

Sharing to Grow:
Economic Activity Associated with Nice Ride Bike Share Stations

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Jessica E. Schoner
R. Andrew Harrison
Xize Wang

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Dr. Greg Lindsey, Professor and Executive Associate Dean
Signature of Capstone Instructor

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Technical Report
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Jessica E. Schoner*
Andrew Harrison
Xize Wang

Humphrey School of Public Affairs
University of Minnesota
301 19th Avenue South
Minneapolis, MN 55405

***Corresponding Author**
schon082@umn.edu

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Abstract

This study examines local economic activity associated with bike sharing programs through a mixed methods investigation of the Nice Ride Minnesota bike share system. The literature on bike share systems is rapidly growing, but little information about the ways in which ridership is both influenced by the presence of businesses and influences those businesses is available. This research provides new information about economic aspects of bike share operations by (1) measuring the marginal effects of the presence of different types of businesses and job accessibility on station activity while controlling for other variables; (2) reporting the perceptions of business owners and managers about the effects of a nearby Nice Ride station on these businesses; and (3) using survey results to describe Nice Ride users' trip making and expenditure patterns.

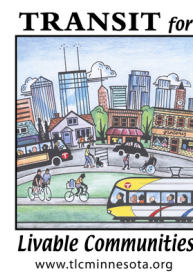
We observed a statistically significant relationship between station trip activity and the number of food-related businesses and job accessibility within a bike share station area. Business owners and managers corroborated these findings by revealing general positive attitudes toward Nice Ride users as customers, although interviewees were ambivalent when asked if they would trade parking or sidewalk cafe space for a Nice Ride station. The user survey revealed that respondents use bike sharing to go to cafes, restaurants, grocery stores, concerts, bars, and the like, and they spend modest amounts of money on these trips. The availability of Nice Ride stations mainly supports mode shifts (e.g., people who choose to bike rather than drive or walk) but it also may induce some new trips. The principal economic effect may be the reallocation of user expenditures to businesses that are more accessible to more people because of the nearby stations.

Acknowledgements

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We would also like to thank Nice Ride Minnesota and Transit for Livable Communities/Bike Walk Twin Cities for the opportunity to partner with them for this research, and for their continued expertise and support throughout the project.

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About the Authors

Andrew Harrison

is a student worker in the Minnesota DOT's bicycle and pedestrian section. He earned his Master of Urban and Regional Planning degree from the Humphrey School of Public Affairs, University of Minnesota in 2012. He has research experience in complete streets policy, transitway development, and nonmotorized travel.

Jessica E. Schoner

is a master's candidate in Civil Engineering and Urban Planning at the University of Minnesota. She has research experience with bicycle facility networks, the relationship between transportation and the built environment, and spatial data analysis.

Xize Wang

is a doctoral candidate at the University of Southern California. He earned his Master of Urban and Regional Planning degree from the Humphrey School of Public Affairs, University of Minnesota in 2012. Xize has research experience in non-motorized transportation, the relationship between transportation and the built environments, and urban spatial analysis.

Executive Summary

Bike share systems have been established in several cities across North America, and many more are considering implementing bike sharing. In Minneapolis-St. Paul, Minnesota, 3,693 subscribers and thousands of day-pass users made more than 217,000 trips using bicycles from the Nice Ride bike share program during the 2011 season. The presence of bike share stations and opportunities they provide for new, inexpensive modes of travel enable people to access dense, urban neighborhoods more efficiently, especially where parking is limited and other modes are inconvenient. This availability of bicycle stations for inexpensive public use potentially affects travel and consumption patterns, though the nature and magnitude of these effects are unknown.

With support from the Bikes Belong Foundation, and in cooperation with Nice Ride Minnesota and Transit for Livable Communities/Bike Walk Twin Cities, a team of graduate students from the Humphrey School of Public Affairs at the University of Minnesota analyzed local economic activity associated with the Nice Ride bike share program. The team used a mixed methods approach to evaluate

1. The marginal effects of the presence of business establishments on a bicycle station's level of use;
2. Measures of the effects of patronage by Nice Ride users on retail sales as reported through a survey of local business owners and managers near stations;
3. Self-reports of trip purpose and expenditures by Nice Ride users.

All three components of the study - the station activity models, business interviews, and subscriber survey - have consistent results that illustrate bike share's role in local economic activity.

Bike share station activity is positively and significantly associated with food-related destinations near the station and with job accessibility, but not with the presences of other types of businesses or the total number of different businesses. Business owners and managers in food-related businesses have generally positive attitudes about the impacts of bike share on their businesses, but few expressed willingness to give up sidewalk or parking spaces for bike share stations. Businesses reported redemption of coupons associated with Nice Ride subscriptions and confirmed patronage by Nice Ride users, but also noted difficulty in distinguishing Nice Ride users from other customers and cyclists. Business owners and managers appear to support Nice Ride more because it is consistent with their values or marketing strategies than because of impacts on their bottom lines.

Subscriber survey respondents indicated that they use Nice Ride for trips to food-related businesses with relative frequency, spending modest amounts of money on these trips. Most of these trips are diverted car trips, indicating a concentration of economic activity around stations as people switch destinations to match their mode choice. Respondents reported on a small but meaningful number of trips that they would not have made if Nice Ride were not available, indicating potential for additional economic activity associated with the presence of a Nice Ride bike share station.

This research is important for planners, academics, and policymakers because the findings will enable local and regional governments to better evaluate the potential benefits of bike share systems. Understanding these relationships is essential for evaluating the effectiveness of public and private start-up funds, making recommendations to peer cities considering their own bike share system, and guiding station placement and distribution to optimize economic impact through improved accessibility. The findings may also help connect local businesses and bike share organizations by explaining their mutually beneficial relationship.

Station Activity Model Summary

Purpose

Estimate the marginal effects of presence of business establishments and job accessibility on Nice Ride station level of use while controlling for neighborhood sociodemographics, the characteristics of the built environment, and elements of transportation infrastructure.

Methodology

The team estimated three ordinary least squares (OLS) regression models of the number of trips taken at 116 Nice Ride bike share stations in 2011:

- Total activity model: the dependent variable is the logarithm of the total Nice Ride station trips in 2011.
- Trip origin model: the dependent variable is the logarithm of the Nice Ride station trip origins in 2011.
- Trip destination model: the dependent variable is the logarithm of the Nice Ride station trip destinations in 2011.

Nineteen independent variables were measured for station areas, which were defined as the ¼-mile walking distance around each station. The four economic variables of interest were the total number of business establishments in the area, the number of food-related businesses, the number of other retail businesses, and job accessibility. The control variables included variables in three categories: station area sociodemographics (4 variables), built environment (6 variables), and transportation infrastructure (5 variables).

Results

The number of food businesses (i.e., restaurants, bars, cafes, grocery stores, specialty food stores, etc.) in a station area has a positive, statistically significant effect on station activity but station activity is not correlated with the total number of businesses or number of other types of retail businesses in the station area. Station activity is positively associated with job accessibility, and the correlation is statistically significant, although the effects are not as strong as the presence of food-related businesses. Station activity is correlated with the proportion of middle aged individuals and white residents in the station area, proximity to water and the central business district, the presence of a shared-use trail, and the number of days during 2011 that a station was open. Key economic variables are shown in Table A.

Table A. Selected Station Activity Model Results

Economic Variables from the Station Activity Models	Total Activity		Origins		Destinations	
	Coeff.	T-Statistic	Coeff.	T-Statistic	Coeff.	T-Statistic
Job Accessibility	0.0000127	2.21**	0.0000131	2.25**	0.00001	2.14**
Shopping Businesses	-0.010715	-0.83	-0.0128571	-0.99	-0.0085434	-0.67
Food Businesses	0.0436912	2.48**	0.0423646	2.37**	0.0451566	2.57**
Total Businesses	-0.0006909	-0.47	-0.0005949	-0.4	-0.0007918	-0.54
Constant	4.81179	7.31***	4.060252	6.09***	4.168671	6.35***
N	116		116		116	
Adjusted R-Square	0.8687		0.8657		0.8696	

Key Findings for Practice

When locating bike share stations, food matters, but not necessarily shopping. Each additional food business located within a ¼-mile walking distance buffer of a Nice Ride station is correlated with a 4.47% increase in station activity. Access to jobs also matters, but not as much.

Bike share planners can use these models to help locate new stations: other factors equal, bike stations in areas with more food businesses, jobs, nearby middle-aged residents, and access to the central business district, trails, and surface water will receive greater use. By assembling relevant information for proposed station areas, planners can use these models to predict use - the potential number of trips - at proposed stations.

Business Interviews Summary

Purpose

Examine business owners' and managers' perceptions of economic activity related to Nice Ride stations.

Methodology

Business owners and managers were interviewed to understand their perspectives on Nice Ride users and whether or not they believe having a station nearby is positively associated with additional customer traffic. Sixty-eight businesses, including businesses affiliated with Nice Ride through marketing initiatives (called the affiliate sub-sample), and from 20 station areas encompassing a range of activity levels and local retail business mixes (spatial sub-sample) were approached to participate in the survey. Twenty-nine businesses, including 22 food-related businesses and seven non-food businesses participated in the study (a participation rate of 43%). Because businesses do not track dollars spent by Nice Ride users, it was necessary to approach the concept of economic activity by eliciting information that could identify:

- Whether or not businesses were visited by Nice Ride users
- Whether or not businesses were proactively attracting Nice Ride users
- Whether or not businesses valued Nice Ride users enough to support replacement of adjacent parking or sidewalk space with a Nice Ride station

Results

A summary of these findings is presented in Table B. Among the 29 business owners or managers who agreed to be interviewed:

- 38% said they had observed Nice Ride users in their place of business.
- 83% said they had seen or interacted with traditional cyclists at their business.
- 17% said they would support replacing parking with a Nice Ride station.
- 8% said they would support replacing sidewalk space with a Nice Ride station.

Business owners and managers from the affiliate sub-sample were more likely to respond positively to replacing parking or sidewalk space with a Nice Ride station than business owners and managers from the spatial sub-sample. No businesses in the spatial sub-sample reported using strategies to specifically attract Nice Ride users; businesses in the affiliate sub-sample do not track Nice Ride deals, discounts or coupon redemption rates, but characterized these strategies as experiencing limited success.

Table B. Selected Business Interview Results

Do you ever interact with or see Nice Ride users at [BUSINESS]?	All Businesses		Food-related Businesses		Non-food-related Businesses	
Interviewee does not see or interact with Nice Ride users	7	24%	4	38%	3	43%
Interviewee sees or interacts with Nice Ride users	11	38%	10	45%	1	14%
Interviewee has difficulty identifying Nice Ride users	11	38%	8	36%	3	43%
Total	29	100%	22	100%	7	100%

Key Findings

Food-related business owners and managers were more likely than those from non-food businesses to have noticed Nice Ride users in their place of business and reported having more interactions with Nice Ride users. Proximity and line-of-sight to a Nice Ride station were primary factors in determining whether or not business owners and managers notice Nice Ride users in their businesses.

Although business owners and managers that advertise at Nice Ride stations have difficulty quantifying the economic benefits of such marketing strategies, they generally express satisfaction with them and report that support for Nice Ride is consistent with the business cultures they desire to cultivate.

Despite their general support for the Nice Ride program, the majority of business owners and managers were not supportive of giving up either parking or sidewalk space for Nice Ride stations. However, not all interviewees felt this way, and interviewees from businesses that are already directly adjacent to a Nice Ride station report no dissatisfaction and remain supportive. Cultivation of relationships with businesses that are already adjacent may be useful in siting new stations.

Subscriber Survey Summary

Purpose

Demonstrate whether or not Nice Ride users divert trips or take new trips and spend money due to the availability of Nice Ride as a transportation option.

Methodology

Nice Ride subscribers were surveyed about their trip-making patterns and how much they spend on these trips across 17 consumer-oriented business categories. The survey was emailed to 3,693 Nice Ride monthly and annual subscribers on May 17, 2012, with a reminder emailed three weeks later. A total of 1,197 valid surveys were received for a total response rate of 30%. Based on analyses of subscriber records, Nice Ride subscribers who ride more frequently were more likely to respond to the survey. The survey instrument was based on previous travel surveys and targeted destinations associated with discretionary spending. The discretionary spending questions asked, for each destination:

- Whether or not the respondent had ever used Nice Ride for that trip purpose

- How many times in the last seven days they had used Nice Ride to get to that particular destination
- On average, how much they spend on a Nice Ride trip to that particular destination
- If Nice Ride were not available, what other mode would they have used to complete the trip (respondents could also indicate that they would not have made the trip otherwise)

We estimated average expenditure per trip using the following equation:

$$\bar{E} = \frac{\sum_{N=1197} W_{\$}}{\sum_{N=1197} T}$$

\bar{E} = Average expenditure per trip

$W_{\$}$ = Respondent's weekly expenditure

T = Respondent's reported trips to all destinations

Results

- Responses to sociodemographic questions indicate that Nice Ride subscribers are mostly middle-aged individuals with above average educations and incomes who own both motor vehicles and bicycles.
- Among the respondents: 59.3% indicated that they use Nice Ride at least once a week, with the most common frequency being “two to three times per week”. (Table C)
- Over 50% indicate that they have used Nice Ride for their commute trip.
- Over 33% indicate that they travel to grocery stores, restaurants, cafes, and bars using Nice Ride.

Table C. Selected Subscriber Survey Respondent Profile

Household Profile			
Average Age	39.6	Students	20.4%
Household Size	2.2	Households with children	19.1%
Respondents with college degrees	85.5%	Respondents with masters, professional, or doctoral degrees	41.3%
Households with income > \$75,000	52.5%		
Transportation Availability			
Bicycles per household	2.6	Households with no bicycles	17.8%
Licensed drivers per household	1.9	Households with fewer vehicles than licensed drivers	37.4%
Vehicles per household	1.6		

Key Findings for Practice

Nice Ride subscribers have purchasing power and they report spending modest amounts of money when they make Nice Ride trips. Across all trips, regardless of purpose and including individuals who reported no expenditures, the 1,197 respondents reported spending \$34,850 in the seven days prior to taking the survey. Depending on assumptions about the number of trips made during the previous seven days, this represents an average of \$7.00 to \$14.00 per trip on shopping, dining, and entertainment/recreation-related expenses.

Food businesses are popular among Nice Ride subscribers; restaurants, cafes, bars, and grocery stores were among the top 10 most visited destinations.

Nice Ride subscribers report that for most destinations, if Nice Ride had not been available, they would have likely driven to their destination instead. This finding means that most economic activity associated with Nice Ride likely is a redistribution of expenditures to those businesses nearer to Nice Ride stations. A small number of Nice Ride subscribers would not have made their trips at all if Nice Ride were not available, indicating that some new economic activity may be associated with bike share programs.

Summary of Discussion & Key Findings

This study combined three different methodologies to understand the relationship between bike share stations and local economic activity. No one methodology yields results that provide a full explanation, so we can validate findings by examining where the results of these components converge. Figure A summarizes our findings on all three components of the study.

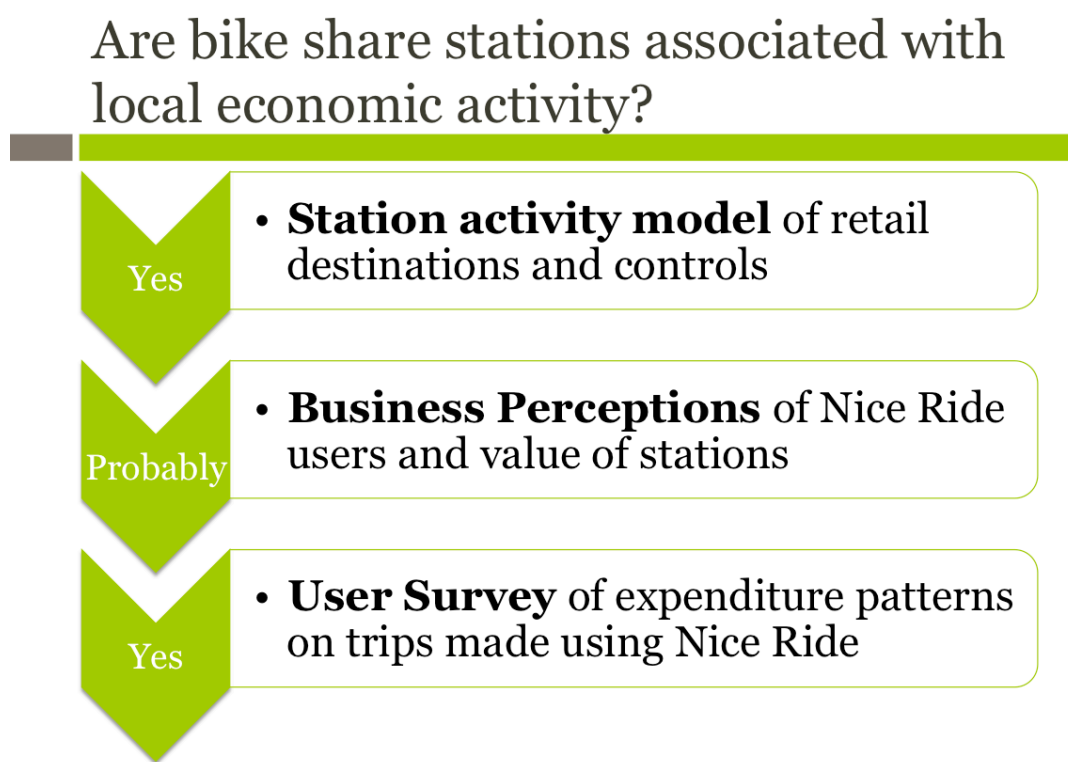


Figure A. Summary of Findings from All Three Study Components

In short, all three perspectives show evidence of economic activity associated with Nice Ride stations, with some central themes standing out, like the centrality of food-related businesses and the overlap between traditional bicyclists and Nice Ride users.

