (i.e., efforts and experiences).

v) Are you trying new marketing approaches with respect to language, cultural barriers or minority groups? Do you maintain data on diversity – can we obtain this?

i) Conclusion

i) If there was one change you could make in the next two to three years to improve the public bikesharing experience in your area, what would it be?

ii) What would you consider your top lesson learned?

iii) Is there anything we didn't talk about that you would like to share?

iv) If I have any follow-up questions to clarify any of your responses, may I call you?

APPENDIX C – NICE RIDE MINNESOTA MEMBER SURVEY

Appendix C presents the survey instrument. The instrument given to Nice Ride Minnesota is given as an example, including the questions. The branching and other logic applied that managed the respondent's path through the survey is not shown. Similar examples are provided for the survey given in other languages in subsequent Appendicies.

2013 North American Public Bikesharing Survey Operated by University of California, Berkeley | Transportation Sustainability Research Center Member Survey – Nice Ride Minnesota

You do not have to answer any question that makes you feel uncomfortable. All answers are confidential and responses will only be reported in aggregate. If you would like more information about your rights as a research participant, please click here.

Please indicate the type of membership that you currently have with Nice Ride Minnesota.

1. Annual Membership
2. 24-hour Membership
3. No longer a member

About how long ago did your membership expire?

1. Less than 1 month ago
2. 1 to 3 months ago
3. 4 to 6 months ago
4. 7 to 12 months ago
5. 1 to 2 years ago
6. More than 2 years ago
7. Other, please specify: _____

Why did you not renew your membership with Nice Ride Minnesota? Please select the primary reason.

1. I moved out of the region
2. I did not find Nice Ride Minnesota to be useful based on where I live
3. I did not find Nice Ride Minnesota to be useful based on where I work
4. It was too expensive
5. I was not comfortable enough on the bicycles
6. Other, please specify: _____

The remainder of the survey mostly pertains to usage of Nice Ride and how it changed your travel patterns. You may continue to take the survey, answering questions to the best of your ability as they applied to when you were a member, or you may skip to the end of the survey.

1. Ill take the rest of the survey

2. No thanks, please take me to the end of the survey

What motivated you to become an annual member? (please select the most fitting response)

1. I tried Nice Ride as a casual (or short-term) member, found it useful, and joined for long-term use.
2. I knew Nice Ride was going to be useful to me, and became an Annual Member right away.
3. I joined Nice Ride as an Annual Member to support it, but I do not really use it
4. I joined Nice Ride as an Annual Member to support it, and have SINCE found it personally useful.
5. None of the above.
6. Other, please specify:

Did you move to downtown Minneapolis or Saint Paul within the last year?

1. Yes, to downtown Minneapolis
2. Yes, to downtown Saint Paul
3. No

To what extent did the existence of Nice Ride Minnesota influence your decision to make this move?

1. It was a major deciding factor
2. It was a minor deciding factor
3. It was not a deciding factor
4. I did not know about it when I moved

When did you first join Nice Ride Minnesota?

Month

1. January
2. February
3. March
4. April
5. May
6. June
7. July
8. August
9. September
10. October
11. November
12. December

Year

1. 2013
2. 2012
3. 2011
4. 2010

Currently, how often do you ride a bicycle (any bicycle)?

1. Less than once a month
2. Once a month
3. Every other week
4. 1 to 3 days per week
5. 4 to 6 days per week
6. Once a day
7. More than once a day

Before you joined Nice Ride Minnesota, how often did you ride a bicycle?

1. Less than once a month
2. Once a month
3. Every other week
4. 1 to 3 days per week
5. 4 to 6 days per week
6. Once a day
7. More than once a day

How often do you check-out a Nice Ride Minnesota bicycle?

1. Less than once a month
2. Once a month
3. Every other week
4. 1 to 3 days per week
5. 4 to 6 days per week
6. Once a day
7. More than once a day

What do consider to be your level of skill on a bicycle? (Please select or provide the response that best describes your skill level on a bike)

1. Very fast, agile, and comfortable
2. Very agile and comfortable
3. Somewhat cautious
4. Somewhat uncomfortable and cautious
5. Very cautious

6. Very uncomfortable and cautious
7. Other, please specify: _____

How safe do you feel riding Nice Ride Minnesota bicycles?

1. Very safe
2. Somewhat safe
3. Somewhat unsafe
4. Very unsafe

What is the highest level of education you have completed?

1. Less than high school
2. High school/GED
3. Some college
4. 2-year college degree
5. 4-year college degree
6. Master's degree (MA, MS, MBA, etc.)
7. Law Degree (JD)
8. Medical Degree (MD)
9. Doctorate degree (PhD, EdD, etc.)
10. Prefer not to answer
11. Other, please specify: _____

I now shop more at locations near Nice Ride docking stations, than I did before Nice Ride started.

1. Strongly agree
2. Agree
3. Disagree
4. Strongly disagree

I think of Nice Ride as an enhancement to the Twin Cities public transportation system.

1. Strongly agree
2. Agree
3. Disagree
4. Strongly disagree

Since joining Nice Ride Minnesota, I have made trips with public transit and bikesharing (together) that I would have previously made with a car.

1. Strongly agree
2. Agree

3. Disagree
4. Strongly disagree

Because of bikesharing, I am spending on transportation…

1. Much more money
2. More money
3. About the same amount of money
4. Less money
5. Much less money

Because of bikesharing, I am spending in local shops and establishments in my city…

1. Much more money
2. More money
3. About the same amount of money
4. Less money
5. Much less money

In my opinion, Nice Ride docking stations:

1. Enhance the attractiveness of nearby shopping locations
2. Reduce the attractiveness of nearby shopping locations
3. Have no effect on the attractiveness of nearby shopping locations

How often do you use Nice Ride in the following ways?
(Please choose one response per row)

	Often	Sometimes	Rarely	Never
Bikesharing TO GET TO a rail station	□	□	□	□
Bikesharing TO GET FROM a rail station	□	□	□	□
Bikesharing TO GET TO a bus stop	□	□	□	□
Bikesharing TO GET FROM a bus stop	□	□	□	□
Bikesharing FROM ONE STATION to ANOTHER station (not linking to public transit)	□	□	□	□
Bikesharing FROM one station BACK TO THE SAME station (not linking to public transit)	□	□	□	□

Please tell us how your membership with Nice Ride Minnesota has led to changes in your use of specific modes of travel.

As a result of my use of Nice Ride Minnesota, I use public transportation…

1. Much more often
2. More often
3. About the same (bikesharing has had no impact)
4. Less often

5. Much less often
6. I did not use public transportation before, and I do not use it now.
7. My use of public transportation changed but not because of Nice Ride.

As a result of my use of Nice Ride Minnesota, I use the bus…

1. Much more often
2. More often
3. About the same (bikesharing has had no impact)
4. Less often
5. Much less often
6. I did not ride the bus before, and I do not ride the bus now.
7. I have changed how I use the bus but not because of Nice Ride.

At what time of day have you MOST OFTEN used the BUS LESS as a result of bikesharing?

1. Commute to work
2. Morning travel (not the commute)
3. Mid-workday travel
4. Evening travel (not the commute)
5. Evening commute from work
6. Overnight travel
7. Weekend day travel
8. Weekend night travel
9. I do not know
10. Other, please specify: _____

What is the primary reason that you are using the bus LESS because of bikesharing?

1. Lower cost and faster travel
2. Just lower cost
3. Too many connections (not have to transfer)
4. Just faster travel
5. Improve travel time reliability
6. Want to get exercise
7. Public transit vehicle is crowded
8. No space for my bike, which I use to connect
9. I consider it safer to travel with bikesharing
10. Not applicable
11. Other, please specify: _____

What trip purposes do you make LESS OFTEN with the bus as a result of bikesharing? (please check all that apply)

1. Go to work
2. Go to school
3. Go to a meeting
4. Go to a restaurant / meal
5. Go shopping
6. Social / entertainment / visit friends
7. Run errands
8. Exercise / recreation
9. Other, please specify: _____

At what time of day have you MOST OFTEN USED THE BUS MORE as a result of bikesharing?

1. Commute to work
2. Morning travel (not the commute)
3. Mid-workday travel
4. Evening travel (not the commute)
5. Evening commute from work
6. Overnight travel
7. Weekend day travel
8. Weekend night travel
9. I do not know
10. Other, please specify: _____

What is the primary reason that you are using the bus MORE because of bikesharing?

1. I have better access TO the bus line
2. I have better access FROM the bus line
3. I have better access BOTH TO and FROM the bus line
4. Other, please specify: _____

What trip purposes do you make MORE OFTEN with the bus as a result of bikesharing? (please check all that apply)

1. Go to work
2. Go to school
3. Go to a meeting
4. Go to a restaurant / meal
5. Go shopping
6. Social / entertainment / visit friends
7. Run errands

8. Exercise / recreation
9. Other, please specify: _____

Since you are USING THE BUS MORE because of bikesharing, WHAT MODES ARE YOU NOW USING LESS as a result of bikesharing? (please check all that apply)

1. Blue Line (formerly the Hiawatha Line)
2. Personal bike
3. Drive alone
4. Drive with others
5. Ride in a car with others
6. Taxi
7. Walk
8. Carsharing vehicle
9. None, I am making additional trips
10. Other, please specify: _____

As a result of my use of Nice Ride Minnesota, I use the Blue Line (formerly the Hiawatha Line)…

1. Much more often
2. More often
3. About the same (bikesharing has had no impact)
4. Less often
5. Much less often
6. I did not use the Blue Line before, and I do not use light rail now.
7. I have changed how I use the Blue Line but not because of Nice Ride Minnesota.

At what time of day have you MOST OFTEN USED the Blue Line (Hiawatha Line) LESS as a result of bikesharing?

1. Commute to work
2. Morning travel (not the commute)
3. Mid-workday travel
4. Evening travel (not the commute)
5. Evening commute from work
6. Overnight travel
7. Weekend day travel
8. Weekend night travel
9. I do not know
10. Other, please specify: _____

What is the primary reason that you are using the Blue Line (Hiawatha Line) LESS because of bikesharing?

1. Lower cost and faster travel
2. Just lower cost
3. Too many connections (not have to transfer)
4. Just faster travel
5. Improve travel time reliability
6. Want to get exercise
7. Public transit vehicle is crowded
8. No space for my bike, which I use to connect
9. I consider it safer to travel with bikesharing
10. Not applicable
11. Other, please specify: _____

What trip purposes do you make LESS OFTEN with the Blue Line (Hiawatha Line) as a result of bikesharing? (please check all that apply)

1. Go to work
2. Go to school
3. Go to a meeting
4. Go to a restaurant / meal
5. Go shopping
6. Social / entertainment / visit friends
7. Run errands
8. Exercise / recreation
9. Other, please specify: _____

At what time of day have you MOST OFTEN used the Blue Line (Hiawatha Line) MORE as a result of bikesharing?