Introduction & Background

Bike share systems are being established in dozens of cities across the world. These systems are designed to provide inexpensive bicycles at strategic locations throughout the city for quick, one-way trips from station to station. Planners, policymakers, and bicycling advocates believe these systems will induce mode shift away from driving, increase physical activity levels, and complement the transit network. To achieve these benefits, government agencies invest considerable sums in start-up capital for bike share systems. Although the literature on bike share programs is growing rapidly, relatively little information is available about the actual benefits of bike share programs and the types of economic activity that are associated with these systems.

Study Background

The University of Minnesota's Humphrey School of Public Affairs, Nice Ride Minnesota, and Transit for Livable Communities/Bike Walk Twin Cities partnered to study travel behavior in the Nice Ride Minnesota bike share system, focusing particularly on the relationship between bike share stations and local economic activity. The Bikes Belong Foundation awarded the Humphrey School research team a grant to cover part of the research costs. The grant was matched by a donation of time and expertise by Humphrey School faculty and students enrolled in a graduate level Urban Planning capstone workshop.

Through this study our research team attempted to identify the impacts of bike share programs on travel behavior and economic activity through a case study of the Nice Ride Minnesota bike share system in Minneapolis and St. Paul. We analyzed bike share station areas, interviewed business owners and managers whose businesses are near bike share stations, and administered a survey of Nice Ride MN's monthly and annual subscribers to identify and measure these travel behavior and economic activity impacts.

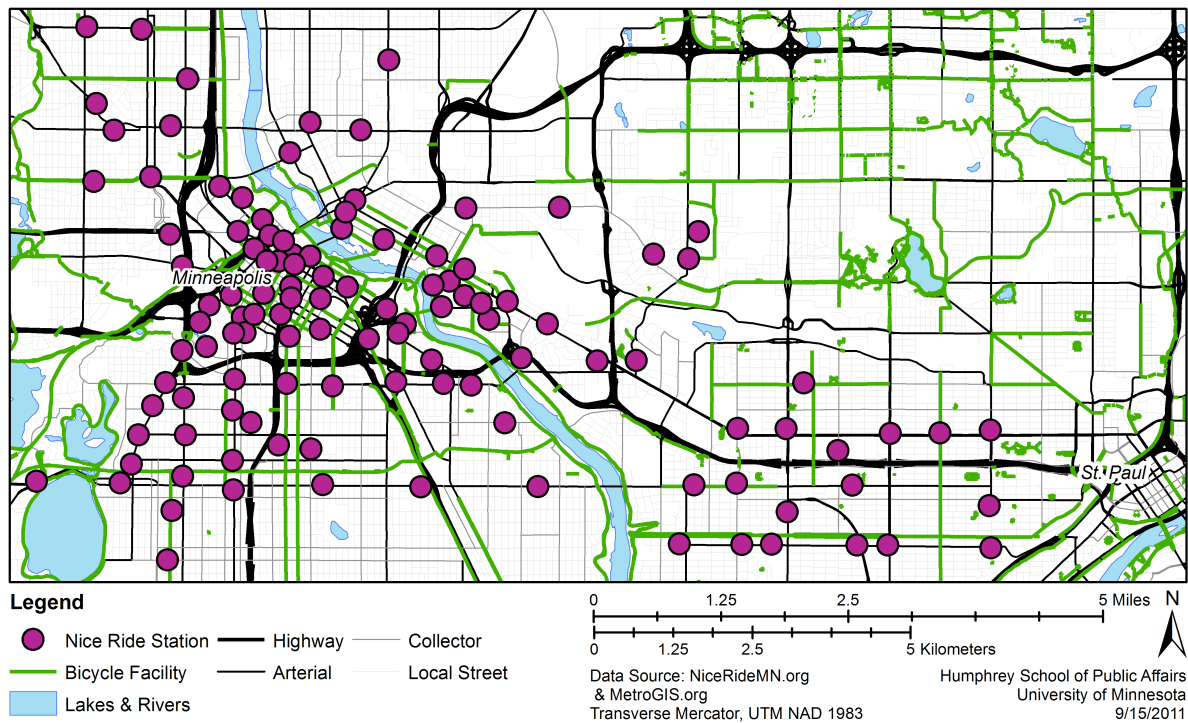
About Nice Ride Minnesota

When Nice Ride began in Spring 2010, the system had 65 stations in Downtown, Uptown, and the University campus in Minneapolis, three areas of the city with comparatively high population density and numbers of business operations (Apel 2012). By the end of the 2011 season, Nice Ride had 116 stations throughout Minneapolis and St. Paul, shown in Map 1. Station locations were initially selected with consideration for their proximity to retail and commercial businesses, proximity to other destinations or features (university campus, libraries, lakes, parks, etc.), higher density residential, nearby bike infrastructure, and the like. A community outreach program helped inform expansions into North Minneapolis and St. Paul.

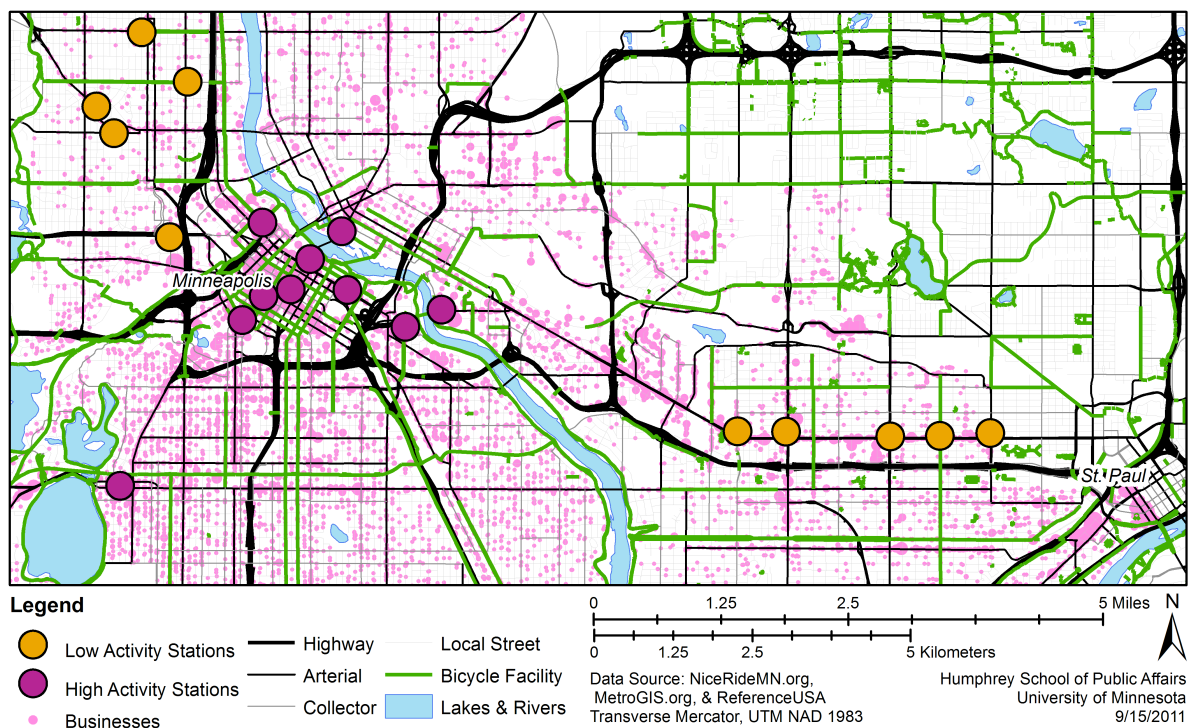
The Nice Ride Minnesota bike share system has attracted large numbers of bike commuters, leisure cyclists, and new cyclists in its first two years since implementation. By the end of the 2011 season, Nice Ride had 3,693 subscribers, and thousands of daily users. The total number of Nice Ride bike trips for the 2011 season surpassed 217,000. The mean number of trips to and from each station in 2011 was 3,749 (Table 1). This average masks wide variation in station usage: the maximum number of trips from a station was 20,544, while the minimum was just 83.

As shown in Map 2, eight of the top 10 most used stations during the 2011 season were located among high concentrations of retail destinations: six near the Minneapolis central business district, one near Calhoun Square in Uptown - a major retail hub, and one at the periphery of the University of Minnesota campus with many restaurants and shops nearby. The remaining two were on the University of Minnesota campus. Conversely, the 10 least used

stations, measured in average trips per day during the 2011 season, were in areas with lower concentrations of retail and consumer-oriented businesses.



Map 1. Nice Ride Stations at the end of the 2011 Season



Map 2. Top 10 Origin and Destination Stations in 2011

Table 1. Nice Ride Station Activity in 2011

	Average	Maximum	Minimum
Total Trips	3,749	20,544	83
Trip Origins	1,875	9,843	37
Trip Destinations	1,874	10,711	39

Economic Activity Conceptual Model

The availability of bicycle stations for inexpensive public use throughout the cities affects travel and consumption patterns, though the extent of these effects is not known. Bike share stations selectively increase accessibility to areas around the station by increasing the number of people who can reach the station area within a reasonable travel time. Increases in accessibility also increase the potential for changes in local economic activity. Figure 1 outlines the causal mechanism through which bike share programs may influence local economic activity.

We theorize that these changes in accessibility due to bike share stations result in additional economic activity near bike share stations, either due to people shifting their travel patterns to end their trips near stations or people taking additional trips due to the overall increases in accessibility throughout their neighborhood.

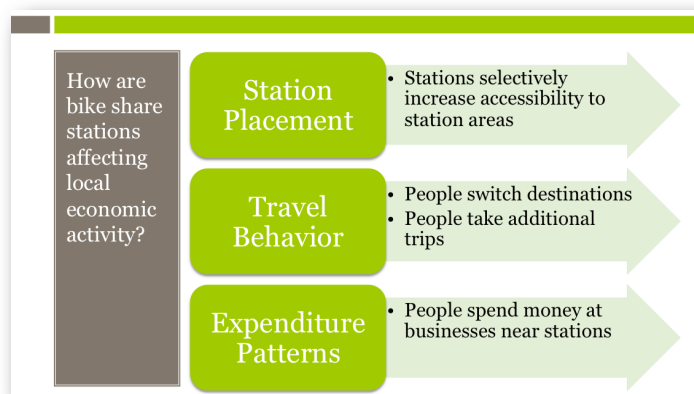


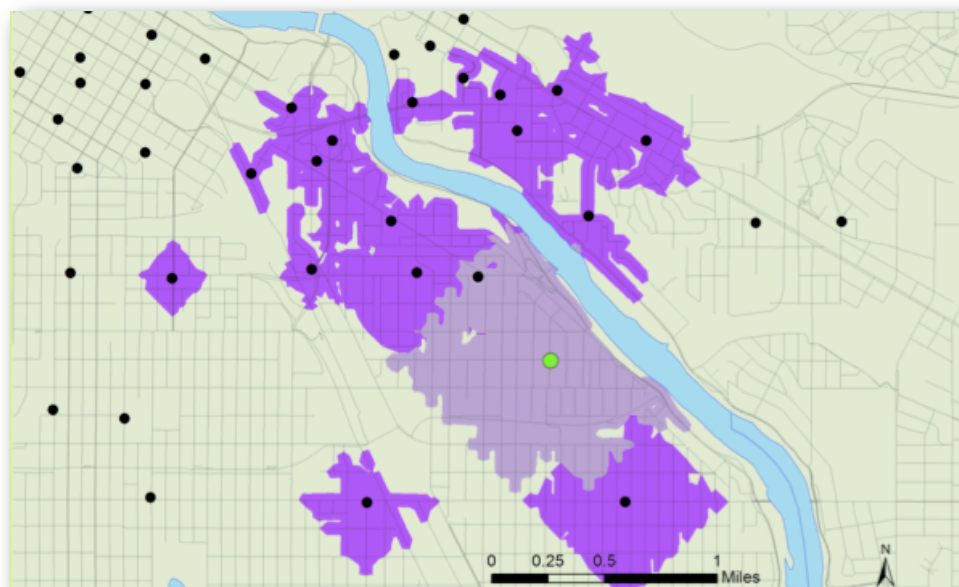
Figure 1. Theoretical Model of Bike Share Station Economic Activity

Maps 3 and 4 demonstrate how this effect may occur using a popular restaurant, the Birchwood Cafe, in the Seward neighborhood of Minneapolis adjacent to a Nice Ride bike share station, as a sample station. Map 3 shows both a walking distance and a Nice Ride distance accessibility buffer around the Birchwood Cafe. From any point in the light purple buffer, a person could walk to Birchwood within 15 minutes. The darker purple buffer demonstrates how Nice Ride changes the nature of accessibility for the Birchwood Cafe: from any point in the magenta buffers, a traveler can reach Birchwood Cafe by walking to the nearest Nice Ride bike share station and biking to the station in front of Birchwood Cafe with a total travel time under 15 minutes. For example, a person could walk five minutes to a bike share station that is a nine-minute bike ride from Birchwood, for a combined total travel time of 14 minutes. These areas were calculated assuming three miles per hour walking speeds and 10 miles per hour biking speeds.

Map 4 shows this same type of change using a 30-minute travelshed around Birchwood Cafe instead of a 15-minute travelshed. As shown in Map 4, the addition of Nice Ride to the transportation network expands Birchwood Cafe's 30-minute accessibility buffer to cover a much larger portion of the City of Minneapolis and the western edges of St. Paul.

Legend

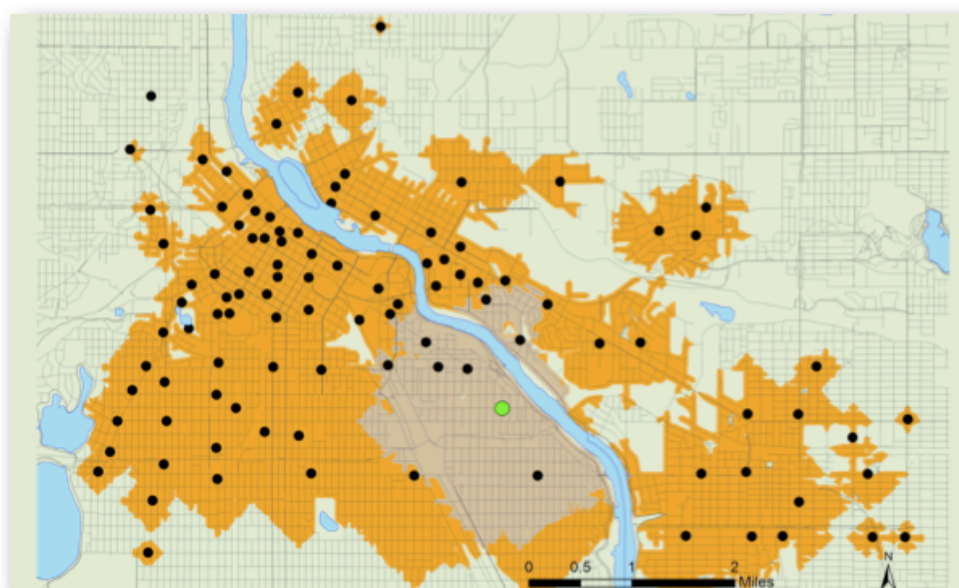
- Birchwood Cafe
- Nice Ride Stations
- Streets
- Lakes & Rivers
- 15 minute walking distance
- 15 minute Nice Ride distance



Map 3. 15-minute travel time buffer to Birchwood Cafe by a combination of walking to stations and bicycling*

Legend

- Birchwood Cafe
- Nice Ride Stations
- Streets
- Lakes & Rivers
- 30 minute walking distance
- 30 minute Nice Ride distance



Map 4. 30-minute travel time buffer to Birchwood Cafe by a combination of walking to stations and bicycling*

* Assumes 3mph walking speed and 10mph bicycling speed.

If this conceptual model is valid, and if bike share stations are associated with local economic activity, changes in accessibility and economic activity should be observable in at least three different ways:

- Station areas with a higher concentration of nearby retail and food-related destinations and jobs should be more successful in attracting trips.
- Business owners may notice Nice Ride users patronizing their business and may employ various marketing strategies to entice Nice Ride users to shop or dine there.
- Nice Ride subscribers should report changes in travel or expenditure patterns due to the availability of Nice Ride.

In this study, we explore each of these three hypotheses to identify and describe economic activity associated with bike share stations.

Related Literature

Globally there are over 120 bike share programs with new programs starting every year (DeMaio 2009). In the United States, bike share systems are increasingly popular due to regional, national, and global energy and environmental sustainability concerns and the visibility of successful early programs (Shaheen, 2010).

As interest in bike share systems grows in the United States, literature on operations and outcomes associated with new programs is beginning to emerge. Numerous planning studies compare business model strategies, mode share projections, public health and environmental impacts, and transportation utility with the narrow focus of evaluating proposals for new bike share systems (Alta Bike Share, 2012). A few studies have used theoretical operations and simulated data to model bike share systems (Lin & Yang 2011; Gould & Karner 2009), but the use of empirical data to explain bike share travel behavior is limited. A recent publication relevant to our work is a 2011 study of Nice Ride trips made in August 2010; Maurer et al (2011) found the rentals are related to trip generation factors (e.g., population, low vehicle households, income), trip attraction factors (e.g., jobs, colleges, parks) and transportation network factors (e.g., bus stop density, distance to rail, bike-share space availability).

Factors associated with nonmotorized travel

While traditional bicycling can be expected to differ from bike share travel, many of the same factors that influence when, where, and how often people bike apply to bike share as well as traditional cycling. Therefore, we can consider the existing literature on nonmotorized travel, walking and bicycling to identify research opportunities for bike share. Sociodemographics, built environment characteristics, transportation infrastructure, and economic accessibility variables have been shown in numerous studies to be associated with levels of nonmotorized travel.

- **Sociodemographic characteristics** have been found to be strongly associated with nonmotorized travel; Lindsey et al (2007) found that trail traffic in Indianapolis, IN is related to the racial structure, age structure and income levels of the neighborhood. Safety, often measured using crime rates in the neighborhood, also affects levels of bicycle and pedestrian travel (Joh et. al., 2011). Buehler et al (2012) confirmed in a study of Washington, DC's CaBi bike share system that bike share users, like the larger cycling population, are overwhelmingly white young adults.
- **Built environment characteristics** can affect levels of active travel in many different ways: Higher population density (Handy et. al, 2002) and a balanced mix of land use types, also called land use entropy (Frank et al. 2004), are positively associated with active travel. Distance to nearby trip attractors, such as parks, lakes, downtown centers, and university campuses, have also been

identified as correlates of nonmotorized trip activity (Dill and Voros 2007, Lee and Moudon 2008, Saelens et al 2003, Hankey et al 2012).

- **Transportation infrastructure**, measured as the supply of bike lanes or shared, multi-use paths, is associated with increased rates of non-motorized travel (Dill, 2009, Nelson and Allen 1997, Dill and Carr 2003).
- **Economic activity indicators**, such as nearby food and shopping businesses as identified by local business databases and NAICS code, correspond to increased rates of active travel (Krizek and Johnson 2006, Horning, El-Geneidy, and Krizek 2008, Joh et al 2011). Job accessibility, measured as the number of jobs accessible within a 30-minute transit ride using 2006 Twin Cities Metro Area data, has also been shown to be positively associated with nonmotorized travel (Hankey et al 2012, Fan et al 2012).

Economic Activity, Travel Behavior, and Bicycling

Quantifying expenditures generated by use of a certain transportation mode is difficult because these expenditures are diffused across different expenditure categories and are typically not tracked with sufficient resolution to provide meaningful estimates. Assembling this expenditure information into meaningful economic activity is also challenging but has been addressed using economic impact analysis models like IMPLAN, originally designed by the USDA Forest Service to measure cost and benefits of conservation projects.

Bicycling-related economic impact studies have typically focused on trail facilities or specific events to quantify the economic impact of a particular piece of infrastructure or particular event on the region. These studies survey users of a facility about their expenditures associated with their trips to it. Survey results are aggregated and extrapolated to known use levels of the trail to estimate direct, indirect, and induced economic impact (Venegas 2009). For example, Kashian (2010) assessed expenditures of attendees at a cycling sporting event, producing a valid picture of total spectator spending and examining the local economic importance of an event that draws 2,000 spectators daily.

Bowles et al. (2011) used IMPLAN to assess economic impact of commuter and recreational cyclist activity statewide. Annualized expenditure estimates and trip behavior were elicited from 1050 individual cyclists through convenience sampling; 20 bicycle establishments were surveyed; health impacts were also assessed to arrive at an overall picture of the economic and health benefits of cycling in Iowa. The reliability of these results are limited by respondent reliability for annualized expenditure estimates; survey methods research suggests that the reliability of self-reported estimates decreases as the time period requested increases; a 7-day time frame tends to produce greatest validity, whereas the annual estimates elicited in some studies should be regarded with caution (Ekelund, et al. 2006).

Recent studies of economic impact of trail systems and statewide bicycling activity have primarily relied on intercept surveys for trail users (Kaliszewski 2011, Buehler 2012) and online survey platforms such as SurveyMonkey for bicycle-related businesses (Bowles, et al. 2011). The CaBi bike share system study stratified stations by activity levels and sampled casual users at selected stations (Buehler et al 2012).

Study Framework

Our objective with this study was to assess local economic activity associated with bike share stations. Given selective increases in accessibility due to the presence of bike share stations, are economic activity indicators such as presence of food related businesses related to trips? We developed a study framework that explored economic activity from three different but mutually reinforcing perspectives: (1) a station activity regression model, (2) business owner perceptions of how bike sharing affects their businesses, and (3) subscriber self-reported travel and spending patterns. Figure 2 shows how these components of our study map to the conceptual framework described in Figure 1. Each of the steps in the conceptual framework maps to two different methodological components of this study to provide mutually validating results.

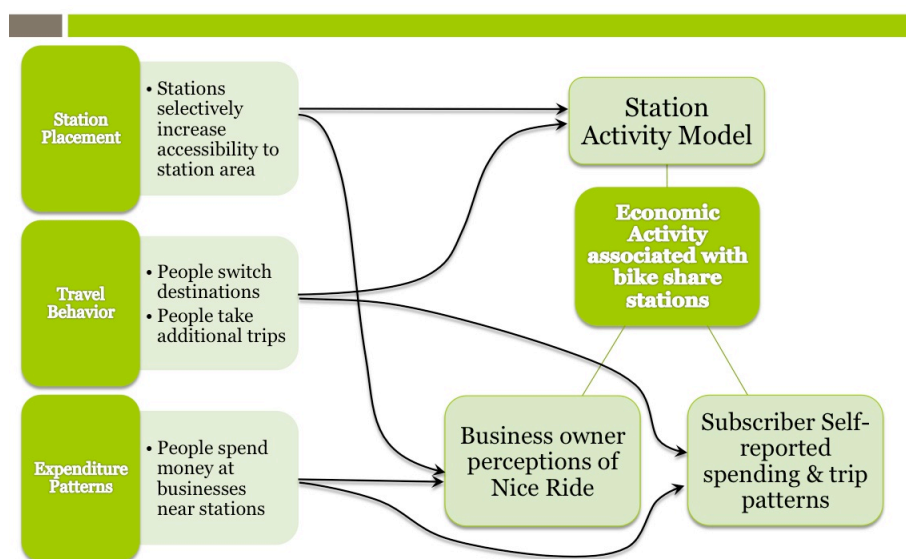


Figure 2. Methodology Framework

Station Placement

The station activity model and business owner interviews both assess the importance of station placement. If station placement is associated with economic activity by selectively increasing accessibility to the nearby destinations, we theorize that economic variables (presence of food businesses, shopping, and job accessibility) in the station area will be positively and significantly associated with trip volumes at that station. We would also expect business owners to value their proximity to the station and notice and recognize customers who arrive via Nice Ride.

Travel Behavior

The station activity model and the subscriber survey map to the travel behavior step in the conceptual model. The station activity model will tell us whether people are traveling to stations with economic destinations nearby. The subscriber survey addresses our theory that people are shifting their trips or making new trips because of the presence of Nice Ride stations.

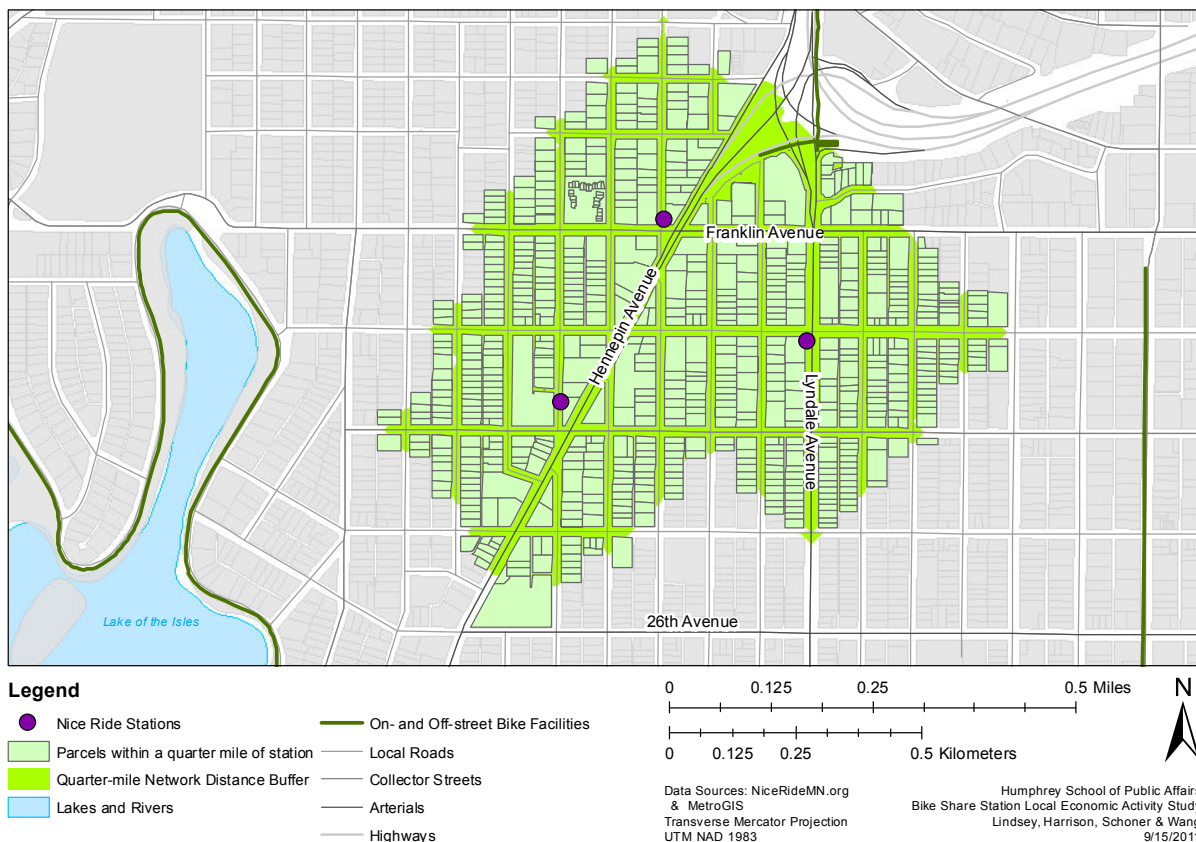
Expenditure Patterns

Expenditure patterns, the final step in the conceptual model, are evaluated from the lenses of business owner interviews and the subscriber survey. If bike share stations are associated with economic activity, both business owners and Nice Ride users should report additional expenditures at businesses near Nice Ride stations.

Methodology

Station Activity Models

We used regression modeling to identify the relationship between total trips, outgoing trips (trip origins), and incoming trips (trip destinations) at any given station during the 2011 season and four categories of independent variables: sociodemographic characteristics, built environment, transportation infrastructure, and indicators of economic activity. Each of the independent variables, as appropriate, was measured at the “station area” level, defined as a ¼-mile network distance buffer around the station. Map 5 contains an example of these station areas from the Lowry Hill East neighborhood in Minneapolis. The goal of this study component is to quantify the marginal effects of economic activity variables, such as retail destinations and job accessibility within the station area, on trip activity at the station while controlling for other factors such as the built environment, transportation infrastructure, and socio-demographic variables. Positive and statistically significant relationships between retail destinations and station activity after controlling for other factors would be indicative of economic activity.



Map 5. ¼-mile walking distance buffer around Lowry Hill East stations

Correlates of Nice Ride Station Activity

For the purpose of this study, we define bike share “station activity” through three measures of the 2011 season: (1) the total number of trip origins at that station, (2) the number of trip destinations, and (3) the sum of trip origins and

trip destinations. To analyze the marginal effects of the economic activity levels on the Nice Ride station activity quantitatively, we modeled each of these three station activity measures as the dependent variable, using four categories of independent variables: (a) sociodemographic characteristics, (b) built environment characteristics, (c) transportation infrastructure and (d) economic activities. The complete list of the independent variables for these models is in Table 2.

Sociodemographic Characteristics

Three sociodemographic control variables are constructed for a ¼-mile walking distance buffer around each station ("station area") using 2010 US Census data. The variable *whitepct* controls for the racial structure of the station areas, specifically, the proportion of the residents who are white/Caucasian. The variable *ynoldpct* controls for the age structure of the station areas; it is the proportion of the residents who are younger than five or older than 64. The variable *medhhinc* shows the median household income of the neighborhood the Nice Ride station locates. The variable *crimerate* is measured at the neighborhood level and reflects the safety level around Nice Ride stations. It is the violent crime number (sum of homicide, rape, robbery and aggravated assault) per 10,000 residents in the neighborhood that contains the station. We expect station activity to have a positive correlation with higher neighborhood income, less crime and a larger percentage of middle-aged people.

Built Environment

To control for the effects of the built environment around each station on station activity, we constructed variables for population density, land use, and proximity to various notable destinations that are suspected to be trip attractors or generators. The variable *popdens* measures the population density in people per square meter using all census blocks in the ¼-mile walking distance buffer around the station; the data comes from the 2010 US Census, similarly to the sociodemographic census variables. Variable *lumix* is an entropy index of land use to measure how varied the land use types are in the ¼-mile walking distance buffer using land use classification data from the Metropolitan Council. The values range from 0 to 1, with higher values indicating a more even mix of a larger variety of land use types. The variables *diswater*, *discbd*, and *dispark* measure the proximity of the station in meters to the nearest lake or river, downtown Minneapolis or St. Paul central business district, and parks. The *campus* dummy variable indicates whether the station is located on the University of Minnesota campus. We expect station activity to be positively associated with population density, more varied land use mix, closer proximity to parks, water, downtown, and campus locations.

Transportation Infrastructure

Like most of the sociodemographic variables, transportation variables are defined for ¼-mile station area buffers around each station. In general, more transportation infrastructure is expected to support the Nice Ride station activity because it provides more access to the stations. The variables *trail* and *bklane* indicate whether a paved trail or bike lane exists in the ¼-mile station network buffer area. There is also a base case variable *nofacility*, which indicates no paved trail or bike lane exists within the station area. The variable *board* shows the total number of transit boarding opportunities, defined by the number of bus routes that stop within each station area and the number of times each bus stops during the day. Variable *neardis* is the distance to the next nearest Nice Ride station. Variable *opendate*, which is the number of days each station operated in 2011, serves as a control variable to make sure the variation of the Nice Ride station activity is not because some stations were not open for the whole season. We expect station activity to be positively related to the presence of paved trails and bike lanes, increased transit boarding opportunities, closer proximity to the next nearest station, and earlier open dates (stations that were open for most or all of the 2011 season).

Table 2. Independent Variables and Expected Signs

Variable	Description	Average	Units/Notes	Exp. Sign
ln(od)	Logarithm of trip origins and trip destinations of a station	7.47	The average trip origin-destination total at a station is 3,749.25	
Socio-Demographic Variables				
whitepct	Proportion of the residents who are white/Caucasian ¹	0.60	Unit: All census blocks intersecting with the ¼-mile station area buffer	+
ynoldpct	Proportion of the residents who are younger than 5 or older than 64 years ²	0.13	Unit: All census blocks intersecting with the ¼-mile station area buffer	-
crimrate	Violent crime rate (per 10,000 residents) in 2010 ^{1,2}	136.30	Unit: Neighborhood of Minneapolis and St. Paul containing the station	-
medhhinc	Median household income ³	\$44,560	Unit: Neighborhood of Minneapolis and St. Paul containing the station	+
Built Environment Variables				
popdens	Population density per square meter ¹	0.0038	Unit: All census blocks intersecting with the ¼-mile station area buffer	+
lumix	Entropy Index of land use ⁴	0.59	Unit: ¼-mile station area buffer. Index ranges from 0-1; higher indicates more mixed land use	+
diswater	Distance to the nearest body of water ⁴	997	Measured in meters	-
discbd	Distance to the nearest CBD (Minneapolis or St. Paul) ⁴	2,903.56	Measured in meters. CBD defined as the centroid of downtown reduced-fee areas from Metro Transit.	-
dispark	Distance to the nearest park ⁴	236.56	Measured in meters. Park is defined as land use type 170.	-
campus	Station located at the University of Minnesota campus ⁴	0.10	Equals 1 if the station is located on the campus; else equals 0.	+
Transportation Infrastructure Variables				
trail	Presence of a paved trail in the station area ⁴	0.27	Equals 1 if paved trail in the ¼-mile station area buffer; else equals 0.	+
bklane	Presence of a bike lane in the station area ⁴	0.48	Equals 1 if bike lane but no paved trail in the station area; else equals 0.	+
nofacility	No presence of paved trail or bike lane in the station area ⁴	0.25	Equals 1 if neither paved trail or bike lane in the ¼-mile station area buffer; else equals 0.	base case
board	Total number of transit boarding opportunities in the station area ⁵	3,091.73	Unit: ¼-mile station area buffer. Index ranges from 0-1; higher indicates more mixed land use	+
neardis	Distance to next nearest bike share station	514.23	Unit: Meters	-
opdate	Days station was operating in the 2011 season	167.95	The last day of service in 2011 is Nov. 6th, 2011.	+
Economic Activity Variables				
access	Total jobs in 30 minutes' transit ride in 2006 ⁶	37,237.86	Unit: All census blocks intersecting with the ¼-mile station area buffer	+
shop	Total number of businesses in the "shopping" category ⁷	4.47	Unit: ⅛-mile station area buffer	+
food	Total number of businesses in the "food" category ⁷	3.97	Unit: ⅛-mile station area buffer	+
ttlbusi	Total number of businesses in all categories ⁷	46.52	Unit: ⅛-mile station area buffer	+

¹ Population data from 2010 Census² Crime data from the Minneapolis and St. Paul Police Departments³ Neighborhood population data from Wilder Research⁴ GIS data from the Metropolitan Council⁵ Data from Metro Transit⁶ Data from Fan et al. (2012)⁷ Data from Reference USA

Economic Activity

After controlling for the sociodemographic, built environment, and transportation variables described previously, we can study the marginal relationship between indicators of economic activity and station activity (trips). The variable *access* is a measure of job accessibility, calculated as the total number of jobs accessible within a 30 minute transit ride from the station using 2006 transit and employment data as per Fan et al (2010). Variables *shop* and *food* indicate the total number of businesses categorized as “shopping” or “food” within a 1/8-mile walking distance buffer around the station. These businesses were identified using the ReferenceUSA business database and categorized by NAICS according to the protocol developed by Horning, El-Geneidy, and Krizek (2008) for measuring nonmotorized accessibility. The 1/8-mile buffer distance was selected for this measure to be consistent with the business owner interview sampling frame, described in the Business Interviews portion of this methodology section. The last variable, *tllbusi*, measures the total number of businesses across all categories at the same 1/8-mile station network buffering areas. All business activity variables are expected to be positively associated with 2011 station activity.