1. Commute to work
2. Morning travel (not the commute)
3. Mid-workday travel
4. Evening travel (not the commute)
5. Evening commute from work
6. Overnight travel
7. Weekend day travel
8. Weekend night travel
9. I do not know
10. Other, please specify: _____

What is the primary reason that you are using the Blue Line (Hiawatha Line) MORE because of bikesharing?

1. I have better access TO the Blue Line
2. I have better access FROM the Blue Line
3. I have better access BOTH TO and FROM the Blue Line
4. Other, please specify: _____

What trip purposes do you make MORE OFTEN with the Blue Line (Hiawatha Line) as a result of bikesharing? (please check all that apply)

1. Go to work
2. Go to school
3. Go to a meeting
4. Go to a restaurant / meal
5. Go shopping
6. Social / entertainment / visit friends
7. Run errands
8. Exercise / recreation
9. Other, please specify: _____

Since you are using the Blue Line (Hiawatha Line) MORE because of bikesharing, WHAT MODES ARE YOU NOW USING LESS (please check all that apply)?

1. Bus
2. Personal bike
3. Drive alone
4. Drive with others
5. Ride in a car with others
6. Taxi
7. Walk
8. Carsharing vehicle
9. None, I am making additional trips
10. Other, please specify: _____

The following questions ask how Nice Ride Minnesota has influenced your travel with a variety of additional travel modes.

As a result of my use of Nice Ride Minnesota, I use Northstar Commuter Rail…

1. Much more often
2. More often
3. About the same (bikesharing has had no impact)
4. Less often

5. Much less often
6. I did not use Northstar before, and I do not use Northstar now.
7. I have changed how I use Northstar but not because of Nice Ride Minnesota.

As a result of my use of Nice Ride Minnesota, I walk…

1. Much more often
2. More often
3. About the same (bikesharing has had no impact)
4. Less often
5. Much less often
6. I did change how much I walk but not because of Nice Ride Minnesota.

As a result of my use of Nice Ride Minnesota, I drive a personal vehicle (e.g., car, SUV, minivan, etc.) …

1. Much more often
2. More often
3. About the same (bikesharing has had no impact)
4. Less often
5. Much less often
6. I did not drive a car before, and I do not drive a car now.
7. I did change how much I drive a car but not because of Nice Ride Minnesota.

As a result of my use of Nice Ride Minnesota, I use taxis…

1. Much more often
2. More often
3. About the same (bikesharing has had no impact)
4. Less often
5. Much less often
6. I did not use taxis in Minneapolis/St. Paul before, and I do not use them now.
7. I did change how much I use taxis but not because of Nice Ride Minnesota.

As a result of my use of Nice Ride Minnesota, I ride a bicycle (any bicycle)…

1. Much more often
2. More often
3. About the same (bikesharing has had no impact)
4. Less often
5. Much less often

As a result of my use of Nice Ride Minnesota, I use carsharing (shared use of a vehicle fleet on a short-term basis, e.g., Zipcar or HourCar)…

1. Much more often
2. More often
3. About the same (bikesharing has had no impact)
4. Less often
5. Much less often
6. I am not a member of carsharing.
7. I did change my use of carsharing but not because of Nice Ride Minnesota.

As a result of my use of Nice Ride Minnesota, I use carpool/rideshare…

1. Much more often
2. More often
3. About the same (bikesharing has had no impact)
4. Less often
5. Much less often
6. I did not carpool or rideshare before, and I do not carpool or rideshare now.
7. I did change how much I carpool/rideshare but not because of Nice Ride Minnesota.

As a result of my use of Nice Ride Minnesota, I make trips (overall)…

1. Much more often
2. More often
3. About the same (bikesharing has had no impact on the amount I travel)
4. Less often
5. Much less often

As a result of my use of Nice Ride Minnesota, I have been getting ...

1. Much more exercise
2. More exercise
3. About the same exercise as before
4. Less exercise
5. Much less exercise
6. My exercise level has changed since joining Nice Ride but not because of Nice Ride Minnesota.

Please indicate how many vehicles you CURRENTLY own or lease of each type in your household:

	0	1	2	3	4	5 or more
Motor vehicle (car, SUV, truck, etc.)	□	□	□	□	□	□
Motorcycle, motorscooter, motorbike	□	□	□	□	□	□
Personal bicycle	□	□	□	□	□	□

Please indicate how many vehicles you OWNED or LEASED DURING THE YEAR BEFORE joining bikesharing:

	0	1	2	3	4	5 or more
Motor vehicle (car, SUV, truck, etc.)	□	□	□	□	□	□
Motorcycle, motorscooter, motorbike	□	□	□	□	□	□
Personal bicycle	□	□	□	□	□	□

CURRENTLY, approximately how many miles per month do you now drive your personal vehicle on average?

Miles per month:

1. 0
2. 100
3. 200
4. 300
5. 400
6. 500
7. 600
8. 700
9. 800
10. 900
11. 1000
12. 1100
13. 1200
14. 1300
15. 1400
16. 1500
17. 1600
18. 1700
19. 1800
20. 1900
21. 2000

22. More than 2000
23. Do not know
24. Other, please specify:

BEFORE JOINING BIKESHARING, approximately how many miles per month did you drive your personal vehicle on average?

Miles per month:

1. 0
2. 100
3. 200
4. 300
5. 400
6. 500
7. 600
8. 700
9. 800
10. 900
11. 1000
12. 1100
13. 1200
14. 1300
15. 1400
16. 1500
17. 1600
18. 1700
19. 1800
20. 1900
21. 2000
22. More than 2000
23. Do not know
24. Other, please specify:

CURRENTLY, what is the overall fuel economy (miles per gallon) of the vehicle you drive most often?

Miles per gallon:

1. 1
2. 2
3. 3
4. 4
5. 5
6. 6
7. 7
8. 8
9. 9
10. 10
11. 11
12. 12
13. 13
14. 14
15. 15
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38. 38
39. 39
40. 40
41. 41
42. 42
43. 43
44. 44
45. 45
46. 46
47. 47
48. 48
49. 49
50. 50
51. Do not know
52. Other, please specify:

BEFORE JOINING BIKESHARING, what was the fuel economy (miles per gallon) of the vehicle you drove?

Miles per gallon:

1. 1
2. 2
3. 3
4. 4
5. 5
6. 6
7. 7
8. 8
9. 9
10. 10
11. 11
12. 12
13. 13
14. 14
15. 15
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34. 34
35. 35
36. 36
37. 37
38. 38
39. 39
40. 40
41. 41
42. 42
43. 43
44. 44
45. 45
46. 46
47. 47
48. 48
49. 49
50. 50
51. Do not know
52. Other, please specify:

Since you joined Nice Ride Minnesota, have you sold, donated, or otherwise gotten rid of a personal household vehicle or considered selling a personal vehicle (e.g. Car, van, SUV, truck, motorcycle, motorscooter, personal bike, etc.)?

1. No
2. Sold, donated, or got rid of a household vehicle
3. Considered selling a personal vehicle

What kind of vehicle did you sell, donate or get ride of (or what vehicle are you considering getting rid of)?

1. Car
2. Van
3. SUV
4. Truck
5. Motorcycle
6. Motorscooter
7. Personal bicycle
8. Other, please specify

How important has your membership in Nice Ride Minnesota been in your decision to sell or consider selling a personal vehicle?

1. Very important
2. Somewhat important
3. Not at all important
4. Don’t know

Have you postponed or avoided a MOTOR VEHICLE (e.g., car, SUV, etc.) purchase that is no longer necessary because bikesharing is available?

1. Yes
2. No
3. I don’t know
4. Not a car or SUV but a:

How often do you wear a helmet while using Nice Ride Minnesota?

1. Always
2. Sometimes
3. Rarely
4. Never

Do you own a bicycle helmet?

1. Yes
2. No

What is the MAIN REASON you do not always use a helmet while using Nice Ride Minnesota? Select the circumstances that most often apply to you regarding helmet use.

1. I never wear a helmet while riding any bicycle
2. My use of bikesharing is not always planned and I do not have a helmet with me in such cases.
3. I do not like to carry a helmet around, even though I generally know in advance when I am going to use bikesharing.
4. Other, please explain: _____

Which of the following best describes why you do not wear a bicycle helmet? Please rank the top three reasons, with one being the most important and three the least of your top choices.

- I am a very safe bicycle rider, and it is not necessary. _____
- Bicycle helmets are uncomfortable. _____
- Bicycle helmets mess up my hair when I wear them. _____
- Bicycle helmets do not look good on me. _____
- I cannot afford a bicycle helmet. _____
- I should probably get a helmet, but I haven't found the time to find one I like. _____
- Other _____

If Other, please explain:

If bikesharing systems made sanitized helmets freely ($0) available through local shops or on-site vending machines (that you would have to return), would you use these helmets, if you did not have your own helmet with you?

1. Definitely
2. Probably
3. Probably Not
4. Definitely Not

The next few questions are about your most recent trip with bikesharing. Please answer them to the best of your ability, you may skip any questions that you cannot or do not wish to answer.

What was the purpose of the most recent trip you took using Nice Ride Minnesota?

5. Go to work
6. Go to school
7. Go to a meeting
8. Go to a restaurant / meal
9. Go shopping

10. Social / entertainment / visit friends
11. Run errands
12. Exercise / recreation
13. Other, please specify: _____

Where did this trip originate?

Address or nearest street intersection (use “&” to separate streets):

What was the trip’s final destination?

Address or nearest street intersection (use “&” to separate streets):

How many stops did you make along the way (where you got off your bike)?

1. 0 stops (you only stopped at the docking stations)
2. 1 stops
3. 2 stops
4. 3 stops
5. 4 stops
6. 5 stops
7. 6 or more stops

About what time of day did you start this trip?

1. 6 AM
2. 7 AM
3. 8 AM
4. 9 AM
5. 10 AM
6. 11 AM
7. 12 PM
8. 1 PM
9. 2 PM

10. 3 PM
11. 4 PM
12. 5 PM
13. 6 PM
14. 7 PM
15. 8 PM
16. 9 PM
17. 10 PM
18. 11 PM
19. 12 AM
20. 1 AM
21. 2 AM
22. 3 AM
23. 4 AM
24. 5 AM

Feel free to offer any further description of how Nice Ride Minnesota has influenced your travel behavior or lifestyle within the Twin Cities (Optional).

If you have any additional comments for Nice Ride Minnesota to help improve services, feel free to offer them here (Optional).

If you have a suggested location for a Nice Ride docking station, please indicate the location in the form of a street intersection below. Please include the city as well. (Optional)

Street #1:	□
Street #2:	□
City:	□

Please indicate two streets that cross near your WORK location as well as the city in which you WORK.

Street #1:	□
Street #2:	□
City:	□

Please indicate two streets that cross near your HOME location as well as the city in which you RESIDE.

Street #1:	□
Street #2:	□
City:	□

What is you gender?

1. Male
2. Female
3. Prefer not to answer

Please indicate the number of people living your household within the following age categories (including yourself).

	0	1	2	3	4	5	More than 5
0 to 5:	□	□	□	□	□	□	□
5 to 15:	□	□	□	□	□	□	□
16 to 19:	□	□	□	□	□	□	□
20 to 40:	□	□	□	□	□	□	□
41 to 60:	□	□	□	□	□	□	□
61 and above:	□	□	□	□	□	□	□

What is your age?

1. Less than 16 years
2. 16 to 17
3. 18 to 19
4. 20 to 24
5. 25 to 29
6. 30 to 34
7. 35 to 39
8. 40 to 44
9. 45 to 49
10. 50 to 54
11. 55 to 59
12. 60 to 64
13. 65 to 69
14. 70 to 74
15. 75 to 79
16. 80 to 89
17. 90 or older
18. Prefer not to answer

Approximately what was your gross (pre-tax) household income in 2012?

1. Less than $10,000
2. $10,000 to $14,999
3. $15,000 to $24,999
4. $25,000 to $34,999
5. $35,000 to $49,999
6. $50,000 to $74,999
7. $75,000 to $99,999
8. $100,000 to $149,999
9. $150,000 to $199,999
10. $200,000 or more
11. Prefer not to answer

Which of the following best describes your racial or ethnic background? (please check all that apply)

1. Asian
2. Black or African-American
3. Hispanic or Latino
4. Native Hawaiian or Other Pacific Islander
5. Native American or Alaska Native
6. White or Caucasian
7. Prefer not to answer
8. Other, please specify: _____

Thank you for completing the survey! If you would like to be considered for the drawing of $25 amazon gift card, please provide an email at which you can be contacted. (This email will only be used for this purpose.) You do not have to provide this complete the survey.

APPENDIX D – ECOBICI MEMBER SURVEY

2013 Encuesta de Bicicletas Públicas Compartidas en América del NorteOperado por la Universidad de California, Berkeley | Centro de Investigaciones de Transporte Sostenible Encuesta de Usuarios– ECOBICI

No tiene que contestar ninguna pregunta con la que no se sienta cómodo. Todas las respuestas son confidenciales y las respuestas solamente van a ser presentadas en conjunto y nunca de manera individual. Si quiere más información sobre sus derechos como participante en la investigación, por favor haga click aquí.

Por favor indique qué tipo de membresía tiene con ECOBICI.

1. 1 día
2. 3 días
3. 7 días
4. Anual

¿Cuándo inició su membresía con ECOBICI?

Mes:

1. Enero
2. Febrero
3. Marzo
4. Abril
5. Mayo
6. Junio
7. Julio
8. Agosto
9. Septiembre
10. Octubre
11. Noviembre
12. Diciembre

Año:

1. 2013
2. 2012
3. 2011
4. 2010

En promedio, ¿con qué frecuencia usaba una bicicleta antes de inscribirse a ECOBICI?

1. Menos de una vez al mes
2. Una vez al mes
3. Una vez cada dos semanas

4. De 1 a 3 veces por semana
5. De 4 a 6 veces por semana
6. Una vez al día
7. Más de una vez al día
8. No la utilizaba

En promedio, ¿con qué frecuencia usa una bicicleta (cualquier bicicleta, incluyendo las de ECOBICI) hoy en día?

1. Menos de una vez al mes
2. Una vez al mes
3. Una vez cada dos semanas
4. De 1 a 3 veces por semana
5. De 4 a 6 veces por semana
6. Una vez al día
7. Más de una vez al día
8. No la utilizaba

¿Con qué frecuencia usa una bicicleta de ECOBICI?

1. Menos de una vez al mes
2. Una vez al mes
3. Una vez cada dos semanas
4. De 1 a 3 veces por semana
5. De 4 a 6 veces por semana
6. Una vez al día
7. Más de una vez al día
8. No la utilizaba

¿Qué nivel considera que tiene manejando una bicicleta? (Por favor, seleccione la respuesta que mejor describa su nivel o proporcione su propia respuesta).

1. Muy rápido/a, ágil, y cómodo/a
2. Muy rápido/a y ágil
3. Un tanto precavido
4. Un tanto incómodo y precavido
5. Muy precavido
6. Muy incómodo y precavido
7. Otro. Por favor, especifíque:

¿Cómo se siente al andar en una bicicleta de ECOBICI?

1. Muy seguro/a
2. Un tanto seguro/a

3. Un tanto inseguro/a
4. Muy inseguro/a

Por favor indique si está Muy de acuerdo, De acuerdo, En desacuerdo, o Muy en desacuerdo con las siguientes afirmaciones basado en su experiencia con ECOBICI.

Ahora hago más compras en locales cercanos a cicloestaciones de ECOBICI, que antes de empezar a usar ECOBICI.

1. Muy de acuerdo
2. De acuerdo
3. En desacuerdo
4. Muy en desacuerdo

Creo que ECOBICI representa una mejora en el sistema de transporte de la Ciudad de México.

1. Muy de acuerdo
2. De acuerdo
3. En desacuerdo
4. Muy en desacuerdo

ECOBICI me da una importante conexión con el sistema de transporte público de la Ciudad de México.

1. Muy de acuerdo
2. De acuerdo
3. Neutro (no tengo opinión)
4. En desacuerdo
5. Muy en desacuerdo

Desde que me inscribí a ECOBICI he hecho viajes con transporte público y ECOBICI (conjuntamente) que antes hubiera hecho en coche.

1. Muy de acuerdo
2. De acuerdo
3. Neutro (no tengo opinión)
4. En desacuerdo
5. Muy en desacuerdo

Debido a ECOBICI, gasto…

1. Mucho más dinero en transporte
2. Más dinero en transporte
3. Aproximadamente la misma cantidad de dinero en transporte
4. Menos dinero en transporte

5. Mucho menos dinero en transporte

Debido a ECOBICI, gasto…

1. Mucho más dinero en tiendas locales de mi ciudad
2. Más dinero en tiendas locales de mi ciudad
3. Aproximadamente la misma cantidad de dinero en tiendas locales de mi ciudad
4. Menos dinero en tiendas locales de mi ciudad
5. Mucho menos dinero en tiendas locales de mi ciudad

¿Cuán a menudo usa usted ECOBICI del siguiente modo? (por favor escoja una respuesta por fila).

	A menudo	A veces	Raramente	Nunca
ECOBICI para IR A la estación del metro	□	□	□	□
ECOBICI DESDE la estación del metro	□	□	□	□
ECOBICI para IR A la estación del autobús (metrobús, trolebús, y/o peseros/microbús)	□	□	□	□
ECOBICI DESDE la estación del autobús (metrobús, trolebús, y/o peseros/microbús)	□	□	□	□
ECOBICI de una estación a OTRA	□	□	□	□
ECOBICI de una estación y VUELTA A LA MISMA estación	□	□	□	□

Por favor díganos como su pertenencia a ECOBICI le ha llevado a hacer cambios en sus modos de viaje.

Como resultado de usar ECOBICI, uso el transporte público...

1. Mucho más a menudo
2. Más a menudo
3. Igual (ECOBICI no influye)
4. Menos a menudo
5. Mucho menos a menudo
6. No usaba el transporte público antes, y tampoco lo hago ahora
7. Mi uso del transporte público ha cambiado, pero no a causa de ECOBICI

Como resultado de mi uso de ECOBICI, uso el autobús (metrobús, trolebús, y/o peseros/microbús)...

1. Mucho más a menudo
2. Más a menudo
3. Igual (ECOBICI no influye)
4. Menos a menudo
5. Mucho menos a menudo
6. No utilizaba el autobús antes, y sigo sin usarlo ahora

7. He cambiado mi uso del autobús, pero no a causa del ECOBICI

¿POR LO GENERAL, en qué momento del día ha usado MENOS A MENUDO el autobús (metrobús, trolebús, y/o peseros/microbús) debido a ECOBICI?

1. Trayecto diario al trabajo
2. Trayectos por la mañana (trayectos no vinculados al trabajo)
3. Trayectos durante el día vinculados al trabajo
4. Trayectos por la tarde (trayectos no vinculados al trabajo)
5. Trayecto de vuelta del trabajo por la tarde
6. Trayectos nocturnos
7. Trayectos durante el fin de semana
8. Trayectos nocturnos durante el fin de semana
9. No lo sé
10. Otro. Por favor, especifique:

¿Cuál es la razón principal por la que usa el autobús (metrobús, trolebús, y/o peseros/microbús) MENOS A MENUDO debido a ECOBICI?

1. Menor costo y trayectos más rápidos
2. Sólo menor costo
3. Demasiados enlaces (para evitar transbordos)
4. Sólo trayectos más rápidos
5. Mejorar la fiabilidad de la duración del trayecto
6. Quiero hacer ejercicio
7. Los vehículos de transporte público están muy abarrotados de gente
8. No hay lugar para mi bicicleta en el autobús y la uso para los enlaces (entre estaciones o desde/hasta mi punto de origen/destino)
9. Considero que ECOBICI es más seguro
10. Ninguno de los anteriores (no aplica)
11. Otro. Por favor ,especifique:

¿Qué tipo de trayectos hace MENOS A MENUDO con el autobús (metrobús, trolebús, y/o peseros/microbús) debido a ECOBICI? (por favor, seleccione todos los que correspondan).

1. Ir al trabajo
2. Ir a la escuela
3. Ir a una reunión
4. Ir a un restaurant/comida
5. Ir de compras
6. Social/ entretenimientos/ visitas a amigos
7. Hacer el mandado
8. Ejercicio / diversión

9. Otro. Por favor, especifique:

¿POR LO GENERAL, en qué momento del día ha usado MÁS A MENUDO el autobús (metrobús, trolebús, y/o peseros/microbús) debido a ECOBICI?

1. Trayecto diario al trabajo
2. Trayectos por la mañana (trayectos no vinculados al trabajo)
3. Trayectos durante el día vinculados al trabajo
4. Trayectos por la tarde (trayectos no vinculados al trabajo)
5. Trayecto de vuelta del trabajo por la tarde
6. Trayectos nocturnos
7. Trayectos durante el fin de semana
8. Trayectos nocturnos durante el fin de semana
9. No lo sé
10. Otro. Por favor, especifique:

¿Cuál es la razón principal por la que usa el autobús (metrobús, trolebús, y/o peseros/microbús) MÁS A MENUDO debido a ECOBICI?