Model Development and Estimation

We used log-linear regression to estimate our three station activity models. Since trip origins, trip destinations, and total trip counts are non-negative integer values, their distributions are inherently skewed from the normal distribution, so we used a natural logarithm transformation of the trip counts as our dependent variables.

The estimation method used is ordinary least squares (OLS). However, since the dependent variables are transformed into the natural logarithm form, the marginal effect of the independent variables will be different from basic OLS models. Specifically, if the coefficient of an independent variable is β , one unit increase of the variable is correlated with $100 \cdot (\exp(\beta) - 1)\%$ increase of the dependent variables, or to its $\exp(\beta)$ times. The adjusted R-square can be a measurement of the goodnesses-of-fit of the models.

The three models estimated with these data are:

- Total activity model: The dependent variable is the natural logarithm of total station activity (trip origins plus trip destinations) in the 2011 season.
- Trip origin model: The dependent variable is the natural logarithm of station trip origins in 2011.
- Trip destination model: The dependent variable is the natural logarithm of station trip destinations in 2011.

Business Interviews

We interviewed business owners and managers to understand their perspectives on Nice Ride users and whether having a station nearby was positively associated with additional customer traffic. We sampled businesses affiliated with Nice Ride through marketing initiatives and from station areas covering a range of activity levels and local retail contexts. The goal of this component was to assess the relative importance of bike share stations to local business owners.

The business interviews sought to assess economic activity associated with Nice Ride stations through brief, one-on-one conversations with business owners and managers. We initially planned to seek precise measures from business interviewees such as sales figures, coupon redemption rates, or estimates of customer traffic, because these measures would enable calculating how much revenue can be associated with Nice Ride users. However, preliminary informational interviews suggested that these businesses do not maintain these types of data. We used

perceptions of Nice Ride users and relative value of station proximity to parking space and sidewalk cafe space as a proxy for economic activity, and surveyed Nice Ride members to identify specific expenditure patterns.

Business interview questions were designed to elicit information that could identify whether or not businesses were visited by Nice Ride users, whether or not businesses were actively attracting Nice Ride users, and whether or not businesses valued Nice Ride users enough to replace adjacent parking or sidewalk space with a Nice Ride station.

Design + Implementation

Sampling and Administration

Sixty eight businesses were selected for inclusion into one of two samples. The first sample, referred to here as an affiliation sample, consisted of 18 businesses that were identified by Nice Ride Minnesota as having in place a reward or discount program for Nice Ride users, or as having a coupon in the Nice Ride coupon book. These businesses' identification and active pursuit of Nice Ride users suggested an understood, potentially well-defined value associated with Nice Ride users.

An additional 50 businesses were selected spatially by station area. We classified all stations into nine categories based on trip activity and number of businesses within a ¼-mile network distance buffer around the station. The nine categories were:

High activity - High business	High activity - Medium business	High activity - Low business
Medium activity - High business	Medium activity - Medium business	Medium activity - Low business
Low activity - High business	Low activity - Medium business	Low activity - Low business

One station area was randomly selected from each of the nine resulting station classification categories (listed in Table 3). The 50 businesses included in this spatially defined sample were selected from within 1⁄8 of a mile of each of the nine stations.

Business interviews were conducted from April 23 to June 13, 2012 following a standard script (see Appendix 1). An interviewer called each business and introduced the Bike Share Station Economic Activity Study. The interviewer requested to speak with an owner or manager and screened them to ensure that only owners or managers who had been with the establishment for at least one full Nice Ride season (April through November 2011) were interviewed. If an eligible owner or manager with sufficient tenure with the business was not available at the first phone call, repeated attempts were made to reach the business. Our research team made a total of 111 phone attempts.

Table 3. Business Sampling Frame

Station Areas in Sample
Lake & Lyndale
Walker Art Center
Washington & Marquette
5th Ave. S & 27th St. E
International Market Square
Fairview & University
Wilder & Marshall
Merriam Park Library
University Ave. NE & 12th Ave. NE

Potential interviewees were asked to schedule a 10 to 15 minute interview at their place of business. Owners and managers who declined the in-person interview were asked if they could answer questions over the telephone instead. Our sample included only owners and managers, not other full- or part-time employees, because owners and managers are more likely to have knowledge and expertise regarding patronage, management and marketing strategies at their businesses. Screening for tenure with the business ensured that the interviewee would have had sufficient opportunity to witness Nice Ride users if they engaged with their business.

Content

The business interview questions are presented in this section. These questions were used with both the affiliation sample and the spatial proximity sample to identify whether and how businesses see economic value in having Nice Ride stations nearby. Questions measured economic value by eliciting characterization of Nice Ride user patronage, identifying Nice Ride-oriented marketing strategies, and exploring relative value of Nice Ride stations, parking, and sidewalk cafe space.

Introductory questions

Two questions were used to confirm the business' inclusion in the sample. Because the interviews took place toward the beginning of the 2012 Nice Ride season, it was necessary to ensure that the interviewee had sufficient experience from the 2011 Nice Ride season to respond to our questions.

1. How long has [BUSINESS] been at this location?

2. How long have you worked for/at [BUSINESS]?

Awareness of Nice Ride Users and Cyclists

Because the survey was dependent upon business owners/managers' perceptions of economic activity surrounding Nice Ride users, it was necessary to identify whether business owners and managers notice Nice Ride users patronizing their business. Additionally, because we anticipated that Nice Ride users may be difficult to distinguish from traditional cyclists, we asked if owners/managers notice cyclists in general.

3a. Do you ever interact with or see Nice Rider users at [BUSINESS]?

3b. [Probe/Clarification] Nice Ride users are the people you might have seen around town on the green bikes - the ones you can get at the bike stations.

3c. [Probe/Clarification] Would you describe Nice Ride users as frequent visitors, occasional visitors, or infrequent visitors?

4. How about cyclists in general?

Customer Incentives for Nice Ride Users

We asked about any discounts, rewards, special deals, or coupons targeted toward Nice Ride users because presence of these incentives would indicate that the business sees economic opportunity from attracting Nice Ride users as customers.

5. Do you have any deals, discounts or business strategies for attracting Nice Riders?

6a. What led you to or inspired you to create a deal for Nice Ride subscribers?

6b. [Probe/Clarification if interviewee expressed favorable attitude for Nice Ride] What is it about Nice Ride that you see fits with your or your business's values?

Additional Utility of Nice Ride

Nice Ride might serve an additional purpose, as a business input either in facilitating employees' work-related errands, or as compensation or a perquisite offered by businesses for employees' use:

7a. Do you, or would you, offer a Nice Ride subscription to employees for work-related errands, commuting or personal use?

7b. [Probe/Clarification for businesses that respond negatively] Is there a main reason that Nice Ride would not work for this purpose?

7c. [Probe/Clarification for businesses that respond affirmatively] What brought you to decide to offer an employee subscription, and did/do your employees use the subscription?

Relative Economic Value

Finally, the interview measured businesses' value of Nice Ride patronage against values of nearby parking and sidewalk space:

8a. If someone proposed replacing parking outside your establishment for a Nice Ride station, what would your or your business's reaction be?

8b. [Probe/Clarification] What about your situation would make such a proposal attractive/unattractive?

9a. Along the same lines, if someone proposed replacing sidewalk space outside your establishment for a Nice Ride station, what would your or your business's reaction be?

9b. [Probe/Clarification] What about your situation would make such a proposal attractive/unattractive?

Business Interview Response Rate

Twenty nine of the 68 businesses in our sample responded, for a 48% response rate. The response rate was higher in the affiliation sample than the spatial sample. The difference in response rate between the food-related and non-food businesses was also much narrower in the affiliation sample. The full response rate by category and sub-sample is in Table 4.

Table 4. Business Sample and Response Rates

Business Types	Food-related (restaurants, cafes, bars, etc.)	Other (non-food shopping and entertainment)	Total
Total Sample	37	31	68
Total Respondents	22	7	29
Response Rate	59%	14%	47%
	Food-related (restaurants, cafes, bars, etc.)	Other (non-food shopping and entertainment)	Total
Affiliation Sample	15	3	18
Affiliation Respondents	9	2	11
Response Rate	60%	66%	61%
	Food-related (restaurants, cafes, bars, etc.)	Other (non-food shopping and entertainment)	Total
Spatial Sample	22	28	50
Spatial Respondents	14	4	18
Response Rate	64%	14%	36%

Subscriber Survey

This component directly asked subscribers about their trip-making patterns and how much they spend on these trips across 17 consumer-oriented business categories. The goal of this component was to confirm station activity and business owner interview findings by demonstrating whether Nice Ride users divert trips or take new trips and spend money due to the presence of Nice Ride. High numbers of new trips to consumer-oriented businesses with substantial associated expenditures would be indicative of economic activity associated with bike share stations.

Survey Design

We designed the survey instrument based on previous travel surveys and to target destinations associated with discretionary spending. We developed a list of 33 destinations for basic trip behavior questions; 17 of these categories were selected for follow-up economic and alternate mode questions. We adopted the business categorization scheme used in Horning, El-Geneidy, and Krizek's 2008 Access to Destinations study on impacts of land use on nonmotorized travel.

The key survey questions used in this study asked subscribers about their overall usage of the Nice Ride system and specific trip-making and expenditure patterns for a set of trip destination types. The list of destinations covered in the survey is available in Table 5. The destination-specific questions asked, for each destination:

1. Have you ever used Nice Ride to get to any of the following [DESTINATION CATEGORY] locations?
2. In the past seven days, about how many times have you used Nice Ride to get to the following [DESTINATION CATEGORY] locations?

These questions give us an idea of the types of retail-oriented destinations people visit on Nice Ride and the frequency with which they make these trips. Survey methodology literature suggests that accuracy on recall questions such as these decreases significantly for timeframes beyond one week.

For destinations associated with discretionary spending, we asked follow up questions about expenditures and alternate modes.

3. On average, about how much do you spend on a typical Nice Ride trip to the following [DESTINATION CATEGORY] locations? (\$)
(If you have not used Nice Ride to get to one of the following locations, enter 0 or leave the answer for that location blank.)
4. If you had not used Nice Ride, how would you have gone to the following [DESTINATION CATEGORY] locations?
Response options: {N/A; Drive; Use my own bike; Transit (bus or rail); Walk; Get a ride from somebody else; Taxi; I would not have made this trip}

These questions were designed to address key questions about expenditures on trips that were either shifted to a Nice Ride station or newly generated because of the accessibility improvements associated with bike share. Analyzing alternate modes can provide insight into trips that were diverted and concentrated around Nice Ride stations and trips that would not have happened at all if Nice Ride were not available. It is plausible to expect that driving trips could have been diverted from a similar destination type but with more parking and a built environment less supportive of nonmotorized travel. Trips where the respondent indicated that they would not have made the trip at all potentially could be considered "new" economic activity.

Destination categories marked with an asterisk in Table 5 were chosen for these follow-up questions because these categories have the potential for additional, repeated business due to increased accessibility levels. Some destinations that are associated with economic activity were not considered for this study because the nature of these businesses does not invite frequent, additional trips as readily as other categories. For example, if accessibility to a local cafe is increased, a consumer may make repeated visits throughout the week, either making new trips to cafes that she would not otherwise have made or by shifting other cafe trips to the newly accessible destination. Accessibility improvements to a personal services business, like a bank or hair salon, may cause mode or destination shift reflecting this change in accessibility, but it would not necessarily trigger an increase in trips because demand for that service should not be heavily dependent on the types of accessibility changes that bike share provides.

Table 5. List of Business Categories

Groceries & Shopping	Dining & Food
* Grocery store	* Sit-down restaurant (casual or fine-dining)
* Farmers market	* Fast food or food-to-go restaurant
* Convenience store	* Café or coffee shop
* Specialty food store (i.e., chocolatier, wine shop, cheese store)	* Juice bar
* Shopping for household goods (non-food), clothes, gifts, books, and the like	* Ice cream shop
Entertainment, Recreation, & Nightlife	Personal Errands
* Bar, pub, or nightclub	Library
* Movie theater	Post office, FedEx, or UPS store
* Play or dance performance	Banking or other financial service
* Music concert	Hair appointment or barber shop
* Spectator sport event (i.e., at Target Field or the Metrodome)	Health care appointment (i.e., doctor or dentist)
* Museum	Pharmacy
* Bowling alley	Friend's or relative's house
	Transit stop or station
Outdoor Recreation	Work & School
Park	Place of employment
Lake	Business meeting
Festival or street fair	Class or school-related activity
Fitness center or recreation class	
No particular destination - just riding for fun	<i>* indicates economic questions in business category</i>

In addition to trip characteristics, we collected information on respondent demographics and household profile, including income, employment and student status, household size, vehicle availability, and personal bicycle availability. These questions helped us analyze questions specific to certain types of businesses included in our business interview sampling frame, including bicycle shops.

The full survey is available for reference in Appendix 2.

Survey Administration

The survey was administered online via e-mail to all monthly and annual Nice Ride subscribers. Nice Ride Minnesota does not have contact information for day-use subscribers, so these users are not included in the subscriber survey. The survey invitation e-mail link was personalized for each subscriber so the survey results could be matched to 2010 and 2011 trip records generated by the bicycle kiosks.

The survey was deployed on May 17, 2012 inviting subscribers to complete the survey. A reminder was sent three weeks later. To encourage participation, we invited participants who completed the survey to enter into a drawing for one of three \$50 gift cards.

Subscriber Survey Response Rate

The survey was sent to 3,693 Nice Ride monthly and annual subscribers on May 17, 2012. One reminder was sent out three weeks later. We received a total of 1,197 valid surveys, for a response rate of 30%. For a voluntary response e-mail survey of this length, this response rate is good.

2011 Subscriber Sample Characteristics

We matched 2012 survey responses to 2011 subscriber trip logs to obtain one measure of how representative our sample is of Nice Ride subscribers and day users. Of the 3,497 2011 season subscribers, 858 completed the survey, or about 25% of 2011 season subscribers.

Table 6 shows some basic comparisons between 2011 season subscribers who did and did not respond to the survey, as well as a snapshot of day users. As can be expected, people who use the Nice Ride bikes more often were more likely to complete the survey. Respondents who were subscribers in the 2011 season had an average of 52 trips during that season. 2011 subscribers who did not respond to the survey had an average of 40 trips during the season. After adjusting for the proportion of the 2011 season in which each respondent actually had a Nice Ride subscription, the data show that respondents took an average of 2.4 trips per week, while nonrespondents only took 2.1 trips per week. Respondents tended to have shorter individual trip durations but overall a longer cumulative travel time on the bikes. For comparison, both respondents and subscriber non-respondents had much shorter trips on average than day users.

Our sample over represents more active Nice Ride subscribers, but the differences between monthly and annual subscribers who did and did not respond to the survey is relatively small. The difference between monthly and annual subscribers compared to day users is large, so the survey findings may not be adequately extrapolated to the day user population.

Table 6. 2011 Subscriber Respondents, Non-Respondents, and Day Users

	All 2011 Subscribers	Subscriber Respondents	Subscriber Non-Respondents	Day Use (Non-Subscriber) Non-Respondents
N	3497	858 (25%)	2639 (75%)	28,727
Average number of rentals for the season (Std. Dev.)	43 (65)	52 (74)	40 (61)	3 (2)
Average number of rentals per week, adjusted for length of subscription (Std. Dev.)	2.1 (3.09)	2.4 (3.2)	2.0 (3.1)	N/A
Average 2011 cumulative duration in hours (Std. Dev.)	8:01:31 (12:34:33)	9:28:18 (13:14:39)	7:33:18 (12:19:00)	1:35:21 (3:42:20)
Average trip duration in minutes (Std. Dev.)	16:22 (43:38)	13:45 (19:29)	17:14 (48:58)	49:37 (2:54:49)
Estimated average trip dis- tance in miles¹ (Std. Dev.)	2.7 (7.3)	2.3 (3.3)	2.9 (8.2)	8.2 (29.1)
Estimated average 2011 cumulative distance¹ (Std. Dev.)	80.2 (125.8)	94.7 (132.4)	75.6 (123.2)	15.9 (37.1)
Average subscriber age (Std. Dev.)	37 (13)	39 (12)	37 (13)	N/A

¹Estimated distances are calculated from trip durations using an approximate travel speed of 10 miles per hour, bicycling continuously.

Results

Station Activity Models

The results of the three models are shown in Table 7. All three models have very high goodness-of-fit, with adjusted R^2 values ranging from 0.8657 to 0.8696. The R^2 statistic means that more than 86% of the variation in trip activity across stations can be explained by this set of variables.

Total Activity Model

Of the 19 variables included in the model, ten of them were significant at the $p < 0.1$ level or better. This means that the probability that the observed correlation between number of trips and the variable is due to chance is less than 10%. Five variables did not have the expected sign, but four of these are statistically insignificant. Since all three models fit equally well with no substantial differences in coefficients or R^2 values, we are focusing attention on the results from the total station activity model.