1. Tengo mejor acceso A la parada de autobús (desde mi origen)
2. Tengo mejor acceso DESDE la parada de autobús (a mi destino)
3. Tengo mejor acceso al autobús (desde mi origen y a mi destino)
4. Otro. Por favor, especifique:

Ya que usa el autobús (metrobús, trolebús, y/o peseros/microbús) MÁS A MENUDO debido a ECOBICI, ¿QUÉ MODOS DE TRANSPORTE USA MENOS A MENUDO debido a ECOBICI? (por favor, seleccione todos los que correspondan).

1. Metro
2. Tren Ligero (Servicio de Transportes Eléctricos del Distrito Federal)
3. Tren suburbano
4. Taxi
5. Auto compartido (Carrot)
6. Bicicleta propia
7. Caminando
8. Conduciendo solo
9. Conduciendo con otros pasajeros
10. Ir como pasajero en un coche
11. Otro. Por favor, especifique:

Como resultado de mi uso de ECOBICI, uso el tren (tren ligero, metro, y/o tren suburbano).

1. Mucho más a menudo
2. Más a menudo
3. Igual (ECOBICI no influye)
4. Menos a menudo
5. Mucho menos a menudo
6. No utilizaba el tren antes, y sigo sin usarlo ahora
7. He cambiado mi uso del tren, pero no a causa de ECOBICI

¿POR LO GENERAL, en qué momento del día ha usado MENOS A MENUDO el tren (tren ligero, metro, y/o tren suburbano) debido a ECOBICI?

1. Trayecto diario al trabajo
2. Trayectos por la mañana (trayectos no vinculados al trabajo)
3. Trayectos durante el día vinculados al trabajo
4. Trayectos por la tarde (trayectos no vinculados al trabajo)
5. Trayecto de vuelta del trabajo por la tarde
6. Trayectos nocturnos
7. Trayectos durante el fin de semana
8. Trayectos nocturnos durante el fin de semana
9. No lo sé
10. Por favor, especifique:

¿Cuál es la razón principal por la que usa el tren (tren ligero, metro, y/o tren suburbano) MENOS A MENUDO debido a ECOBICI?

1. Menor costo y trayectos más rápidos
2. Sólo menor costo
3. Demasiados enlaces (para evitar transbordos)
4. Sólo trayectos más rápidos
5. Mejorar la fiabilidad de la duración del trayecto
6. Quiero hacer ejercicio
7. Los vehículos de transporte público están muy abarrotados de gente
8. No hay lugar para mi bicicleta en el autobús y la uso para los enlaces (entre estaciones o desde/hasta mi punto de origen/destino)
9. Considero que ECOBICI es más seguro
10. Ninguno de los anteriores (no aplica)
11. Otro. Por favor, especifique:

¿Qué tipo de trayectos hace MENOS A MENUDO con el tren (tren ligero, metro, y/o tren suburbano) debido a ECOBICI? (por favor, seleccione todos los que correspondan).

1. Ir al trabajo
2. Ir a la escuela
3. Ir a una reunión
4. Ir a un restaurant/comida
5. Ir de compras
6. Social/ entretenimientos/ visitas a amigos
7. Hacer el mandado
8. Ejercicio / diversión
9. Otro. Por favor ,especifique:

¿POR LO GENERAL, en qué momento del día ha usado MÁS A MENUDO el tren (tren ligero, metro, y/o tren suburbano) debido a ECOBICI?

1. Trayecto diario al trabajo
2. Trayectos por la mañana (trayectos no vinculados al trabajo)
3. Trayectos durante el día vinculados al trabajo
4. Trayectos por la tarde (trayectos no vinculados al trabajo)
5. Trayecto de vuelta del trabajo por la tarde
6. Trayectos nocturnos
7. Trayectos durante el fin de semana
8. Trayectos nocturnos durante el fin de semana
9. No lo sé
10. Otro. Por favor, especifique:

¿Cuál es la razón principal por la que usa el tren (tren ligero, metro, y/o tren suburbano) MÁS A MENUDO debido a ECOBICI?

1. Tengo mejor acceso A la parada de tren (desde mi origen)
2. Tengo mejor acceso DESDE la parada de tren (a mi destino)
3. Tengo mejor acceso al tren (desde mi origen y a mi destino)
4. Otro. Por favor, especifique:

¿Qué tipo de trayectos hace MÁS A MENUDO con el tren (tren ligero, metro, y/o tren suburbano) debido a ECOBICI? (por favor, seleccione todos los que correspondan).

1. Ir al trabajo
2. Ir a la escuela
3. Ir a una reunión
4. Ir a un restaurant/comida

5. Ir de compras
6. Social/ entretenimientos/ visitas a amigos
7. Hacer el mandado
8. Ejercicio / diversión
9. Otro. Por favor, especifique:

Ya que usa el tren (tren ligero, metro, y/o tren suburbano) MÁS A MENUDO debido a ECOBICI, ¿QUÉ MODOS DE TRANSPORTE USA MENOS A MENUDO debido a ECOBICI? (por favor, seleccione todos los que correspondan).

1. Metro
2. Trolebús (Servicio de Transportes Eléctricos del Distrito Federal)
3. Metrobús
4. Peseros/microbús
5. Taxi
6. Auto compartido (Carrot)
7. Bicicleta propia
8. Caminando
9. Conduciendo solo
10. Conduciendo con otros pasajeros
11. Ir como pasajero en un coche
12. Ninguno, hago más trayectos en general
13. Otro. Por favor, especifique:

Como resultado de mi uso de ECOBICI, camino...

1. Mucho más a menudo
2. Más a menudo
3. Igual (mi uso de ECOBICI no influye)
4. Menos a menudo
5. Mucho menos a menudo
6. He cambiado cuánto camino, pero no a causa de ECOBICI

Como resultado de mi uso de ECOBICI, manejo un coche...

1. Mucho más a menudo
2. Más a menudo
3. Igual (ECOBICI no influye)
4. Menos a menudo
5. Mucho menos a menudo
6. No conducía/manejaba un coche antes, y sigo sin hacerlo ahora.

7. He cambiado cuánto manejo coche antes, pero no a causa de ECOBICI.

Como resultado de mi uso de ECOBICI, uso taxis...

1. Mucho más a menudo
2. Más a menudo
3. Igual (ECOBICI no influye)
4. Menos a menudo
5. Mucho menos a menudo
6. No usaba taxis en la Ciudad de México antes, y sigo sin usarlos ahora.
7. He cambiado cuánto uso taxis, pero no a causa de ECOBICI.

Como resultado de mi uso de ECOBICI, uso una bicicleta (cualquier bicicleta)...

1. Mucho más a menudo
2. Más a menudo
3. Igual (ECOBICI no influye)
4. Menos a menudo
5. Mucho menos a menudo

Como resultado de mi uso de ECOBICI, uso autos compartidos (Carrot)…

1. Mucho más a menudo
2. Más a menudo
3. Igual (ECOBICI no influye)
4. Menos a menudo
5. Mucho menos a menudo
6. No pertenezco a ninguna organización de autos compartidos.
7. He cambiado mi uso de autos compartidos, pero no a causa del ECOBICI.

Debido a mi uso de ECOBICI, por lo general hago...

1. Muchos más trayectos
2. Más trayectos
3. El mismo número de trayectos (ECOBICI no afecto la cantidad de trayectos)
4. Menos trayectos
5. Muchos menos trayectos

Debido a mi uso de ECOBICI, hago...

1. Mucho más ejercicio
2. Más ejercicio
3. La misma cantidad de ejercicio que antes
4. Menos ejercicio
5. Mucho menos ejercicio

6. La cantidad de ejercicio que hago ha cambiado desde el inicio de mi mersía ECOBICI pero no debido a ECOBICI

¿Posee o tiene acceso a algún vehículo motorizado en su hogar? (Carro, camioneta/ furgoneta, SUV, motocicleta, bicicleta personal).

1. Sí
2. No

Por favor, indique cuántos vehículos de cada tipo tiene (o tiene acceso) en su hogar.

Carro, camioneta/furgoneta, SUV, u otro vehículo de motor personal:

1. 0
2. 1
3. 2
4. 3
5. 4
6. 5 o más

Motocicleta:

1. 0
2. 1
3. 2
4. 3
5. 4
6. 5 o más

Bicicleta personal (a parte de las de ECOBICI) que funcione:

1. 0
2. 1
3. 2
4. 3
5. 4
6. 5 o más

Actualmente, ¿cuántos kilómetros al mes maneja con su propio vehículo en promedio?

1. 0
2. 100
3. 200
4. 300
5. 400

6. 500
7. 600
8. 700
9. 800
10. 900
11. 1000
12. 1100
13. 1200
14. 1300
15. 1400
16. 1500
17. 1600
18. 1700
19. 1800
20. 1900
21. 2000
22. Más que 2000
23. No sé
24. Otro. Por favor, especifique:

Antes de inscribirse a ECOBICI, ¿cuántos kilómetros al mes manejaba con su propio vehículo en promedio?

1. 0
2. 100
3. 200
4. 300
5. 400
6. 500
7. 600
8. 700
9. 800
10. 900
11. 1000
12. 1100
13. 1200
14. 1300
15. 1400
16. 1500

17. 1600
18. 1700
19. 1800
20. 1900
21. 2000
22. Más que 2000
23. No sé
24. Otro. Por favor, especifique:

Que es la economia de combustible del vehiculo que usted conduce con la frequencia mas alta (lts / 100 km)?

1. 1
2. 2
3. 3
4. 4
5. 5
6. 6
7. 7
8. 8
9. 9
10. 10
11. 11
12. 12
13. 13
14. 14
15. 15
16. 16
17. 17
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22. 22
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33. 33
34. 34
35. 35
36. 36
37. 37
38. 38
39. 39
40. 40
41. 41
42. 42
43. 43
44. 44
45. 45
46. 46
47. 47
48. 48
49. 49
50. 50
51. No sé
52. Otro. Por favor, especifique:

Desde que se inscribió a ECOBICI, ¿ha vendido, regalado o se ha deshecho de algún otro modo de un vehículo personal de su hogar o ha considerado vender su auto?

1. No
2. Vendido o regalado el auto
3. Considerado vender mi auto

¿Qué tipo de vehículo ha vendido, regalado, o se ha deshecho (o qué vehículo está considerando en vender)?

1. Carro
2. Camioneta/furgoneta
3. SUV
4. Motocicleta

5. Bicicleta personal
6. Otro. Por favor, especifíque:

¿Qué importancia ha tenido el ser socio de ECOBICI en su decisión de vender o considerar vender su propio auto?

1. Muy importante
2. Algo importante
3. Nada importante
4. No lo sé

¿Ha retrasado o cancelado la compra de un vehículo de motor (por ejemplo, carro, SUV, motocicleta, etc) que ya no le es necesario ahora que ECOBICI está disponible?

1. Sí
2. No
3. No lo sé
4. Ni un carro, ni un SUV, ni una motocicleta, pero un/una:

¿Qué es lo que más le gusta de ECOBICI?

1. Es cómodo
2. Me ayuda a incluir ejercicio en mi rutina diaria.
3. Ahorro dinero usando ECOBICI
4. Estoy haciendo una buena acción para el medio ambiente
5. Es divertido
6. Otro. Por favor, especifique:

Por favor indique qué tecnología de móvil utiliza más a menudo.

1. Teléfono móvil normal (no un smartphone)
2. iPhone
3. Android
4. Blackberry
5. Palm
6. No utilizo ningún tipo de móvil ni smartphone
7. Otro. Por favor, especifique:

¿Con qué frecuencia lleva casco cuando utiliza ECOBICI?

1. Siempre

2. A veces
3. Casi nunca
4. Nunca

¿Tiene un casco para ir en bicicleta?

1. Sí
2. No

¿Cuál es la RAZÓN PRINCIPAL por la que no siempre usa casco cuando usa ECOBICI? Seleccione las circunstancia que se adheren a su situación más a menudo con respecto al uso del casco.

1. Nunca uso casco cuando voy en bicicleta, no importa qué bicicleta esté usando.
2. A veces uso ECOBICI sin planearlo con antelación y en esos casos no uso casco.
3. No me gusta cargar con el casco, aunque sepa con antelación que voy a usar ECOBICI.
4. Otro. Por favor, especifique:

¿Cuál de las siguientes razones explica mejor por qué no usa un casco cuando va en bicicleta? Por favor ordene las tres razones más importantes, 1 siendo la razón más importante y 3 la menos importante.

Soy un ciclista muy seguro y no es necesario.	□
Los cascos de bicileta son muy incómodos	□
Cuando me pongo un casco de bicicleta mi cabello se desordena/lía	□
Los cascos de bicicleta no se me ven bien	□
No puedo permitirme un casco de bicicleta	□
Seguramente debería comprar un casco, pero todavía no he tenido tiempo de encontrar uno que me guste	□
Otro	□

Si otro, por favor explique:

Si ECOBICI ofreciera cascos limpios de forma gratuita en tiendas locales o a través de un dispensador automático en las cicloestaciones (que se tiene que devolver), ¿usaría esos cascos, si no tuviera su propio casco?

1. Seguro que sí
2. Probablemente sí
3. Probablemente no

4. Seguro que no

Las siguientes preguntas tratan de su trayecto más reciente con ECOBICI. Por favor conteste lo mejor que pueda, puede saltarse cualquier pregunta que no sepa o no quiera responder.

¿Cuál fue el motivo del último viaje que hizo usando ECOBICI?

1. Ir al trabajo
2. Ir a la escuela
3. Ir a una reunión
4. Ir a un restaurant/comida
5. Ir de compras
6. Social/ entretenimientos/ visitas a amigos
7. Hacer el mandado
8. Ejercicio / diversión
9. Otro. Por favor, especifique:

Antes de que ECOBICI estuviera disponible, ¿cómo hubiera hecho este viaje más a menudo? (marque todos los modos que hubiera usado en un viaje individual antes de ECOBICI).

1. Metro
2. Trolebús (Servicio de Transportes Eléctricos del Distrito Federal)
3. Tren Ligero (Servicio de Transportes Eléctricos del Distrito Federal)
4. Metrobús
5. Peseros/microbús
6. Tren suburbano
7. Taxi
8. Auto compartido (Carrot)
9. Bicicleta propia
10. Caminando
11. Conduciendo solo
12. Conduciendo con otros pasajeros
13. Ir como pasajero en un coche
14. Otro. Por favor, especifique:

Además de su motivo más usual de viaje, ¿por qué otros motivos ha usado ECOBICI? (por favor marque todos los que correspondan).

1. Ir al trabajo
2. Ir a la escuela
3. Ir a una reunión
4. Ir a un restaurant/comida
5. Ir de compras
6. Social/ entretenimientos/ visitas a amigos
7. Hacer el mandado
8. Ejercicio / diversión
9. Otro. Por favor, especifique:

¿Cuál es su nivel de satisfacción con ECOBICI?

1. Muy satisfecho
2. Satisfecho
3. Poco satisfecho
4. Algo decepcionado
5. Decepcionado
6. Muy decepcionado
7. No aplica

No dude en explicar con más detalle de qué manera ECOBICI ha influido en sus hábitos de transporte o su estilo de vida en la Ciudad de México. (opcional)

Si tiene más comentarios sobre ECOBICI para mejorar los servicios. Por favor escríbalos aquí. (opcional)

Información demográfica y ubicación aproximada de CASA/TRABAJO

Por favor indique dos calles que se crucen cerca de su lugar de trabajo y la ciudad.

Calle 1	
Calle 2	
Colonia	
Delegación	

Aproximadamente, ¿cuánto tiempo hace que trabaja en este lugar? (años, meses)

Años enteros:

Meses:

Por favor indique dos calles que se crucen cerca de su casa y la ciudad.

Calle 1	
Calle 2	
Colonia	
Delegación	

Aproximadamente, ¿cuánto tiempo hace que vive en este lugar? (años, meses)

Años enteros:

Meses:

¿Es hombre o mujer?

1. Hombre
2. Mujer
3. Prefiero no contestar

¿Cuál es su edad?

1. 16 - 17 años
2. 18 - 24
3. 25 - 34
4. 35 - 44
5. 45 - 54
6. 55 - 64
7. 65 años o mayor
8. Prefiero no contestar

Aproximadamente, ¿cuánto fueron sus ingresos durante el mes pasado?

1. Menos de $2.000
2. Entre $2.000 y $2.999
3. Entre $3.000 y $3.999
4. Entre $4.000 y $4.999
5. Entre $5.000 y $5.999
6. Entre $6.000 y $6.999
7. Entre $7.000 y $7.999
8. Entre $8.000 y $8.999
9. Entre $9.000 y $9.999
10. Más de $10.000
11. Prefiero no contestar

¿Cuál es su nivel de estudios más alto?

1. No tengo el bachillerato superior
2. Graduado de la preparatoria
3. Carrera Técnica
4. Licenciatura

5. Especialidad
6. Maestría
7. Abogado
8. Médico
9. Doctorado
10. Prefiero no contestar
11. Otro. Por favor, especifique:

Como participante en esta encuesta, le gustaría entrar en el sorteo de una tarjeta de Amazon de $321.64 (25USD)? Si es que sí, por favor escriba su dirección de correo electrónico a continuación y muchas gracias por su colaboración.

1. No, gracias.
2. Sí, mi e-mail de contacto es:

APPENDIX E – MONTREAL MEMBER SURVEY

2013 Enquête sur les Services de Vélo en libre-service Public Nord-Américain effectuée par l'Université de Californie, Berkeley | Transportation Sustainability Research CenterMembre Enquête - BIXI Montreal

Vous pouvez passer toute question qui vous mettrait mal à l'aise. Vos réponses sont confidentielles et seront traitées séparément de toute donnée identifiable. Si vous souhaitez obtenir de plus amples informations sur vos droits en tant que participant à cette recherche, cliquez ici.

Quel type d'abonnement à BIXI possédez-vous actuellement ?

1. Abonnent annuel
2. Abonnement de 30 jours
3. Abonnement de 24 heures occasionnel

Quand vous êtes-vous inscrit au système BIXI Montreal ?

Mois:

1. Janvier
2. Février
3. Mars
4. Avril
5. Mai
6. Juin
7. Juillet
8. Août
9. Septembre
10. Octobre
11. Novembre
12. Décembre

Année :

1. 2013
2. 2012
3. 2011
4. 2010
5. 2009

En ce moment à quelle fréquence roulez-vous en vélo en moyenne (quel que soit le vélo)?

1. Moins d'une fois par mois
2. Une fois par mois
3. Aux deux semaines

4. De 1 à 3 fois par semaine
5. De 4 à 6 fois par semaine
6. Une fois par jour
7. Plus d'une fois par jour

Avant de rejoindre BIXI, à quelle fréquence utilisiez-vous un vélo en moyenne ?

1. Moins d'une fois par mois
2. Une fois par mois
3. Aux deux semaines
4. De 1 à 3 fois par semaine
5. De 4 à 6 fois par semaine
6. Une fois par jour
7. Plus d'une fois par jour

A quelle fréquence empruntez-vous un vélo BIXI ?

1. Moins d'une fois par mois
2. Une fois par mois
3. Aux deux semaines
4. De 1 à 3 fois par semaine
5. De 4 à 6 fois par semaine
6. Une fois par jour
7. Plus d'une fois par jour

Comment décririez-vous votre degré d'habileté sur un vélo (sélectionnez ou indiquez dans « autre » la réponse qui correspond le mieux à votre degré d'habileté sur un vélo)

1. Très à l'aise, rapide et agile
2. Très à l'aise et agile
3. Plutôt prudent
4. Plutôt prudent et pas vraiment à l'aise
5. Très prudent
6. Très prudent et mal à l'aise
7. Autre, précisez:

A quel point vous sentez-vous en sécurité quand vous utilisez BIXI ?

1. Très en sécurité
2. Plutôt en sécurité
3. Pas très en sécurité
4. Pas du tout en sécurité

D’après votre expérience avec BIXI, indiquez pour les propositions suivantes si vous êtes Entièrement d’accord, D’accord, Pas d’accord ou Pas du tout d’accord.

Désormais, je magasine plus aux endroits proches des stations BIXI que je ne le faisais avant le lancement de BIXI.

1. Entièrement d’accord
2. D’accord
3. Pas d’accord
4. Pas du tout d’accord

Je considère BIXI comme une amélioration du système de transport public de Montréal.

1. Entièrement d’accord
2. D’accord
3. Pas d’accord
4. Pas du tout d’accord

Depuis mon adhésion à BIXI, j’ai réalisé des déplacements conjointement en transport en commun et en vélo en libre-service que j’aurais auparavant fait en auto.

1. D’accord
2. Pas d’accord
3. Pas du tout d’accord

Avec le vélo en libre-service, je dépense dans les transports…

1. Beaucoup plus d’argent
2. Plus d’argent
3. Environ la même quantité d’argent
4. Moins d’argent
5. Beaucoup moins d’argent

Avec le vélo en libre-service, je dépense dans les magasins et structures locales…

1. Beaucoup plus d’argent
2. Plus d’argent
3. Environ la même quantité d’argent
4. Moins d’argent
5. Beaucoup moins d’argent

A mon avis, les stations BIXI…

1. Augmentent l’attractivité des magasins à proximité
2. Réduisent l’attractivité des magasins à proximité
3. N’ont pas d’effet sur l’attractivité des magasins à proximité

A quelle fréquence utilisez-vous BIXI des façons suivantes: (sélectionnez une réponse par ligne)

	Souvent	Parfois	Rarement	Jamais
Vélo en libre-service VERS une gare	□	□	□	□
Vélo en libre-service au RETOUR d'une gare	□	□	□	□
Vélo en libre-service VERS un arrêt d'autobus	□	□	□	□
Vélo en libre-service au RETOUR d'un arrêt d'autobus	□	□	□	□
Vélo en libre-service ENTRE une station et une AUTRE station	□	□	□	□
Vélo en libre-service D'UNE station de RETOUR à la MÊME station	□	□	□	□

Décrivez, s'il vous plait, les changements que votre abonnement à BIXI a induits dans votre utilisation des modes de transports suivants.