Among the sociodemographic variables, *whitepct* and *ynoldpct* are significant. The coefficient of *whitepct* is positive, indicating that station areas with a higher percent of residents who identify as Caucasian had higher levels of trip activity in 2011. The negative coefficient on *ynoldpct* shows that a higher share of station area residents who are children or seniors corresponds to fewer bike share trips. The variables *crimerate* and *medhhinc* are not significantly associated with trips after controlling for other sociodemographic, built environment, transportation, and economic factors.

Two of the six built environment variables are significant: *diswater* and *discbd* have negative coefficients. This suggests that proximity to lakes and rivers or downtown Minneapolis or St. Paul is positively associated with trip activity. Interestingly, density, land use mix, proximity to parks, and locations on the U of M campus are all insignificant despite these variables appearing repeatedly in nonmotorized travel literature. The lack of significance of the U of M campus variable could be because the number of students on campus is much lower in summer months when overall use of Nice Ride is greater.

Three of the five transportation infrastructure variables are significant at 10% level. There is a positive effect of trail, indicating more trips occurred at stations with easy access to paved trails. Bike lanes, unlike trails, do not appear to affect station activity. Transit boarding opportunities were also insignificant. Contrary to our hypothesis, the coefficient for *neardis* is positive. This may indicate a saturation effect: when stations are too close together, trip demand is dispersed among several stations instead of concentrated in one somewhat isolated station. The variable *opdate* also has a positive effect, indicating that it effectively controls for stations that were not open for the entire 2011 season.

Two of our four economic activity variables were significant. Job accessibility (*access*) from the station was positively associated with station activity. This could be due to commuters using Nice Ride to access their jobs or for job accessibility serving as a proxy for the intensity of retail, food, service, and other business destinations in the area. The variable *food* is also significant, showing that station activity has a strong, positive relationship with the number of restaurants and cafes around the station. Each additional food business within the 1/8-mile station area buffer is associated with 4.47% more trips to and from that station. However, the variable *shop* and *ttlbusi* were also not

significant, suggesting no effect of the total number of businesses or shopping destinations in particular after controlling for food businesses, accessibility, and all the other controls listed above.

Table 7. Station Activity Regression Models

	Model 1 – logarithm of total activity (origin + destination)		Model 2 – logarithm of origins		Model 3 – logarithm of destinations	
Independent variables	coefficient	t-statistic	coefficient	t-statistic	coefficient	t-statistic
Sociodemographic						
whitepct	1.609617	5.5***	1.642	5.53***	1.57799	5.41***
ynoldpct	-1.759717	-2.02**	-1.7427	-1.97**	-1.77836	-2.04**
crimrate	-0.0002167	-0.37	-0.0002	-0.34	-0.00023	-0.39
medhhinc	0.0028307	0.9	0.002	0.68	0.00352	1.12
Built Environment						
popdens	24.36703	0.7	24.403	0.69	24.34763	0.7
lumix	-0.2232655	-0.65	-0.212	-0.6	-0.23642	-0.69
diswater	-0.0004468	-3.64***	-0.0004	-3.37***	-0.00047	-3.87***
discbd	-0.0001522	-2.84***	-0.00014	-2.62***	-0.00016	-3.03***
dispark	-0.0004455	-1.26	-0.00044	-1.22	-0.00045	-1.28
campus	0.3998993	1.38	0.370	1.26	0.43113	1.49
Transportation Infrastructure						
trail	0.5134097	3.33***	0.53350	3.42***	0.49427	3.22***
bklane	0.0491655	0.34	0.06487	0.45	0.03371	0.24
board	-0.0000081	-0.32	-0.0000069	-0.27	-0.00001	-0.38
neardis	0.0005974	1.96*	0.001	1.66*	0.00068	2.23*
opdate	0.0107227	8.47***	0.0108493	8.46***	0.0106168	8.42***
Economic Activity						
access	0.0000127	2.21**	0.0000131	2.25**	0.00001	2.14**
shop	-0.010715	-0.83	-0.0128571	-0.99	-0.0085434	-0.67
food	0.0436912	2.48**	0.0423646	2.37**	0.0451566	2.57**
ttlbusi	-0.0006909	-0.47	-0.0005949	-0.4	-0.0007918	-0.54
Constant	4.81179	7.31***	4.060252	6.09***	4.168671	6.35***
No. of observations	116		116		116	
Adjusted R-square	0.8687		0.8657		0.8696	

* p < 0.1; ** p < 0.05; *** p < 0.01

Business Interviews

Business Type

Food-related businesses were much more likely to grant an interview, and their answers differed from non-food businesses in several ways. Non-food-related businesses were less inclined to participate in interviews and more likely to hang up or respond negatively when asked to participate. While 25 of the 68 businesses included in the original sample (40%) were non-food-related, only seven of the 29 interviewed businesses (24%) were non-food-related. To reflect the differences both in participation rate and responses, results are presented for food- and non-food-related businesses separately.

Visibility of Nice Riders

The majority of the business owners/managers interviewed (76%) indicated that they had either seen a Nice Ride user come into their business or had seen Nice Ride bicycles being ridden nearby. Food-related businesses and bike shops were more likely to be aware of and recognize Nice Ride users than other business types. Interviewees from the 21 food-related businesses and two bike shops were familiar with the Nice Ride bike share system and all reported, at minimum, that they had seen Nice Ride users in the neighborhood. Interviewees from non-food-related businesses expressed unfamiliarity with Nice Ride and were less likely to have noticed Nice Ride users in their places of business.

Interviewees had difficulty quantifying the number of Nice Ride users entering their business; when probed for additional insight into the number of Nice Ride users entering their business, typical responses indicated that it was difficult to determine who had arrived specifically using a Nice Ride bicycle. Of the interviewees who responded that they did see or interact with bicyclists at their business, 10 specifically indicated that Nice Ride users were more difficult to identify. Interviewees speculated that Nice Ride users tend to leave their Nice Ride bicycles at Nice Ride stations instead of parking them outside of businesses; upon returning their bikes, Nice Ride users become indistinguishable from other cyclists (if carrying helmets) or other customers in general. Corroborating the finding that Nice Ride users become “hidden” by other cyclists, 25 interviewees confirmed that they saw large numbers of cyclists coming into their businesses. Tables 8a, b, and c document visibility of Nice Ride users by business type and sample.

Table 8a. Visibility of Nice Ride users to Business Owners - All Businesses

Do you ever interact with or see Nice Ride users at [BUSINESS]?	All Businesses		Food-related Businesses		Non-food-related Businesses	
Interviewee does not see or interact with Nice Ride users	7	24%	4	38%	3	43%
Interviewee sees or interacts with Nice Ride users	11	38%	10	45%	1	14%
Interviewee has difficulty identifying Nice Ride users	11	38%	8	36%	3	43%
TOTAL	29	100%	22	100%	7	100%
Additional Comments						
Interviewee definitely sees or interacts with traditional cyclists at place of business	24	83%	19	86%	5	71%
Interviewee expressed difficulty discerning Nice Ride users from traditional cyclists	11	38%	10	45%	1	14%

Table 8b. Visibility of Nice Ride users to Business Owners - Affiliation Sub-sample

Do you ever interact with or see Nice Ride users at [BUSINESS]?	Affiliation Sub-sample		Food-related Businesses		Non-food-related Businesses	
Interviewee does not see or interact with Nice Ride users	1	9%	0	0%	1	50%
Interviewee sees or interacts with Nice Ride users	5	45%	5	56%	0	0%
Interviewee has difficulty identifying Nice Ride users	3	45%	4	44%	1	50%
TOTAL	11	100%	9	100%	2	100%

Table 8c. Visibility of Nice Ride users to Business Owners - Spatial Sub-sample

Do you ever interact with or see Nice Ride users at [BUSINESS]?	Spatial Sub-sample		Food-related Businesses		Non-food-related Businesses	
Interviewee does not see or interact with Nice Ride users	6	33%	4	31%	2	40%
Interviewee sees or interacts with Nice Ride users	6	33%	5	38%	1	20%
Interviewee has difficulty identifying Nice Ride users	6	33%	4	31%	2	40%
TOTAL	18	100%	13	100%	5	100%

Deals, Discounts, Coupons, and Advertising

Interviews with owners and managers of businesses identified by Nice Ride as offering deals, discounts, rewards or coupons for Nice Ride users (i.e., the affiliate sub-sample) suggest limited participation by Nice Ride users. None reported high participation rates among Nice Ride users, with the highest being several coupon redemptions per weekend at the beginning of the Nice Ride season, tapering off to one or two redemptions per weekend for the remainder of the season. One business reported high participation in a half-price drink special for cyclists; however, this special is available to any patron carrying a bicycle helmet and is not exclusive to Nice Ride users.

Interviews with business owners from the spatial sample revealed no additional deals, discounts or rewards being offered for Nice Ride users or bicyclists at large.

Businesses also sponsor and advertise at Nice Ride stations. Of the five businesses interviewed that sponsor and advertise at Nice Ride stations, two explained that the high visibility of Nice Ride stations make them attractive venues for advertising. Nice Ride stations are unique features in the urban landscape, are visited by thousands of arriving and departing Nice Ride users over the course of the year, and typically experience high volumes of foot, automotive and bus transit as well. While these businesses have difficulty estimating the impacts of such advertising, no participant voiced dissatisfaction around buying advertising on Nice Ride stations relative to other advertising venues. Each of the five businesses explained that Nice Ride bike share in general is in accord with their overall business values and culture.

Nice Ride for Business Use

Owners and managers expressed limited interest in using Nice Ride for business purposes, e.g., for employees' use in running work-related errands (picking up supplies, making deliveries, commuting to work). Only one interviewee

expressed support for the idea. Another interviewee shared that in the previous season, Nice Ride had provided their business with 23 free subscriptions, none of which was used. All other interviewees explained that they were not interested in paying for employees to use Nice Ride. Several businesses went on to explain that employees often had their own bicycles.

Parking and Sidewalk Questions

Few businesses value Nice Ride stations enough to sacrifice automobile parking or sidewalk space in order to be adjacent to a Nice Ride station.

The majority of interviewees expressed ambivalent or negative attitudes toward hypothetical proposals to replace parking and/or sidewalk space with a Nice Ride station. Of the 29 interviewees, 17 were opposed or expressed reluctance toward replacing parking in front of their business with a Nice Ride station. Eight of these mentioned negative reactions from neighboring residents and businesses as among their concerns. A Nice Ride station in place of limited parking would be “unpopular,” according to one interviewee; according to another interviewee, “there would probably be an uprising.” Only five business owners/managers expressed positive support for replacing parking with a Nice Ride station.

Similarly, fourteen of the 29 interviewees expressed ambivalent or negative attitudes toward hypothetical proposals to replace sidewalk space with a Nice Ride station. Concerns primarily arose among restaurants whose sidewalk space doubled as patio seating during the Nice Ride season, although other businesses indicated that a Nice Ride station might clutter the sidewalk or impede handicapped access. Only two business owners/managers expressed positive support for replacing parking with a Nice Ride station.

In six separate interviews, owners/managers indicated that they simply preferred the Nice Ride station in its current location. In each of these instances the Nice Ride station was within line of sight, but was not directly in front of the business. This position is demonstrated in Figure 3. Another business owner shared that he had enjoyed having a Nice Ride station across the street from his business in 2011 and was curious if it would be reinstalled in the 2012 season; he was not supportive, however, of replacing parking or sidewalk space directly in front of his restaurant with a Nice Ride station.

While food-related businesses expressed greater enthusiasm for the survey and for Nice Ride, the enthusiasm did not translate to increased support for replacing parking or sidewalk space. A plurality of food-related business owners and managers (49%) opposed the idea of replacing parking, compared to only 29% of non-food, non-bike businesses. Likewise, a majority of food-related business interviewees (54%) were more likely to oppose replacing sidewalk space than non-food businesses (40%). The objection to using sidewalk space in particular reflects how important outdoor seating is to food-related businesses.

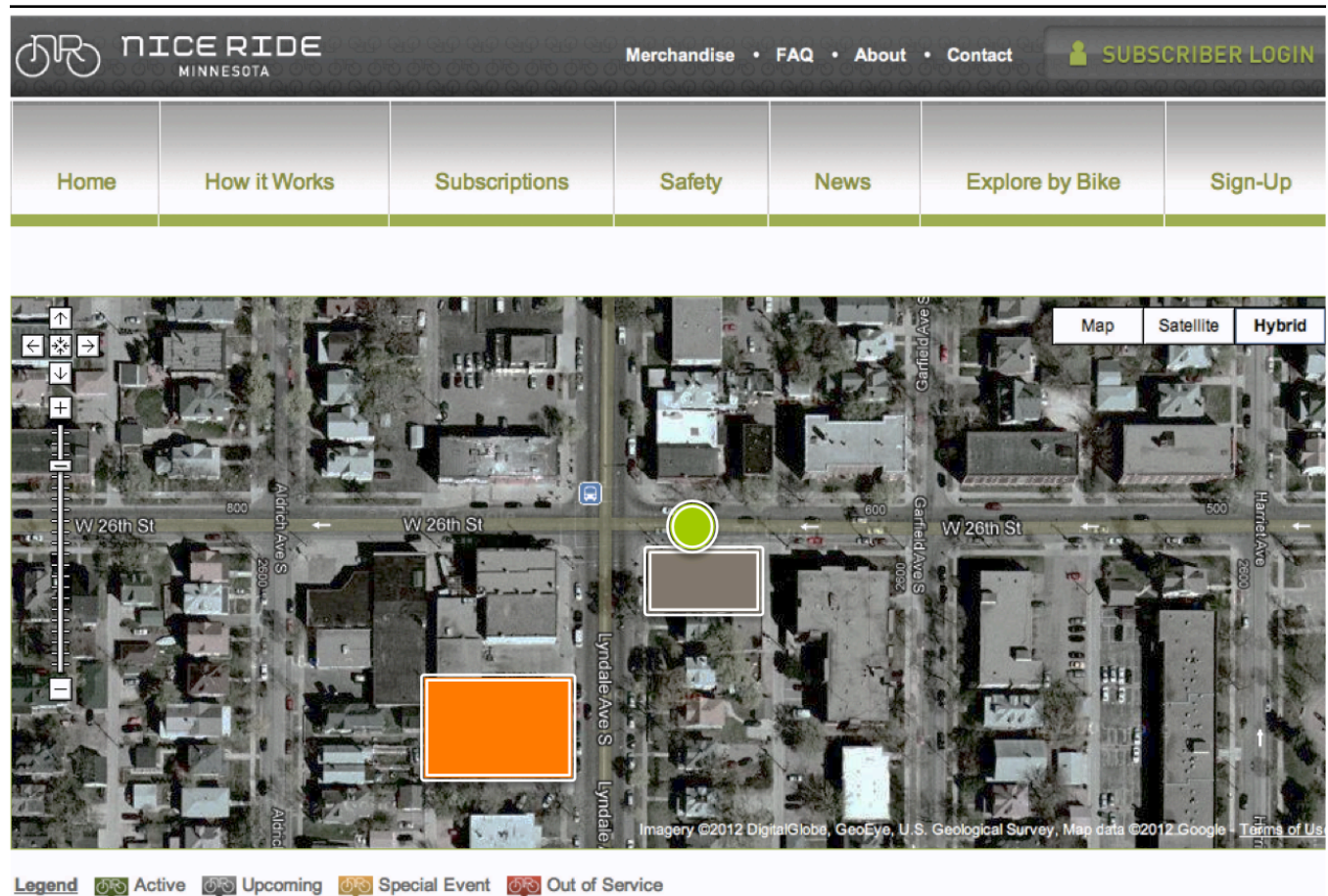


Figure 3. Station Placement Relative to Business:
 The bike share station (green dot) is across the street from the business (orange box) and within line of sight due to the vacant lot (gray box).

In the two interviews in which a Nice Ride station was situated directly in front of the interviewee's business, the interviewee indicated satisfaction with and strong support for the station. Tables 9a, b, and c summarize business attitudes about replacing parking and sidewalk space by category.

Table 9a. Business Owner Valuation of Parking & Sidewalk Space - All Businesses

If someone proposed replacing parking outside our establishment for a Nice Ride station, what would your business's reaction be?	All Businesses		Food-related Businesses		Non-food-related Businesses	
Negative	17	65%	15	71%	2	40%
Positive	5	19%	4	19%	1	20%
Not Sure	4	15%	2	10%	2	40%
Total	26	100%	21	100%	5	100%
Did not respond	3		1		2	
If someone proposed replacing sidewalk space outside our establishment for a Nice Ride station, what would your business's reaction be?	All Businesses		Food-related Businesses		Non-food-related Businesses	
Negative	14	54%	12	57%	2	40%
Positive	2	8%	2	10%	0	0%
Not Sure	10	38%	7	33%	3	60%
Total	26	100%	21	100%	5	100%
Did not respond	3		1		2	

Table 9b. Business Owner Valuation of Parking & Sidewalk Space - Affiliation Sub-Sample

If someone proposed replacing parking outside our establishment for a Nice Ride station, what would your business's reaction be?	All Affiliation Sub-Sample Businesses		Food-related Businesses		Non-food-related Businesses	
Negative	6	60%	5	62%	1	50%
Positive	4	40%	3	38%	1	50%
Not Sure	0	0%	0	0%	0	0%
Total	10	100%	8	100%	2	100%
Did not respond	1		1		0	
If someone proposed replacing sidewalk space outside our establishment for a Nice Ride station, what would your business's reaction be?	All Affiliation Sub-Sample Businesses		Food-related Businesses		Non-food-related Businesses	
Negative	6	60%	4	50%	2	100%
Positive	2	20%	2	25%	0	0%
Not Sure	2	20%	2	25%	0	0%
Total	10	100%	8	100%	2	100%
Did not respond	1		1		2	

Table 9c. Business Owner Valuation of Parking & Sidewalk Space - Spatial Sub-Sample

If someone proposed replacing parking outside our establishment for a Nice Ride station, what would your business's reaction be?	All Spatial Sub-Sample Businesses		Food-related Businesses		Non-food-related Businesses	
Negative	11	73%	10	77%	1	33%
Positive	1	7%	1	8%	0	0%
Not Sure	4	27%	2	15%	2	67%
Total	16	100%	13	100%	3	100%
Did not respond	2		0		2	
If someone proposed replacing sidewalk space outside our establishment for a Nice Ride station, what would your business's reaction be?	All Spatial Sub-Sample Businesses		Food-related Businesses		Non-food-related Businesses	
Negative	8	50%	8	62%	0	0%
Positive	0	0%	0	0%	0	0%
Not Sure	8	50%	5	38%	3	100%
Total	16	100%	13	100%	3	100%
Did not respond	2		0		2	

Shared Values

Businesses care about more than short-term “bottom line” measures of economic activity. In eight interviews, business owners and managers shared a strong sense that Nice Ride comports with business cultures that are environmentally sustainable, supportive of personal health and wellness, supportive of community ties, and immersed in local cross-promotion. The distinctiveness of the Nice Ride bike share system was also cited as a reason - supporting an alternative and homegrown transportation system provided a sense of satisfaction for businesses.

Interviewees from two bike shops in proximity to a Nice Ride station shared their support for Nice Ride despite initial fears that bike share would erode bike rental business. Anecdotally, one bike shop interviewee indicated that people have used Nice Ride for a time before purchasing a personal bicycle. The second bike shop interviewee recounted the tendency of apartment-dwellers to take Nice Ride to bike shops in order to take out longer term, weekend rentals.

Subscriber Survey

Sample Demographics

Table 10 shows a demographic profile for our sample. Overall, the average age was approximately 40. Over 80% of respondents live in households without children; almost 13% live in zero-vehicle households, and 37.4% live in households where the number of licensed drivers exceeds the number of vehicles available. The average number of bicycles per household exceeds the average household size, suggesting that most Nice Ride users already have at least one personal bicycle available for use. Eighteen percent of households in this sample do not have a bicycle at home.

Table 10. Demographic Profile of Survey Respondents

Household Profile			
Average Age	39.6	Students	20.4%
Household Size	2.2	Households with children	19.1%
Respondents with bachelors degrees	85.5%	Respondents with masters, professional, or doctoral degrees	41.3%
Households with income > \$75,000	52.5%		
Transportation Availability			
Bicycles per household	2.6	Households with no bicycles	17.8%
Licensed drivers per household	1.9	Households with fewer vehicles than licensed drivers	37.4%
Vehicles per household	1.6		

The sample is relatively high income, with over half of households (52.5%) having an income above \$75,000. The respondents are also very highly educated, with nearly half (41.3%) having some education beyond a bachelor's degree; 20% of respondents are full-time or part-time students.

Overall Trip Patterns

In our sample, 59.3% of respondents indicated that they use Nice Ride at least once a week, with the most common frequency being two to three times per week. The average (mean) trip frequency reported was 2.0 times per week (Figure 4), and 2-3 times per week was the most commonly selected response (mode). 53.2% of respondents had used Nice Ride within the past seven days prior to completing the survey. When asked about a list of work/school, shopping, dining, entertainment, errands, and recreational destinations, our survey respondents reported using Nice Ride to make an average of 4.2 visits to these locations in the seven days prior to completing the survey (Figure 4). This finding is more than double the reported trip frequency, suggesting that respondents are either making multiple visits on each trip (multi-purpose trips), over-reporting their trip behavior when asked about specific destinations, under-reporting their trip behavior when asked for an average weekly frequency, or some combination of these effects.

To assess the validity of these responses, we compared 2012 survey responses to the electronic trip records from the 2011 season for each respondent. We calculated the average weekly trips from both the full 2011 season and a window from May 10, 2011 to June 13, 2011 that may be more representative of survey data collected in late May-early June 2012 than the whole season average. We compared each individual's trip records to the previous year because 2012 records were not available. The electronic trip records show that the average number of weekly trips for these survey respondents was approximately 2.2 for May-June 2011 and 2.4 for the whole 2011 season (Figure 4). These calculated 2011 trip frequencies are relatively close to the reported average weekly frequency. However, the gap between reported visits and reported average trip frequency limits our ability to assume that respondents accurately recalled their own behavior over seven days prior to completing the survey. Until the actual 2012 trip reports are available at the end of the season, the potential for over-reporting in the sample should be considered when interpreting these results.

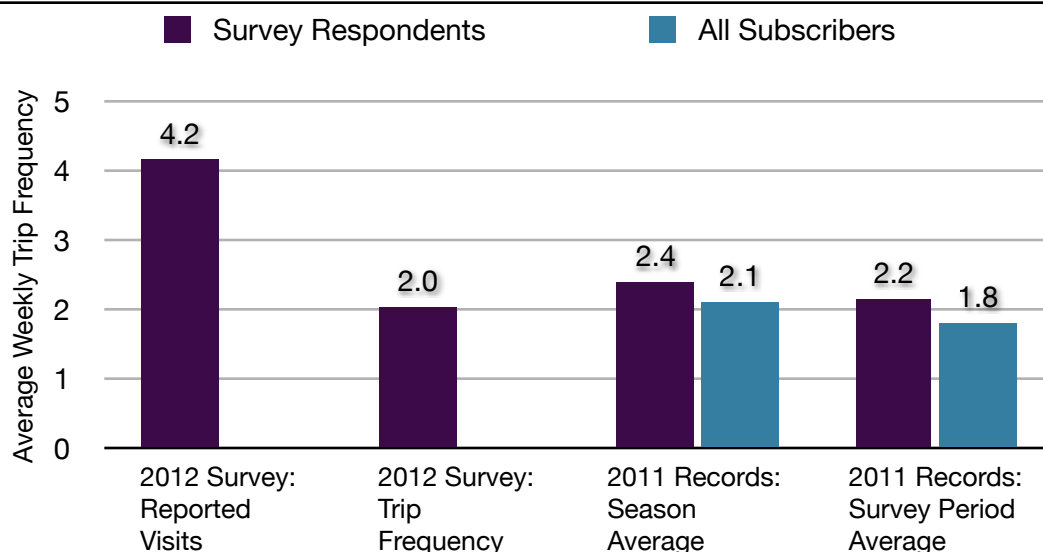


Figure 4. Trip Frequency in the 2012 Survey and 2011 Electronic Trip Records

Another limitation of the survey data was the time of collection. Trip records from 2011 show that August was the busiest month for Nice Ride that year. As shown in Figure 5, 18.9% of all trips in the 2011 season occurred in August. May was the third least busy month, with only 9% of the season's trips occurring in May. If this trend repeats in 2012, our survey administration period occurred during a relatively low-volume time, and the results may not accurately reflect the entire season.

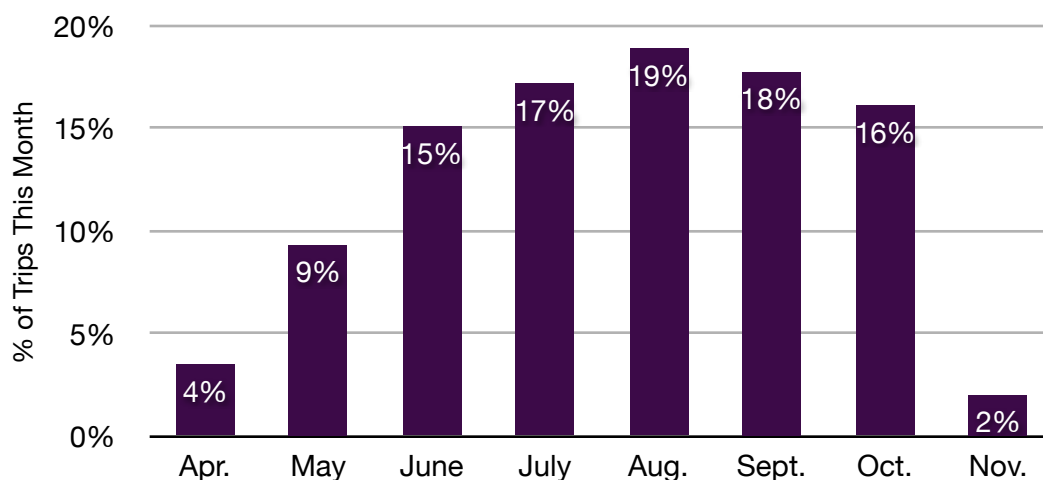


Figure 5. Distribution of Trips throughout the 2011 Season

Destination Specific Trip Patterns

Table 11 presents the number of respondents using Nice Ride to visit any given destination and the frequency with which they make each trip. The average number of trips in the past seven days is computed using a simple average of respondents' answers to a question about how many times in the past seven days they used Nice Ride to visit that destination. The column "Average among respondents already making this trip" is the average number of trips in the past seven days only among people who indicated that they went at least once. This shows how evenly trip patterns are distributed across the entire sample. For example, the average number of times a respondent used Nice Ride to get to an ice cream shop in the past seven days is 0.1, but the average number of visits among only people who made at least one of these trips is 1.4, 14 times the overall average. Commuting looks completely different: the

average frequency overall is 1.2, and the average for people who commuted at least once is only 2.5 times larger (3.0).

The final column, “Trip rate for entire sample”, provides a lower bound estimate of the trip rate by dividing the number of visits made via Nice Ride among the entire sample by the sample size ($N = 1197$), as shown in this equation:

$$T_d = \frac{\sum_{N=1197} \text{All Reported Trips to } d}{N = 1197}$$

T_d = trip rate for destination d
 d = destination category (grocery store, etc.)

This value is almost always lower than the average trip frequency because it treats all non-responses as zero.

Table 11. Nice Ride Trips by Destination Type

Destination	Ever Made This Trip (N=1197)	% Ever Making This Trip (N=1197)	Average Number of Trips in the Past 7 Days*	Average among respondents already making this trip**	Trip Rate for entire sample (N=1197)
Work & School					
Place of employment	645	53.9%	1.2 (2.0)	3.0 (2.0)	0.8 (1.7)
Business meeting	403	33.7%	0.4 (0.9)	1.7 (1.0)	0.2 (0.7)
Class or school-related activity	274	22.9%	0.5 (1.9)	3.1 (3.9)	0.3 (1.4)
Work & School Subtotal	852	71.2%	1.8 (3.0)	3.6 (3.3)	1.3 (2.6)
Groceries & Shopping					
* Grocery store	455	38.0%	0.4 (0.8)	1.4 (0.9)	0.2 (0.6)
* Farmers market	251	21.0%	0.1 (0.4)	1.1 (0.5)	0.1 (0.3)
* Convenience store	251	21.0%	0.2 (0.8)	1.7 (1.4)	0.1 (0.5)
* Specialty food store	264	22.1%	0.2 (0.6)	1.4 (0.9)	0.1 (0.4)
* Shopping for household goods (non-food)	363	30.3%	0.3 (0.8)	1.6 (1.3)	0.2 (0.6)
Groceries & Shopping Subtotal	670	56.0%	1.1 (2.3)	2.8 (3.1)	0.6 (1.9)
Dining & Food					
* Sit-down restaurant (casual or fine-dining)	563	47.0%	0.5 (0.8)	1.4 (0.9)	0.2 (0.6)
* Fast food or food-to-go restaurant	289	24.1%	0.3 (0.8)	1.5 (1.0)	0.1 (0.5)
* Café or coffee shop	502	41.9%	0.4 (1.0)	1.7 (1.4)	0.2 (0.7)
* Juice bar	60	5.0%	0.0 (0.4)	1.8 (2.0)	0.0 (0.2)
* Ice cream shop	183	15.3%	0.1 (0.5)	1.4 (1.2)	0.0 (0.3)
Dining & Food Subtotal	732	61.2%	1.1 (2.4)	2.6 (3.0)	0.6 (1.8)
Entertainment, Recreation, & Nightlife					
* Bar, pub, or nightclub	431	36.0%	0.5 (0.9)	1.5 (0.9)	0.2 (0.6)
* Movie theater	190	15.9%	0.1 (0.3)	1.1 (0.2)	0.0 (0.2)
* Play or dance performance	140	11.7%	0.0 (0.2)	1.1 (0.3)	0.0 (0.1)
* Music concert	195	16.3%	0.1 (0.3)	1.1 (0.3)	0.0 (0.2)
* Spectator sport event	297	24.8%	0.1 (0.4)	1.2 (0.4)	0.0 (0.2)

Destination	Ever Made This Trip (N=1197)	% Ever Making This Trip (N=1197)	Average Number of Trips in the Past 7 Days*	Average among respondents already making this trip**	Trip Rate for entire sample (N=1197)
Entertainment, Recreation, & Nightlife [Continued]					
* Museum	160	13.4%	0.1 (0.3)	1.2 (0.8)	0.0 (0.2)
* Bowling alley	41	3.4%	0.0 (0.1)	1.0 (0.0)	0.0 (0.0)
Entertainment Subtotal	590	49.3%	0.8 (1.3)	2.0 (1.5)	0.3 (0.9)
Personal Errands					
Library	310	25.9%	0.3 (0.8)	1.5 (1.1)	0.1 (0.4)
Post office, FedEx, or UPS store	227	19.0%	0.2 (0.6)	1.3 (0.8)	0.1 (0.3)
Banking or other financial service	238	19.9%	0.3 (0.9)	1.8 (1.6)	0.1 (0.5)
Hair appointment or barber shop	131	10.9%	0.1 (0.2)	1.0 (0.0)	0.0 (0.1)
Health care appointment	148	12.4%	0.1 (0.4)	1.4 (0.7)	0.0 (0.2)
Pharmacy	111	9.3%	0.1 (0.3)	1.2 (0.4)	0.0 (0.2)
Friend's or relative's house	248	20.7%	0.4 (1.1)	1.7 (1.7)	0.1 (0.6)
Transit stop or station	382	31.9%	0.7 (1.4)	2.4 (1.7)	0.2 (0.9)
Personal Errands Subtotal	646	54.0%	1.5 (3.2)	3.2 (4.0)	0.6 (2.2)
Outdoor Recreation					
Park	409	34.2%	0.5 (1.7)	1.8 (3.0)	0.2 (1.0)
Lake	289	24.1%	0.3 (0.8)	1.6 (1.0)	0.1 (0.5)
Festival or street fair	278	23.2%	0.1 (0.3)	1.0 (0.0)	0.0 (0.2)
Fitness center or recreation class	186	15.5%	0.4 (1.0)	2.1 (1.3)	0.1 (0.6)
No destination - just riding for fun	467	39.0%	0.9 (2.6)	2.6 (3.9)	0.3 (1.6)
Outdoor Recreation Subtotal	705	58.9%	1.6 (3.9)	3.6 (5.2)	0.7 (2.7)
Total					
All Commercial Categories	907	75.8%	2.3 (4.7)	4.4 (5.8)	1.5 (4.0)
All Categories	1103	92.1%	5.0 (9.3)	8.1 (10.7)	4.2 (8.7)

* "Average number of trips in the past 7 days" includes everyone who responded to the question for that particular destination category, even if their response was 0. Non-responses were omitted.

** "Average among respondents already making this trip" includes everyone who responded to the question for that particular destination category with a value equal to or greater than 1. Non-responses and values of 0 were omitted.

Overall, the most popular Nice Ride trip is the journey to work, with over half of all respondents indicating that they've used Nice Ride for this type of trip. Consumer-oriented businesses also see a relatively high rate of trips made by Nice Ride. Five of the top 10 most visited destinations are consumer-oriented businesses: sit down restaurants, cafes, grocery stores, bars, and other non-food shopping businesses. The whole dining subcategory was the second most popular set of destinations, with 61.2% of respondents indicating that they have used Nice Ride for this trip purpose in the past and a trip rate of 0.6 visits per week.

Because this survey was administered in late May and early June, these trip frequencies may not be representative of the full bike share season. Some of these categories are affected by seasonal trends. For example, most farmers markets do not start until the second weekend of June. If the surveys were administered later in the season when more farmers markets were open, the average number of farmers market visits might be higher than the reported 0.1 trips in the past seven days.

Economic & Expenditure Patterns

We calculated the total expenditure among our sample of 1,197 respondents in the seven days preceding survey completion; For each respondent and expenditure-related destination among the 17 shopping, dining, and entertainment/recreation destination categories, we calculated their “past 7 days” expenditure by multiplying their average expenditure per trip by how many times they reported visiting that destination in the past 7 days using this equation:

$$W_s = \sum_d E_d * F_d$$

W_s = Respondent's weekly expenditure

d = Shopping, dining, or entertainment destination

E_d = Respondent's reported expenditure on an average trip to destination d

F_d = Respondent's reported frequency of visiting d in the past 7 days

We estimated an overall expenditure rate per trip by summing each respondent's reported expenditures and dividing by the total number of reported trips to all 33 destination categories, using this equation:

$$\bar{E} = \frac{\sum_{N=1197} W_s}{\sum_{N=1197} T}$$

\bar{E} = Average expenditure per trip

W_s = Respondent's weekly expenditure

T = Respondent's reported trips to all destinations

For example, if a respondent spent on average \$25.00 on a typical Nice Ride trip to the grocery store, and the respondent also reported visiting the grocery store twice via Nice Ride in the past seven days, their weekly grocery expenditure attributable to Nice Ride was \$50.00. Their total expenditure would be the sum of these values across all 17 destination categories for which we asked about spending patterns in the 2012 survey. Their total reported trips to all destinations would include those two grocery trips, as well as any other trips to the 17 expenditure-related categories and 16 categories for which we did not ask about expenditure patterns.