Du fait de mon utilisation de BIXI, j'utilise les transports en commun…

1. Beaucoup plus souvent
2. Plus souvent
3. Aussi souvent (le vélo en libre-service n'a eu aucun impact)
4. Moins souvent
5. Beaucoup moins souvent
6. Je n'utilisais pas les transports en commun avant, et je ne les utilise pas maintenant
7. Mon utilisation des transports en commun a changé, mais pas du fait de BIXI

Du fait de mon utilisation de BIXI, je prends le bus…

1. Beaucoup plus souvent
2. Plus souvent
3. Aussi souvent (le vélo en libre-service n'a eu aucun impact)
4. Moins souvent
5. Beaucoup moins souvent
6. Je ne prenais pas le bus avant et ne le prends pas maintenant
7. Mon utilisation du bus a changé, mais pas du fait de BIXI

A quel moment de la journée votre utilisation du bus a-t-elle LE PLUS DIMINUÉ du fait de votre utilisation du vélo en libre-service ?

1. Lors des trajets réguliers vers mon lieu de travail
2. Lors des trajets matinaux (en dehors des trajets vers votre travail)
3. Lors des trajets de milieu de journée
4. Lors des trajets du soir (en dehors des trajets de retour de travail)
5. Lors des trajets réguliers de retour de mon lieu de travail
6. Lors des trajets de nuit

7. Pour les trajets de jour pendant la fin de semaine
8. Pour les trajets de nuit pendant la fin de semaine
9. Je ne sais pas
10. OtherAutre, précisez:

Quelle est la principale raison pour laquelle vous utilisez MOINS LE BUS du fait du vélo en libre-service ?

1. Parce que c'est moins cher et plus rapide
2. Parce que c'est moins cher seulement
3. Parce qu'il y a trop de correspondances (pour ne pas avoir à changer)
4. Parce que c'est plus rapide seulement
5. Parce que les temps de trajet sont plus fiables
6. Pour faire de l'exercice
7. Parce que les bus sont bondés
8. Parce qu'il n'y a pas de place pour mon vélo et que j'en ai besoin pour les connexions
9. Parce que je trouve que le vélo en libre-service est plus sûr
10. Ne s'applique pas
11. Autre, précisez:

Pour quel genre de trajets utilisez-vous MOINS SOUVENT le bus du fait de votre utilisation du vélo en libre-service ? (veuillez cocher toutes les réponses qui s'appliquent)

1. Aller au travail
2. Aller à l'école
3. Aller à une réunion
4. Aller au restaurant/à un repas
5. Aller magasiner
6. Social/divertissement/visiter des amis
7. Faire des commissions
8. Exercice/récréation
9. Autre, précisez:

A quel moment de la journée votre utilisation du bus a-t-elle LE PLUS AUGMENTÉ du fait de votre utilisation du vélo en libre-service ?

1. Lors des trajets réguliers vers mon lieu de travail
2. Lors des trajets matinaux (en dehors des trajets vers votre travail)
3. Lors des trajets de milieu de journée

4. Lors des trajets du soir (en dehors des trajets de retour de travail)
5. Lors des trajets réguliers de retour de mon lieu de travail
6. Lors des trajets de nuit
7. Pour les trajets de jour pendant la fin de semaine
8. Pour les trajets de nuit pendant la fin de semaine
9. Je ne sais pas
10. Autre, précisez:

Quelle est la principale raison pour laquelle vous utilisez PLUS LE BUS du fait du vélo en libre-service ?

1. Cela facilite mon ACCES AUX lignes de bus
2. Cela facilite mon ACCES DEPUIS les lignes de bus
3. Cela facilite mon accès AUX lignes de bus ET DEPUIS les lignes de bus
4. Autre, précisez:

Pour quel genre de trajets utilisez-vous PLUS SOUVENT le bus du fait de votre utilisation du vélo en libre-service ? (veuillez cocher toutes les réponses qui s'appliquent)

1. Aller au travail
2. Aller à l'école
3. Aller à une réunion
4. Aller au restaurant/à un repas
5. Aller magasiner
6. Social/divertissement/visiter des amis
7. Faire des commissions
8. Exercice/récréation
9. Autre, précisez:

Comme vous utilisez PLUS LE BUS du fait du vélo en libre-service, QUELS MODES UTILISEZ-VOUS MOINS du fait du vélo en libre-service ? (veuillez sélectionner toutes les réponses qui s'appliquent)

1. Métro
2. Vélo personnel
3. Automobile en tant que conducteur seul (sans passagers)
4. Automobile en tant que conducteur avec passager(s)
5. Automobile en tant que passager
6. Taxi
7. Marche à pied

8. Véhicule en auto-partage
9. Aucun : je fais des trajets supplémentaires
10. Autre, précisez:

Du fait de mon utilisation de BIXI, je prends le Métro de Montréal…

1. Beaucoup plus souvent
2. Plus souvent
3. Aussi souvent (le vélo en libre-service n'a eu aucun impact)
4. Moins souvent
5. Beaucoup moins souvent
6. Je ne prenais pas le Métro avant et ne le prends pas maintenant
7. Mon utilisation du Métro a changé, mais pas du fait de BIXI

A quel moment de la journée votre utilisation du Métro a-t-elle LE PLUS DIMINUÉ du fait de votre utilisation du vélo en libre-service ?

1. Lors des trajets réguliers vers mon lieu de travail
2. Lors des trajets matinaux (en dehors des trajets vers votre travail)
3. Lors des trajets de milieu de journée
4. Lors des trajets du soir (en dehors des trajets de retour de travail)
5. Lors des trajets réguliers de retour de mon lieu de travail
6. Lors des trajets de nuit
7. Pour les trajets de jour pendant la fin de semaine
8. Pour les trajets de nuit pendant la fin de semaine
9. Je ne sais pas
10. Autre, précisez:

Quelle est la principale raison pour laquelle vous utilisez MOINS LE MÉTRO du fait du vélo en libre-service ?

1. Parce que c'est moins cher et plus rapide
2. Parce que c'est moins cher seulement
3. Parce qu'il y a trop de correspondances (pour ne pas avoir à changer)
4. Parce que c'est plus rapide seulement
5. Parce que les temps de trajet sont plus fiables
6. Pour faire de l'exercice
7. Parce que les Métros sont bondés
8. Parce qu'il n'y a pas de place pour mon vélo et que j'en ai besoin pour les connexions
9. Parce que je trouve que le vélo en libre-service est plus sûr

10. Ne s’applique pas
11. Autre, précisez:

Pour quel genre de trajets utilisez-vous MOINS SOUVENT le Métro du fait de votre utilisation du vélo en libre-service? (veuillez cocher toutes les réponses qui s’appliquent)

1. Aller au travail
2. Aller à l’école
3. Aller à une réunion
4. Aller au restaurant/à un repas
5. Aller magasiner
6. Social/divertissement/visiter des amis
7. Faire des commissions
8. Exercice/récréation
9. Autre, précisez:

A quel moment de la journée votre utilisation du Métro a-t-elle LE PLUS AUGMENTÉ du fait de votre utilisation du vélo en libre-service ?

1. Lors des trajets réguliers vers mon lieu de travail
2. Lors des trajets matinaux (en dehors des trajets vers votre travail)
3. Lors des trajets de milieu de journée
4. Lors des trajets du soir (en dehors des trajets de retour de travail)
5. Lors des trajets réguliers de retour de mon lieu de travail
6. Lors des trajets de nuit
7. Pour les trajets de jour pendant la fin de semaine
8. Pour les trajets de nuit pendant la fin de semaine
9. Je ne sais pas
10. Autre, précisez:

Quelle est la principale raison pour laquelle vous utilisez PLUS LE MÉTRO du fait du vélo en libre-service ?

1. Cela facilite mon ACCES AU Métro
2. Cela facilite mon ACCES DEPUIS le Métro
3. Cela facilite mon accès AU Métro ET DEPUIS le Métro
4. Autre, précisez:

Pour quel genre de trajets utilisez-vous PLUS SOUVENT le bus du fait de votre utilisation du vélo en libre-service ? (veuillez cocher toutes les réponses qui s'appliquent)

1. Aller au travail
2. Aller à l'école
3. Aller à une réunion
4. Aller au restaurant/à un repas
5. Aller magasiner
6. Social/divertissement/visiter des amis
7. Faire des commissions
8. Exercice/récréation
9. Autre, précisez:

Comme vous utilisez PLUS LE MÉTRO du fait du vélo en libre-service, QUELS MODES UTILISEZ-VOUS MOINS du fait du vélo en libre-service ? (veuillez sélectionner toutes les réponses qui s'appliquent)

1. Autobus
2. Train de banlieue
3. Vélo personnel
4. Automobile en tant que conducteur seul (sans passagers)
5. Automobile en tant que conducteur avec passager(s)
6. Automobile en tant que passager
7. Taxi
8. Marche à pied
9. Véhicule en auto-partage
10. Aucun : je fais des trajets supplémentaires
11. Autre, précisez:

Du fait de mon utilisation de BIXI, je prends le Train de banlieue…

1. Beaucoup plus souvent
2. Plus souvent
3. Aussi souvent (le vélo en libre-service n'a eu aucun impact)
4. Moins souvent
5. Beaucoup moins souvent
6. Je ne prenais pas le Train de banlieue avant et ne le prends pas maintenant
7. Mon utilisation du Train de banlieue a changé, mais pas du fait de BIXI

A quel moment de la journée votre utilisation du Train de banlieue a-t-elle LE PLUS DIMINUÉ du fait de votre utilisation du vélo en libre-service ?

1. Lors des trajets réguliers vers mon lieu de travail
2. Lors des trajets matinaux (en dehors des trajets vers votre travail)
3. Lors des trajets de milieu de journée
4. Lors des trajets du soir (en dehors des trajets de retour de travail)
5. Lors des trajets réguliers de retour de mon lieu de travail
6. Lors des trajets de nuit
7. Pour les trajets de jour pendant la fin de semaine
8. Pour les trajets de nuit pendant la fin de semaine
9. Je ne sais pas
10. Autre, précisez:

Quelle est la principale raison pour laquelle vous utilisez MOINS LE TRAIN DE BANLIEUE du fait du vélo en libre-service?