Table 12 presents these expenditure responses for all destination types. This “past seven days” total expenditure across all destination categories is \$34,850. We then estimated an average expenditure per Nice Ride visit to this destination and an average weekly expenditure per respondent by dividing the aggregate expenditure by number of visits and the sample size, respectively. We refer these trips “visits” because discrepancies between frequency of these visits and other estimates of trip frequency suggest that some combination of over-reporting and multi-purpose trips is distorting the findings.

Table 12. Weekly Expenditures on Nice Ride Trips

Destination	Number of visits in the past 7 days	Expenditure in the past 7 days	Average Expenditure Per Visit	Average Expenditure Per Respondent (N=1197)
Groceries & Shopping				
Grocery store	257	\$6,295	\$24.49	\$5.26
Farmers market	67	\$961	\$14.34	\$0.80
Convenience store	122	\$1,042	\$8.54	\$0.87
Specialty food store	115	\$1,961	\$17.05	\$1.64
Shopping for household goods (non-food)	183	\$4,780	\$26.12	\$3.99
Groceries & Shopping Subtotal	744	\$15,039	\$20.21	\$12.56
Dining & Food				
Sit-down restaurant (casual or fine-dining)	258	\$7,176	\$27.81	\$5.99
Fast food or food-to-go restaurant	148	\$1,282	\$8.66	\$1.07
Café or coffee shop	228	\$1,819	\$7.98	\$1.52
Juice bar	16	\$57	\$3.56	\$0.05
Ice cream shop	45	\$251	\$5.58	\$0.21
Dining & Food Subtotal	695	\$10,585	\$15.23	\$8.84
Entertainment, Recreation, & Nightlife				
Bar, pub, or nightclub	218	\$5,537	\$25.40	\$4.63
Movie theater	35	\$515	\$14.71	\$0.43
Play or dance performance	15	\$196	\$13.07	\$0.16
Music concert	31	\$715	\$23.06	\$0.60
Spectator sport event	52	\$1,978	\$38.04	\$1.65
Museum	27	\$235	\$8.70	\$0.20
Bowling alley	2	\$50	\$25	\$0.04
Entertainment Subtotal	380	\$9,226	\$24.28	\$7.71
All Categories Total				
All Commercial Visits	1819	\$34,850	\$19.16	\$29.11
All Visits	4977	\$34,850	\$7.00	\$29.11

Groceries and shopping had the highest average weekly expenditure per respondent (\$12.56), but entertainment, recreation, and nightlife had the highest average expenditure per visit (\$24.26). This is reasonable given how many more times in the past seven days respondents reported visiting grocery and shopping destinations than entertainment, recreation, and nightlife destinations. The latter category included several high-cost destinations, such as sporting events and concerts or music performances, that increase average cost per visit. The average expenditure over the past seven days for each respondent was \$29.11. The average expenditure per visit to any of the 17 consumer-oriented destinations for which we collected expenditure data was \$19.16, though if these expenditures are averaged out over the full set of 33 destinations, expenditure per visit is \$7.00. These estimates do not include spending that occurred at destinations classified as work and school (business meetings), errands (pharmacy, salon), or recreation (festival or street fair, fitness classes).

Limitations & Potential for Extrapolating Results

As previously discussed, several features of this dataset limits its generalizability. The data were collected during months that historically have had lower than average trip volumes and certain types of spending opportunities, such as farmers markets and sporting events, were not fully operational for the summer yet. Our sample was more active during the 2011 Nice Ride season than average subscribers, so their behavior may not represent all subscribers very closely. While reported weekly trip frequency in the survey was similar to average frequency in the 2011 season electronic trip records, the large discrepancy between reported weekly trip frequency and reported number of visits to a list of 33 destinations within the past seven days suggests uncertainty in the actual frequency with which people use Nice Ride to visit these destinations. Part of the gap could be attributable to multi-purpose trips, where a Nice Ride user visits several destinations within the station area after checking in their bike. Another plausible explanation is bias in the respondents' perceptions. Asking about specific destinations might make it harder for respondents to focus on the exact 7-day timeframe, and some respondents may consciously or subconsciously inflate their responses due to their personal affinity for Nice Ride.

Given these limitations, projections using the weekly expenditure and average expenditure per visit should be interpreted with caution. We estimate expenditures using six different trip rates from both survey questions (trip frequency and visits to destinations) and averages from the 2011 electronic trip records. We also used two different methods of estimating expenditures associated with Nice Ride that partly address the discrepancy between reported trip frequency and reported visits to destinations. The first method uses past seven days weekly expenditure in aggregate or per respondent (\$34,850 or \$29.11 respectively) to estimate an expenditure per trip based on our six different trip frequencies. This estimate of expenditure per trip is then used to estimate expenditure during the entire 2011 season for subscribers (148,590 trips) and all users (217,530 trips). The second projection uses the estimated \$7.00 expenditure per trip calculated in the first step to estimate a weekly and seasonal expenditure per respondent or subscriber. Table 13 presents the findings from each of these methods across the six measures of trip frequency. While the different methods produce varying results, they represent conservative upper and lower bounds for actual grocery, shopping, dining, and entertainment/recreation expenditure associated with Nice Ride.

Table 13. Expenditure Projections

<i>Method for estimating trip frequency:</i>	Survey: Sum of Reported Visits	Survey: Average Frequency of Use	2011 Records: Respondent May/June Average	2011 Records: Respondent Season Average	2011 Records: Overall May/June Average	2011 Records: Overall Season Average
Trip Rate (per week)	4.2	2.0	2.1	2.4	1.8	2.1
Estimated trips in the past 7 days for 1197 respondents	4,977	2,436	2,573	2,857	2,212	2,516
Projection Method 1, using estimated weekly expenditure per respondent				\$29.11 per respondent per week		
Estimated expenditure per trip	\$7.00	\$14	\$13.54	\$12.20	\$15.76	\$13.85
Projected 2011 season expenditures for subscribers (148,590 trips)	\$1,040,458	\$2,125,860	\$2,012,206	\$1,812,479	\$2,341,502	\$2,058,379
Projected 2011 season expenditures for all users (217,530 trips)	\$1,523,191	\$3,112,177	\$2,945,792	\$2,653,400	\$3,427,867	\$3,013,387
Projection Method 2, using estimated expenditure per trip:				\$7.00 per trip		
Estimated "Past 7 Days" expenditure for 1197 respondents	\$34,850	\$17,057	\$18,020	\$20,006	\$15,486	\$17,616
Projected "Past 7 Days" expenditure for all 3693 subscribers	\$107,520	\$52,623	\$55,596	\$61,722	\$47,777	\$54,348
Projected 30-week season expenditures for 1197 respondents	\$1,045,500	\$511,698	\$540,600	\$600,172	\$464,573	\$528,474
Projected 30-week season expenditures for all 3693 subscribers	\$3,225,590	\$1,578,699	\$1,667,867	\$1,851,658	\$1,433,308	\$1,630,454

Both methods of projecting spending patterns reported in the survey to expenditures for the whole season place spending associated with Nice Ride in the range of \$1 to \$3.5 million. Given the large share of trips to destinations that fall in our non-expenditure categories, the estimate of \$7.00 per trip seems the most plausible. Using the estimate of \$7.00 per trip for all 217,530 trips during the 2011 season, we calculated \$1.52 million in spending associated with Nice Ride. Examining the 2012 trip records when they become available at the end of the season will help identify the appropriate measure of trip frequency for estimating seasonal expenditure.

Alternate Modes

For each of the destination categories associated with expenditures, respondents were asked by which other mode they would have made this particular trip if Nice Ride were not available. This question gives us insight into how Nice Ride shifts economic activity by selectively improving accessibility around station hubs. For the vast majority of destination types, a plurality of respondents indicated that they would have driven if they had not used Nice Ride. For farmers markets, convenience stores, coffee shops, and juice bars, walking is the primary alternate mode. Transit is the primary alternate mode for sporting events. Figure 6 presents the breakdown of alternate mode responses by destination type.

The response option "I would not have made this trip" was designed to identify *new* trips that would not have occurred if Nice Ride were not a transportation option; in theory, spending that happens on newly generated trips could be regarded as new economic activity. For example, someone who regularly brings their lunch from home to work in Downtown Minneapolis may decide to bike to a local cafe or restaurant now that Nice Ride is widely

available. The expenses of dining out minus the money not spent on packing a lunch at home would be newly generated economic activity attributable to Nice Ride.

One limitation that was discovered through survey administration is that respondents may not have considered their “alternate option” as a “trip”. For example, someone who used to walk to a food place adjacent to their office inside the Downtown Minneapolis skyway system might not have considered this a trip comparable to using Nice Ride to go out for lunch slightly farther away from the skyway by their office, so they would report the alternate mode to their new Nice Ride trips as “I would not have made this trip”. Some of these trips may be truly new trips, but there is no way to discern these trips from the example suggested where the respondent does not consider an economically equivalent action as a “trip”. Nonetheless, we can at least acknowledge that “I would not have made this trip” represents shifting of economic activity to the bike share station areas. Other alternate modes, especially driving, probably indicate some additional level of shifting economic activity as people choose destinations within station areas in lieu of destinations better suited toward their alternate mode.

If you had not used Nice Ride, how would you have gone to the following:

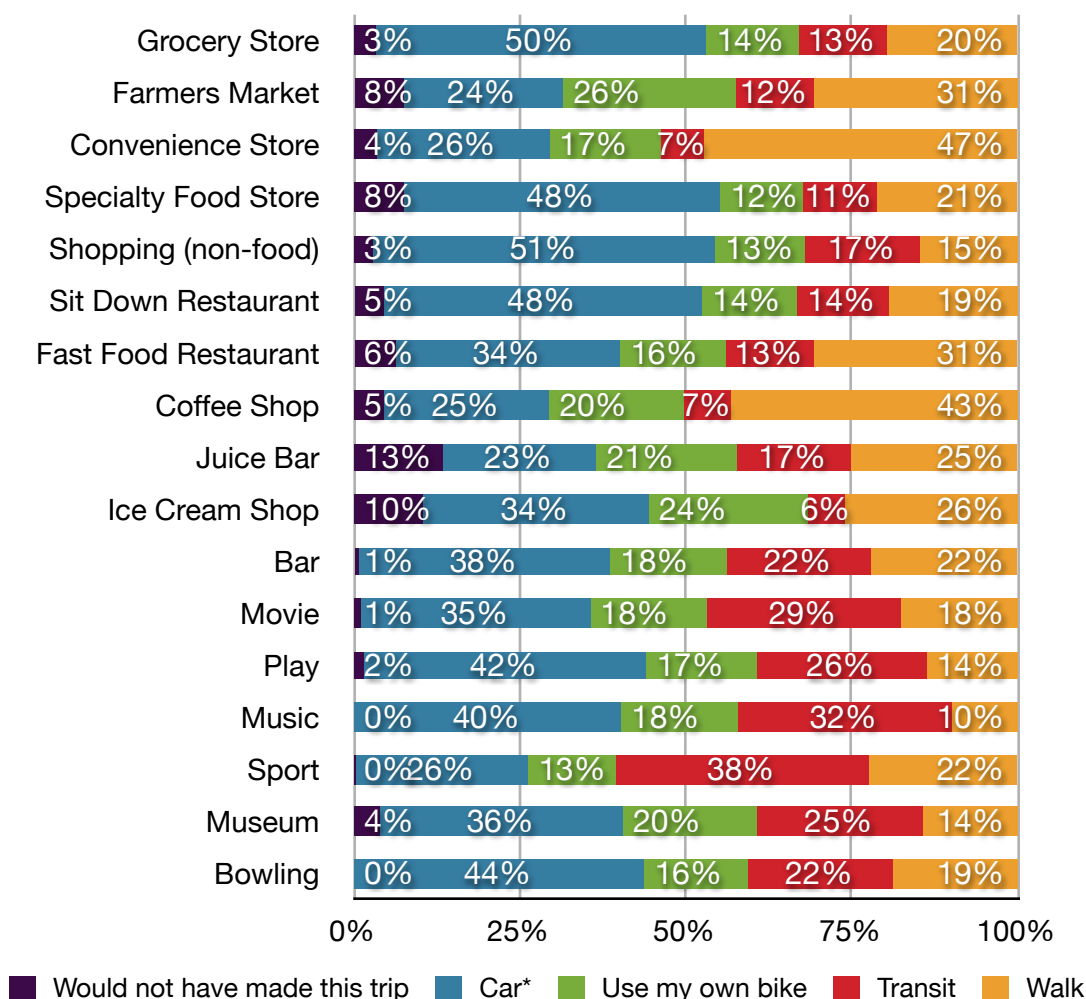


Figure 6. Alternate Modes for Nice Ride Trips

*Car trips defined as driving a personal vehicle, getting a ride from somebody else, or taking a taxi.

Discussion & Key Findings

This study combined three different methodologies to understand the relationship between bike share stations and local economic activity. No one methodology yields results that provide a full explanation, so we can validate findings by examining where the results of these components converge. Figure 7 summarizes our findings on all three components of the study. In short, all three perspectives show evidence of economic activity associated with Nice Ride stations, with some central themes standing out, like the centrality of food-related businesses.

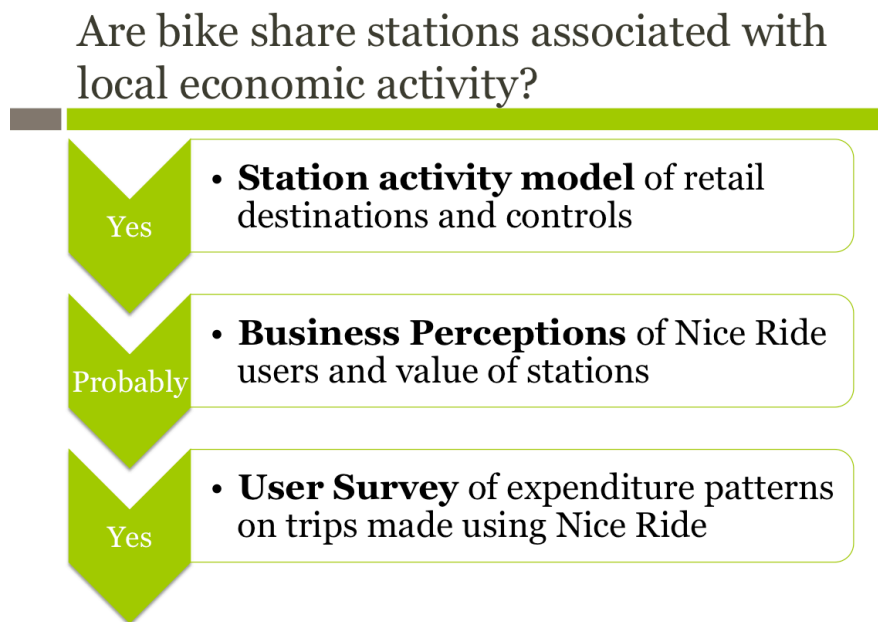


Figure 7. Findings from All Three Study Components

Station Activity Model

Regression modeling of Nice Ride trips and the characteristics of the surrounding station area revealed a positive and statistically significant relationship between the number of food-related businesses, job accessibility, and trips at any given station. Each additional food related business within a 1/8-mile walking distance buffer from the station corresponds to a 4.5% increase in station activity - the number of trips arriving at and leaving from that station. The effect of job accessibility on trips is a little weaker: each additional 1,000 jobs accessible within 30 minutes by transit from the station is associated with a 1.3% increase in station activity.

While food businesses and job accessibility were significantly related to trip activity, there was no statistically significant relationship between the number of non-food shopping businesses or the total number of businesses and station activity. Food-related businesses seem to have a distinctive effect: they do not just serve as a proxy for general retail density. The importance of job accessibility may reflect both the utility of bike share for workers and the high correlation between the number of jobs and the number of businesses within a given area, possibly masking significance of total businesses through multicollinearity.

Proximity to the next nearest bike share station was another important control factor: despite our original theory that station density would provide network effects that increase activity, our model suggests that closer station proximity may spread demand across stations, resulting in marginally lower trip rates at each one. This is not necessarily a bad outcome or a reason to disperse stations widely without further study. There may be network effects that occur after a threshold is reached that our model was not designed to identify. Increasing density may produce diminishing marginal returns. Controlling for the opening date of the station was necessary to ensure that we were comparing activity across stations fairly: stations that were open for the full season had more trips than stations that did not open until the season was half over.

Model Applications

The station activity model can be used to estimate the magnitude of the relationship between economic activity indicators and bike share trips. This application enables stakeholders and policy makers to better understand these relationships quantitatively. The model also can be used to evaluate potential station locations as part of bike share system expansion or optimization. The coefficients from the model can be used with sociodemographic, built environment, transportation infrastructure and economic activity measures to produce an estimated annual usage level to show the development potential for a given hypothetical station location.

The trip origin model and the trip destination model can be used together to estimate the “net gain” and “net loss” of the existing and future bike share stations. This application could help the Nice Ride operations team plan their bicycle transporting system to minimize system-balancing costs.

Business Interviews

Like the regression models, the importance of food-related businesses was reflected in our survey of business owners and managers. Food-related businesses were more likely to participate in the study and more likely to notice Nice Ride users among their customer base. Some non-food businesses in specific sub-sectors, like bike shops, had particular awareness of Nice Ride simply because of the overlap between bike share and their own business model. More often, however, the non-food businesses simply didn't give Nice Ride much thought.