1. Parce que c'est moins cher et plus rapide
2. Parce que c'est moins cher seulement
3. Parce qu'il y a trop de correspondances (pour ne pas avoir à changer)
4. Parce que c'est plus rapide seulement
5. Parce que les temps de trajet sont plus fiables
6. Pour faire de l'exercice
7. Parce que les Métro sont bondés
8. Parce qu'il n'y a pas de place pour mon vélo et que j'en ai besoin pour les connexions
9. Parce que je trouve que le vélo en libre-service est plus sûr
10. Ne s'applique pas
11. Autre, précisez:

Pour quel genre de trajets utilisez-vous MOINS SOUVENT le Train de banlieue du fait de votre utilisation du vélo en libre-service ? (veuillez cocher toutes les réponses qui s'appliquent)

1. Aller au travail
2. Aller à l'école
3. Aller à une réunion
4. Aller au restaurant/à un repas
5. Aller magasiner
6. Social/divertissement/visiter des amis
7. Faire des commissions

8. Exercice/récréation
9. Autre, précisez:

A quel moment de la journée votre utilisation du Train de banlieue a-t-elle LE PLUS AUGMENTÉ du fait de votre utilisation du vélo en libre-service ?

1. Lors des trajets réguliers vers mon lieu de travail
2. Lors des trajets matinaux (en dehors des trajets vers votre travail)
3. Lors des trajets de milieu de journée
4. Lors des trajets du soir (en dehors des trajets de retour de travail)
5. Lors des trajets réguliers de retour de mon lieu de travail
6. Lors des trajets de nuit
7. Pour les trajets de jour pendant la fin de semaine
8. Pour les trajets de nuit pendant la fin de semaine
9. Je ne sais pas
10. Autre, précisez:

Quelle est la principale raison pour laquelle vous utilisez PLUS LE TRAIN DE BANLIEUE du fait du vélo en libre-service ?

1. Cela facilite mon ACCES AU Train de Banlieue
2. Cela facilite mon ACCES DEPUIS le Train de banlieue
3. Cela facilite mon accès AU Train de banlieue ET DEPUIS le Train de banlieue
4. Autre, précisez:

Pour quel genre de trajets utilisez-vous PLUS SOUVENT le Train de banlieue du fait de votre utilisation du vélo en libre-service ? (veuillez cocher toutes les réponses qui s’appliquent)

1. Aller au travail
2. Aller à l’école
3. Aller à une réunion
4. Aller au restaurant/à un repas
5. Aller magasiner
6. Social/divertissement/visiter des amis
7. Faire des commissions
8. Exercice/récréation
9. Autre, précisez:

Comme vous utilisez PLUS LE TRAIN du fait du vélo en libre-service, QUELS MODES UTILISEZ-VOUS MOINS du fait du vélo en libre-service ? (veuillez sélectionner toutes les réponses qui s'appliquent)

1. Autobus
2. Métro
3. Vélo personnel
4. Automobile en tant que conducteur seul (sans passagers)
5. Automobile en tant que conducteur avec passager(s)
6. Automobile en tant que passager
7. Taxi
8. Marche à pied
9. Véhicule en auto-partage
10. Aucun : je fais des trajets supplémentaires
11. Autre, précisez:

Du fait de mon utilisation de BIXI, je marche

1. Beaucoup plus souvent
2. Plus souvent
3. Aussi souvent (le vélo en libre-service n'a eu aucun impact)
4. Moins souvent
5. Beaucoup moins souvent
6. La fréquence à laquelle je marche à pied que je fais a changé, mais pas du fait de BIXI

Du fait de mon utilisation de BIXI, je conduis mon véhicule personnel (voiture, VUS, mini van, etc.) …

1. Beaucoup plus souvent
2. Plus souvent
3. Aussi souvent (le vélo en libre-service n'a eu aucun impact)
4. Moins souvent
5. Beaucoup moins souvent
6. Je ne conduisais pas de voiture avant et n'en conduis pas maintenant
7. La fréquence à laquelle je conduis un véhicule a changé, mais pas du fait de BIXI

Du fait de mon utilisation de BIXI, je prends le taxi…

1. Beaucoup plus souvent
2. Plus souvent

3. Aussi souvent (le vélo en libre-service n'a eu aucun impact)
4. Moins souvent
5. Beaucoup moins souvent
6. Je ne prenais pas le taxi à Montréal avant et ne le prends pas maintenant
7. Mon utilisation du taxi a changé, mais pas du fait de BIXI

Du fait de mon utilisation de BIXI, je fais du vélo (quel qu'il soit)

1. Beaucoup plus souvent
2. Plus souvent
3. Aussi souvent (le vélo en libre-service n'a eu aucun impact)
4. Moins souvent
5. Beaucoup moins souvent

Du fait de mon utilisation de BIXI, j'utilise les services d'auto-partage (usage partagé d'une flotte de véhicule pour des courtes durées, par exemple Communauto)

1. Beaucoup plus souvent
2. Plus souvent
3. Aussi souvent (le vélo en libre-service n'a eu aucun impact)
4. Moins souvent
5. Beaucoup moins souvent
6. Je n'utilise pas l'auto-partage
7. Mon utilisation de l'auto-partage a changé, mais pas du fait de BIXI

Du fait de mon utilisation de BIXI, j'utilise le covoiturage…

1. Beaucoup plus souvent
2. Plus souvent
3. Aussi souvent (le vélo en libre-service n'a eu aucun impact)
4. Moins souvent
5. Beaucoup moins souvent
6. Je n'utilisais pas le covoiturage avant et ne l'utilise pas maintenant
7. Mon utilisation du covoiturage a changé, mais pas du fait de BIXI

Du fait de mon utilisation, je fais globalement des trajets

1. Beaucoup plus souvent
2. Plus souvent
3. Aussi souvent (le vélo en libre-service n'a eu aucun impact sur la quantité de trajets que je fais)
4. Moins souvent
5. Beaucoup moins souvent

Du fait de mon utilisation de BIXI, je fais…

1. Beaucoup plus d'exercice
2. Plus d'exercice
3. Autant d'exercice qu'avant
4. Moins d'exercice
5. La quantité d'exercice que je fais a changé depuis que j'ai rejoint BIXI mais pas à cause de BIXI

Votre ménage possède-t-il ou a-t-il accès à un ou plusieurs véhicule(s) à moteur ou vélo ? (automobile, van, VUS, camion, motocyclette, scooter)

1. Oui
2. Non

Veuillez indiquer pour chaque type combien de véhicules de votre ménage possède ou loue.

Automobile, van, VUS, camion, ou autre véhicule personnel à moteur :

1. 0
2. 1
3. 2
4. 3
5. 4
6. 5 ou plus

Motocyclette :

1. 0
2. 1
3. 2
4. 3
5. 4
6. 5 ou plus

Scooter ou vélomoteur :

1. 0
2. 1
3. 2
4. 3
5. 4
6. 5 ou plus

Vélo personnel (en dehors de BIXI) qui fonctionne :

1. 0
2. 1
3. 2
4. 3
5. 4
6. 5 ou plus

Actuellement, combien de kilomètres parcourez-vous en moyenne au volant de votre véhicule personnel par mois (approximativement)?

1. 0
2. 100
3. 200
4. 300
5. 400
6. 500
7. 600
8. 700
9. 800
10. 900
11. 1000
12. 1100
13. 1200
14. 1300
15. 1400
16. 1500
17. 1600
18. 1700
19. 1800
20. 1900
21. 2000
22. Plus que 2000
23. Je ne sais pas
24. Autre, précisez:

Avant de commencer le vélo en libre-service, combien de kilomètres par mois parcouriez-vous en moyenne au volant de votre véhicule personnel (approximativement)?

1. 0
2. 100
3. 200
4. 300
5. 400
6. 500
7. 600
8. 700
9. 800
10. 900
11. 1000
12. 1100
13. 1200
14. 1300
15. 1400
16. 1500
17. 1600
18. 1700
19. 1800
20. 1900
21. 2000
22. Plus que 2000
23. Je ne sais pas
24. Autre, précisez:

Quelle est la consommation en essence (litres / 100km) du véhicule que vous conduisez le plus souvent ?

1. 1
2. 2
3. 3
4. 4
5. 5
6. 6
7. 7
8. 8
9. 9

10. 10
11. 11
12. 12
13. 13
14. 14
15. 15
16. 16
17. 17
18. 18
19. 19
20. 20
21. 21
22. 22
23. 23
24. 24
25. 25
26. 26
27. 27
28. 28
29. 29
30. 30
31. 31
32. 32
33. 33
34. 34
35. 35
36. 36
37. 37
38. 38
39. 39
40. 40
41. 41
42. 42
43. 43
44. 44
45. 45
46. 46
47. 47

48. 48
49. 49
50. 50
51. Je ne sais pas
52. Autre, précisez:

Depuis votre adhésion à BIXI, avez-vous vendu, fait don ou autrement disposé d'un véhicule personnel ou avez-vous songé à vendre un véhicule personnel (automobile, van, VUS, camion, motocyclette, scooter, vélo personnel, etc.)

1. Non
2. Vendu ou fait don d'un véhicule personnel
3. Songé à vendre un véhicule personnel

De quel genre de véhicule vous êtes-vous défait (vendu, donné ou autre) ou avez-vous envisagé de vous défaire ?

1. Automobile
2. Van
3. VUS
4. Camion
5. Motocyclette
6. Scooter
7. Vélo personnel
8. Autre, précisez:

A quel point votre abonnement à BIXI a-t-il été important dans votre décision de vendre ou dans votre inclinaison à vendre votre véhicule personnel ?

1. Très important
2. Assez important
3. Pas du tout important
4. Je ne sais pas

Avez-vous reporté ou renoncé à l'achat d'un VEHICULE A MOTEUR (automobile, VUS, etc.) qui n'est plus nécessaire en raison de la possibilité d'utiliser le vélo en libre-service ?

1. Oui
2. Non
3. Je ne sais pas
4. Pas une automobile, ni un VUS mais un(e)

À quelle fréquence portez-vous un casque protecteur lorsque vous utilisez les vélos BIXI ?

1. Toujours
2. Parfois
3. Rarement
4. Jamais

Possédez-vous un casque protecteur pour vélo ?

1. Oui
2. Non

Quelle est la PRINCIPALE RAISON pour laquelle vous n'utilisez pas toujours un casque lorsque vous utilisez BIXI ? Sélectionnez la proposition qui correspond habituellement le mieux à votre situation vis-à-vis du port du casque.

1. Je ne porte jamais de casque lorsque je roule en vélo, quel que soit le vélo.
2. Mon utilisation du vélo en libre-service n'est pas toujours prévue et je n'ai donc pas toujours un casque avec moi.
3. Je n'aime pas transporter un casque, même si de manière générale je sais à l'avance quand je vais utiliser un vélo en libre-service.
4. Autre, veuillez expliquer:

Parmi les propositions suivantes, lesquelles décrivent le mieux la raison pour laquelle vous ne portez pas de casque protecteur ? Veuillez sélectionner trois raisons principales et les classer dans leur ordre d'importance, 3 étant le moins important et 1 le plus important.

Je suis un cycliste prudent et ce n'est donc pas nécessaire	☐
Les casques de vélo sont inconfortables	☐
Les casques de vélo décoiffent mes cheveux	☐
Je n'aime pas l'allure qu'ils me donnent	☐
Je n'ai pas les moyens d'en acheter un	☐
Je devrais sans doute m'en acheter un, mais je n'ai pas trouvé le temps d'en chercher un qui me plaise	☐
Autre	☐

Si autre, veuillez préciser :

Si les systèmes de vélo en libre-service proposaient des casques désinfectés de manière gratuite disponibles dans des magasins locaux ou des bornes libre-service (que vous retourneriez après usage) utiliseriez-vous ces casques, dans la mesure où vous n'avez pas votre propre casque avec vous ?

1. Certainement
2. Probablement
3. Probablement pas
4. Certainement pas

Les questions suivantes portent sur votre plus récent trajet en vélo en libre-service. Merci d'y répondre dans la mesure du possible, si vous ne pouvez pas ou ne souhaitez pas répondre à une question, vous pouvez la passer.

Quel était le but du plus récent trajet que vous avez effectué avec BIXI Montréal ?

1. Aller au travail
2. Aller à l'école
3. Aller à une réunion
4. Aller au restaurant/à un repas
5. Aller magasiner
6. Social/divertissement/visiter des amis
7. Faire des commissions
8. Exercice/récréation
9. Autre, précisez

Où avez-vous commencé ce trajet?

Adresse ou intersection la plus proche (utilisez « & » pour séparer le nom des rues):

Quel était la destination finale de ce trajet ?

Adresse ou intersection la plus proche (utilisez « & » pour séparer le nom des rues)

Combien de fois vous êtes-vous arrêté(e) au cours de ce trajet (arrêts lors desquels vous descendez du vélo) ?

1. 0 arrêts (vous vous êtes seulement arrêtés à la station BIXI)
2. 1 arrêt
3. 2 arrêts
4. 3 arrêts
5. 4 arrêts
6. 5 arrêts
7. 6 arrêts ou plus

Veuillez indiquer l'adresse ou l'intersection la plus proche pour chacun des arrêts intermédiaires. (utilisez « & » pour séparer le nom des rues)

Premier arrêt, adresse ou intersection la plus proche :	□
Deuxième arrêt, adresse ou intersection la plus proche :	□
Troisième arrêt, adresse ou intersection la plus :	□
Quatrième arrêt, adresse ou intersection la plus : proche :	□
Cinquième arrêt, adresse ou intersection la plus proche :	□

Veuillez indiquer de manière approximative à quelle heure vous avez commencé ce trajet?

1. 6h
2. 7h
3. 8h
4. 9h
5. 10h
6. 11h
7. Midi
8. 13h
9. 14h
10. 15h
11. 16h
12. 17h
13. 18h
14. 19h
15. 20h

16. 21h
17. 22h
18. 23h
19. Minuit
20. 1h
21. 2h
22. 3h
23. 4h
24. 5h

N’hésitez pas à fournir d’autres détails sur la façon dont BIXI a influencé vos habitudes de déplacement en utilisant le cadre ci-dessous (optionnel).

Si vous avez des suggestions pour les opérations de BIXI pouvant aider à améliorer les services, n’hésitez pas à nous en faire part ici (optionnel).

Veuillez indiquer le nom de deux rues en intersection à proximité de votre TRAVAIL ainsi que le nom de la ville.

Rue n°1	□
Rue n°2	□
Ville	□

Veuillez indiquer le nom de deux rues en intersection à proximité de votre DOMICILE ainsi que le nom de la ville.

Rue n°1	□
Rue n°2	□
Ville	□

Êtes-vous un homme ou une femme ?

1. Homme
2. Femme
3. Je préfère ne pas répondre

Veuillez indiquer le nombre de personnes que représente votre ménage en choisissant parmi les catégories ci-dessous (y compris vous-même).

De 0 à 5 :	□
De 6 à 15 :	□
De 16 à 19 :	□
De 20 à 40 :	□
De 41 à 60 :	□
Plus de 61 :	□

Quel âge avez-vous ?

1. Moins de 16 ans
2. De 16 à 17 ans
3. De 18 à 19 ans
4. De 20 à 24 ans
5. De 25 à 29 ans
6. De 30 à 34 ans
7. De 35 à 39 ans
8. De 40 à 44 ans
9. De 45 à 49 ans
10. De 50 à 54 ans
11. De 55 à 59 ans
12. De 60 à 64 ans
13. De 65 à 69 ans
14. De 70 à 74 ans
15. De 75 à 79 ans
16. De 80 à 89 ans
17. 90 ans ou plus
18. Je préfère ne pas répondre

Quel était approximativement le revenu BRUT de votre ménage en 2012?

1. Moins de 10 000 $
2. 10 000 $ à 14 999 $
3. 15 000 $ à 24 999 $
4. 25 000 $ à 34 999 $
5. 35 000 $ à 49 999 $
6. 50 000 $ à 74 999 $
7. 75 000 $ à 99 999 $
8. 100 000 $ à 149 999 $
9. 150 000 $ à 199 999 $
10. 200 000 $ ou plus

11. Je préfère ne pas répondre

Quel est votre plus haut niveau de formation scolaire ?

1. Moins que secondaire
2. Secondaire/général ou professionnel
3. CEGEP
4. Universitaire premier cycle
5. Universitaire deuxième cycle
6. Doctorat
7. Je préfère ne pas répondre
8. Autre, précisez:

Lesquels des énoncés suivants décrivent le mieux votre horizon ethnique ? (Veuillez cocher tous ceux que s'appliquent)

1. Asiatique/Île du Pacifique
2. Noir(e)/Africain(e)-Américain(e)
3. Hispanique/Latino
4. Natif (native) d'Hawaii ou autres Iles du Pacific
5. Indien(ne) d'Amérique/Natif (native) d'Alaska
6. Blanc ou Caucasien
7. Je préfère ne pas répondre
8. Autre

Si vous souhaitez participer au tirage d'une carte-cadeau Amazon de 25 $, veuillez indiquer une adresse électronique sur laquelle vous pouvez être contacté ci-dessous (cette adresse sera utilisée uniquement à cette fin.) Cette adresse n'est en rien obligatoire pour valider ce questionnaire.

1. Non, merci
2. Oui, adresse électronique:

APPENDIX F – HUBWAY ON-STREET SURVEY

2013 North American Public Bikesharing Survey Operated by the University of California, Berkeley | Transportation Sustainability Research Center On-Street Survey – Hubway Metro-Boston

You do not have to answer any question that makes you feel uncomfortable. All answers are confidential and responses will only be reported in aggregate. If you would like more information about your rights as a research participant, please click here.

Please indicate the type of membership that you currently have with Hubway.

1. Annual Member
2. Monthly Member
3. 3-Day Pass
4. 24-Hour Pass

Do you think that you will purchase an annual pass this year?

1. Definitely
2. Probably
3. Probably Not
4. Definitely Not

What was the MAIN purpose of the most recent trip you took using Hubway?

1. Go to work
2. Go to school
3. Go to a meeting
4. Go to a restaurant / meal
5. Go shopping
6. Social / entertainment / visit friends
7. Run errands
8. Exercise / recreation
9. Other (please specify) _____

If Hubway was not available, how would you have made this trip? (check the MAIN mode that you would have used)

1. I would not have made this trip
2. Bus
3. Subway or trolley
4. Commuter Rail
5. Ferry
6. Personal bike

7. Drive alone
8. Drive with others
9. Ride in a car with others
10. Taxi
11. Walk
12. Zipcar or other carsharing vehicle
13. Other (please specify) _____

Did you wear a helmet for this trip?

1. Yes
2. No

Did you complete this trip by yourself or with a group of people?

1. By myself
2. With 1 other person
3. With 2 other people
4. With 3 or more people

Are you:

1. A resident of the Boston Metropolitan Region?
2. A tourist in the Boston Metropolitan Region?
3. On business travel in the Boston Metropolitan Region?
4. Other _____

Do you own or lease car?

1. Yes
2. No

What is your gender?

1. Male
2. Female
3. Prefer not to answer

What is your age?

1. Less than 18 years
2. 18 to 19
3. 20 to 24
4. 25 to 29
5. 30 to 34
6. 35 to 39

7. 40 to 44
8. 45 to 49
9. 50 to 54
10. 55 to 59
11. 60 to 64
12. 65 to 69
13. 70 to 74
14. 75 to 79
15. 80 to 89
16. 90 or older
17. Prefer not to answer

What is your HOME zip code? (leave blank if you do not know or prefer not to answer)

Zip code:

What is your WORK zip code? (leave blank if you do not know or prefer not to answer)

Zip code:

Approximately what was your household income in 2012?

1. Less than $10,000
2. $10,000 to $14,999
3. $15,000 to $24,999
4. $25,000 to $34,999
5. $35,000 to $49,999
6. $50,000 to $74,999
7. $75,000 to $99,999
8. $100,000 to $149,999
9. $150,000 to $199,999
10. $200,000 or more
11. Prefer not to answer

If you would like to be considered for the drawing of $25 amazon gift card, please provide an email at which you can be contacted. (This email will only be used for this purpose.) You do not have to provide this to complete the survey.

ABBREVIATIONS AND ACRONYMS

ACS	American Community Survey
CAD	Canadian Dollar
CO_2	Carbon Dioxide
FTA	Federal Transit Administration
GPS	Global Positioning System
GSA	General Services Administration
IT	Information Technology
MXN	Mexican Peso
RFID	Radio-Frequency Identification
SFMTA	San Francisco Municipal Transportation Agency
TSRC	Transportation Sustainability Research Center
USD	United States Dollar

ENDNOTES

1. Not all bikesharing systems are IT-based to facilitate sharing.

2. It is not theoretically ideal to assess bike demand through station departures and bike supply through station arrivals. Instead, it would be more ideal to count someone's desired demand to access a bike from a particular location. However, it is not possible to observe a failed attempt to rent a bike, which occurs if all the docks are empty. An attempt to rent a bike may also happen, if a transaction is not properly processed. In reality, bike demand at an empty station "spills over" to a nearby station. Similarly, it is not possible to observe a failed attempt to return a bike to a particular station, which occurs if all docks are full. Presumably, that bike is returned to another station—leading to a "spillover" effect—or it is returned to the desired station at another time. In this analysis, departures from and arrivals to stations reflect the rebalancing system in place.

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