These trends seem to be a manifestation of a fundamental theory in geography and urban planning called the Central Place Theory: different types of businesses require different sizes of customer bases in order to sustain operations (Bartlett 2003). Local cafes can get enough customer traffic from small neighborhoods. Many of these smaller food-related businesses develop relationships with customers who visit the establishment frequently. Conversely, non-food businesses in the sample, such as bike stores, jewelry stores, and cell phone shops, are higher order goods and each business generally serves a much larger market share. These businesses are less oriented toward repeat customers and less dependent on nearby residents for customer traffic; there is no cell phone or jewelry equivalent to the “coffee shop regular” who visits the same cafe every morning on their way to work. Both the interview findings and the station activity model results suggest that there is a stronger relationship between Nice Ride subscribers and more locally-oriented businesses such as restaurants and cafes, and there is no apparent relationship between bike share stations and higher order goods.

The relationship between Nice Ride users and traditional bicyclists also emerged as an important theme. The two bike shops had mixed initial reactions to the new bike share system: one expressed concern that Nice Ride would take away from their bike rental business, but later discovered that tourists would stay downtown, use Nice Ride to get to their business, and then rent a traditional bicycle for a longer ride. Another bike shop hoped that building a relationship with Nice Ride would increase their business: they assumed that Nice Ride would entice non-bicyclists to try biking, and many of these Nice Ride users would purchase a new bicycle because of the experience. This seems to be consistent with the types of bicycling infrastructure that was significant in the model. The presence of trails was positively associated with station activity, but on-street bike lanes seemed to have no effect. If these bike shops are

correct in their hopes and assumptions that Nice Ride users are primarily recreational cyclists or people new to bicycling, it seems consistent that off-street trails but not on-street lanes would be significant.

Subscriber Survey

The subscriber survey addressed many of the questions brought up in the two other components of the study. Where the station activity model identified significant variables in explaining the number of trips at stations, and the business owner interviews reported how an external group of people perceived Nice Ride users, this survey directly asked Nice Ride subscribers about their trip making and expenditure patterns.

Respondents reported many trips and frequent, modest expenditures at food-related businesses. The trip purpose reported most often was the journey to work, but trips to bars, cafes, grocery stores, and fast food restaurants also stood out as popular destinations. Many of these trips replaced car trips, suggesting that Nice Ride users probably shifted destinations to a place close enough to bike to, effectively concentrating their economic activity in station areas. Stations in a cluster of food-related businesses may experience higher levels of activity due to this effect.

While the station activity model and business interviews found no significant relationship between trip activity and non-food businesses, the subscriber survey revealed that Nice Ride users do in fact use Nice Ride for trips to non-food businesses. Nice Ride subscribers make trips to sporting events, movies, and shopping, and they spend money on these trips. As posited about the business interview results, however, Nice Ride subscribers are a small proportion of a much larger customer base. Shopping businesses were not related to station activity in the regression model, but this may be due to the repeat customer nature of food businesses that isn't as strong in shopping destinations.

The subscriber survey also reinforced findings associated with the demographics section of the station activity model. The demographic variables in the regression model suggested that a lower share of residents who are children or seniors is associated with higher levels of trip activity. The survey in turn shows that respondents live predominately in households without children.

The survey sheds light onto the questions proposed by bike shops in the business interviews. Contrary to one of the themes that came out during interviews with bike shops, most Nice Ride users have their own bikes. Fewer than 18 percent of households in the survey did not have bicycles at home, and the average number of bicycles per household exceeded the average number of people per household among our respondents. This suggests that Nice Ride fills a different travel need from traditional bicycling, and business owners might need to adapt their bicycle marketing strategies in order to attract more Nice Ride users.

Implications for Practice

Station Activity Model

- When it comes to placing new stations, food destinations and access to jobs matter. Each additional food business in a bike share station area is associated with 4.5% more trips at that station. Shopping destinations don't seem to matter as much.
- Several other land use control variables were important for predicting station activity and should be considered when placing new stations: notably, distance to water and distance to the Central Business District. Closer is better for both of these destinations. Access to trails also is an important consideration.

Business Interviews

Nice Ride visibility

- Business owners may have difficulty recognizing whether or not Nice Ride users are visiting their business and spending money there. Proximity and line-of-sight to a Nice Ride station are primary factors in determining whether or not Nice Ride users are noticed.
- Business owners should not associate a lack of Nice Ride bikes parked immediately out front with a lack of patronage by Nice Ride users. Because Nice Ride users are charged additional fees after 30 minutes' use, they tend to return their bikes before visiting a business. Businesses that are not within line-of-sight are less likely to notice this activity. Upon entering a business, therefore, Nice Ride users become indistinguishable from other cyclists (if carrying a bike helmet) or from other customers in general (if not).

Deals, discounts, and coupons

- Interviewees from businesses that advertise at Nice Ride stations have difficulty quantifying the likely economic impact of such marketing strategies yet generally express satisfaction with them.
- Business interviewees are not registering substantial economic activity in the form of Nice Ride deals, discounts or coupon redemption rates - although Nice Ride-specific incentives were not compared against other incentive programs in the business interviews. Despite this outcome, businesses are supportive of Nice Ride because it fits their overall business culture and plans.

Nice Ride parking and sidewalk space

- The relationship between Nice Ride stations and business activity is perceived with risk compared to business activity associated with parking and sidewalk space. Businesses are particularly sensitive to spatial constraints in dense urban environments. Where parking and sidewalk space are viewed as vital to the business's welfare, interviewees express trepidation at the thought of replacing these spaces with a Nice Ride station.
- Five businesses were supportive of replacing parking with a Nice Ride station because they would increase visibility to the business compared to large vehicles in an on-street parking space. Businesses that are already directly adjacent to a Nice Ride station express no dissatisfaction and remain supportive. Appealing to these visibility arguments as well as the capacity of a station relative to a parking space (several bikes fit into the space of one car) may help reduce anxiety experienced by businesses who have limited parking resources.
- In the case of businesses that are across the street or diagonally across an intersection from a Nice Ride station that is within line-of-sight of the business, interviewees expressed very positive sentiment toward Nice Ride even though they were unable to quantify the additional sales generated by their proximity to a Nice Ride station.

Business Types

- Food-related businesses do report Nice Ride users among their customers and generally feel that Nice Ride users contribute to their bottom line. Targeting food-related businesses for station placement and sponsorship may be more successful than targeting non-food related businesses.
- Interviewees from non-food related businesses are less likely to notice Nice Ride users in their business and do not share the sense that Nice Ride users contribute to their bottom line. Survey data or business-specific arguments (in the case of bike shops) might raise awareness among non-food businesses of bike share users as customers.

Subscriber Survey

- Bike share serves different travel purposes than traditional bicycling, as evidenced by the rates of bicycle ownership in our sample. Bike share systems and traditional bicycle ownership appear to be complements, not substitutes.
- Nice Ride members report taking many trips and spending modest amounts of money on these trips. Survey respondents may be over-representing their trip behavior, so if using survey results to appeal to businesses for support, the magnitude of effect should be expressed with these caveats.
- Nice Ride members are on average higher income, more highly educated, middle aged, and childless than the adult population at large. They have significant purchasing power. Presenting this demographic profile to businesses when appealing for support may help business owners and managers understand the potential customer relationships they could build with Nice Ride subscribers. The extent to which they respond to advertising that appeals directly to Nice Ride subscribers should be explored in greater depth.

- Survey results in this study are from monthly and annual subscribers only; they do not represent the trip and expenditure patterns of day users. Day users are more likely to have out of state zip codes and be tourists, so their trips may be associated with more economic activity than those surveyed.
- Most Nice Ride trips replace car trips. This information may be used to mollify concerns from businesses about bike share stations taking up limited parking supply.

Areas for Future Research

Seasonal & Full Year Activity

This study took place in May, which historically has had lower than average Nice Ride traffic. Scaling factors could be developed from trip records to estimate the outcomes of a full year study, but repeating the study with surveys being administered throughout the year may produce significantly different outcomes from both the subscriber survey and the business interviews. Subscribers may report taking more trips because overall trip volumes are higher. Their expenditure patterns also may look different because of increases in the availability of seasonally-related destinations such as farmers markets and sports venues. Business owners may notice Nice Ride users more because the season will have been open for 4 months instead of only one low-volume month.

Modeling Tool Development

The station activity model tells us about the relationship between business destinations, land use, transportation network, and a station's intensity of use. With continued development and testing, this model could be used to predict activity levels of hypothetical station locations. This tool could be used by Nice Ride or peer cities for system set-up and expansion, in order to plan for maximum ridership and maximum economic activity generation. The model could be validated by using comparing predictions for, say, 2012 with actual data from Nice Ride records.

Alternate Modes

This study looked at alternate modes as an indicator of trips that may be concentrated around Nice Ride hubs or otherwise would not have occurred in order to estimate economic activity from expenditures. Further analyses of these data could identify the economic value of diverted car trips in terms of fuel savings, maintenance costs, and health savings due to the increased levels of active travel. These alternate mode data could also be used to model carbon emissions and other pollutants avoided due to diverted car trips. Hypothetical routing models could estimate levels of air pollutant exposure for Nice Ride cyclists on "typical" trips.

Station Area Sensitivity

Station areas were defined as a ¼-mile walking distance buffer given existing literature on typical walking distances to transit stations. This method assumes that bike share operates like an individual, on-demand transit system. Further study could identify the sensitivity levels of station area features to walking distance to the station using a gravity model that discounts features that are farther away from the station.

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2012 Alta Bike Share. Alta Planning + Design. <http://www.altabicycleshare.com/services/feasibility-study/>

Appendix 1: Business Interview Protocol

Date:

Key Informant Interview Location:

Interviewee information:

Name:

Phone:

Position:

Cell:

Email:

Add'l:

1 How long has [BUSINESS] been at this location?

2 How long have you worked for/at [BUSINESS]?

3 Do you ever interact with or see Nice Riders at [BUSINESS]?

4 How about cyclists in general?

5 Do you have any deals, discounts or business strategies for attracting Nice Riders?

6 What led you to or inspired you to create a deal for Nice Ride Subscribers?

7 Do you, or would you, offer a Nice Ride subscription to employees for work-related errands, commuting or personal use?

8 If someone proposed replacing parking outside your establishment with a Nice Ride station, what would your reaction be?

9 Along the same lines, if someone proposed replacing sidewalk space outside your establishment with a Nice Ride station, what would your reaction be?

Additional Notes:

Appendix 2: Subscriber Survey Instrument

Nice Ride MN e-mailed a survey invitation and survey link to all of their monthly and annual subscribers.

Invitation Text:

Dear [Respondent First Name]

Nice Ride Minnesota and the University of Minnesota are partnering to conduct a survey to better understand the effects of bike sharing on personal travel and local businesses. We are sending you this e-mail on behalf of the University of Minnesota research team to invite you to participate in a survey about your experience with bikesharing. Your participation is completely voluntary, and it should take less than 10 minutes. To complete the survey online, please visit this link:

<http://www.surveymonkey.com/s/LV99MKZ?c=RespondentID>

By taking this survey, you'll be helping Nice Ride better understand how our stations affect how subscribers get around the Twin Cities. You'll also help us understand the relationship between Nice Ride and local businesses.

Your participation in the study is voluntary and your responses will be kept completely confidential. You may skip any questions that you do not wish to answer and can quit the survey at any time. The results from this survey will be reported in aggregate statistics so no individual responses will be identifiable.

To thank you for your participation in this study, the U of M is conducting a random drawing to win a \$50 Target gift card. The drawing will be held {10 days after surveys are distributed}, so to be entered into the drawing, please complete your survey before then.

If you have any questions about this survey, please contact the U of M research team at schon082@umn.edu.

Thank you very much for participating in this study!

Nice Ride Minnesota

Dr. Greg Lindsey, Humphrey School of Public Affairs, UMN

Copy of electronic survey follows on the next page.

Bikes Belong Nice Ride Survey

*** 1. Dear Nice Ride Subscriber:**

Thank you for agreeing to take our survey about the impacts of bikesharing on personal travel and local businesses!

By taking this survey, you'll be helping Nice Ride better understand how its stations affect how subscribers get around the Twin Cities. You'll also help local businesses better understand their relationship with Nice Ride subscribers.

Your participation in the study is voluntary and your responses will be kept completely confidential. You may skip any questions that you do not wish to answer and can quit the survey at any time. In any report we might publish, we will not include any information that would make it possible to identify a survey participant.

To thank you for your participation in this study, the U of M is conducting a raffle to win one of three \$50 Target gift cards. To enter the drawing, please include your e-mail address in the last question at the end of the survey and complete the survey by Sunday, May 27.

Thank you very much for participating in this study!

☐ I have read the consent form and agree to take the survey

Nice Ride Trips

For this next section, we are going to ask you about the kinds of places you visit and activities you do using Nice Ride bikes.

Bikes Belong Nice Ride Survey

1. How would you characterize your frequency of using Nice Ride bikes?

- ☐ Daily
- ☐ 4-6 Times a week
- ☐ 2-3 Times a Week
- ☐ Once a Week
- ☐ 2-3 Times a Month
- ☐ Once a Month
- ☐ Less than Once a Month

2. Have you used Nice Ride within the past 7 days?

- ☐ Yes
- ☐ No

Work & School

1. Have you ever used Nice Ride to get to any of the following work & school locations?

- ☐ Place of employment
- ☐ Business meeting
- ☐ Class or school-related activity

2. In the past 7 days, about how many times have you used Nice Ride to get to the following work & school locations?

Place of employment	<input type="text"/>
Business meeting	<input type="text"/>
Class or school-related activity	<input type="text"/>

Groceries & Shopping

Bikes Belong Nice Ride Survey

1. Have you ever used Nice Ride to get to the following groceries & shopping locations? (Check all that apply)

- ☐ Grocery store
- ☐ Farmers market
- ☐ Convenience store
- ☐ Specialty food store (i.e., chocolatier, wine shop, cheese store)
- ☐ Shopping for household goods (non-food), clothes, gifts, books, and the like

2. In the past 7 days, about how many times have you used Nice Ride to get to the following groceries & shopping locations?

Grocery store	<input type="text"/>
Farmers market	<input type="text"/>
Convenience store	<input type="text"/>
Specialty food store (i.e., chocolatier, wine shop, cheese store)	<input type="text"/>
Shopping for household goods (non-food), clothes, gifts, books, and the like	<input type="text"/>

3. On average, about how much do you spend on a typical Nice Ride trip to the following grocery & shopping locations? (\$)

(If you have not used Nice Ride to get to one of the following locations, enter 0 or leave the answer for that location blank)

Grocery store	<input type="text"/>
Farmers market	<input type="text"/>
Convenience store	<input type="text"/>
Specialty food store (i.e., chocolatier, wine shop, cheese store)	<input type="text"/>
Shopping for household goods (non-food), clothes, gifts, books, and the like	<input type="text"/>

Bikes Belong Nice Ride Survey

4. If you had not used Nice Ride, how would you have gone to the following grocery & shopping locations?

	N/A	Drive	Use my own bike	Transit (bus or rail)	Walk	Get a ride from somebody else	Taxi	I would not have made this trip
Grocery store	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Farmers market	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Convenience store	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Specialty food store (i.e., chocolatier, wine shop, cheese store)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Shopping for household goods (non-food), clothes, gifts, books, and the like	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Dining & Food

1. Have you ever used Nice Ride to get to the following dining & food locations? (Check all that apply)

- ☐ Sit-down restaurant (casual or fine-dining)
- ☐ Fast food or food-to-go restaurant
- ☐ Café or coffee shop
- ☐ Juice bar
- ☐ Ice cream shop

2. In the past 7 days, about how many times have you used Nice Ride to get to the following dining & food locations?

Sit-down restaurant (casual or fine-dining)	<input type="text"/>
Fast food or food-to-go restaurant	<input type="text"/>
Café or coffee shop	<input type="text"/>
Juice bar	<input type="text"/>
Ice cream shop	<input type="text"/>

Bikes Belong Nice Ride Survey

3. On average, about how much do you spend on a typical Nice Ride trip to the following dining & food locations? (\$)

(If you have not used Nice Ride to get to one of the following locations, enter 0 or leave the answer for that location blank)

Sit-down restaurant (casual or fine-dining)

Fast food or food-to-go restaurant

Café or coffee shop

Juice bar

Ice cream shop

4. If you had not used Nice Ride, how would you have gone to the following dining & food locations?

	N/A	Drive	Use my own bike	Transit (bus or rail)	Walk	Get a ride from somebody else	Taxi	I would not have made this trip
Sit-down restaurant (casual or fine-dining)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Fast food or food-to-go restaurant	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Café or coffee shop	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Juice bar	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ice cream shop	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Entertainment, Recreation, & Nightlife

1. Have you ever used Nice Ride to get to the following entertainment, recreation, & nightlife locations? (Check all that apply)

- ☐ Bar, pub, or nightclub
- ☐ Movie theater
- ☐ Play or dance performance
- ☐ Music concert
- ☐ Spectator sport event (i.e., at Target Field or the Metrodome)
- ☐ Museum
- ☐ Bowling Alley

Bikes Belong Nice Ride Survey

2. In the past 7 days, about how many times have you used Nice Ride to get to the following entertainment, recreation, & nightlife locations?

Bar, pub, or nightclub	<input type="text"/>
Movie theater	<input type="text"/>
Play or dance performance	<input type="text"/>
Music concert	<input type="text"/>
Spectator sport event (i.e., at Target Field or the Metrodome)	<input type="text"/>
Museum	<input type="text"/>
Bowling Alley	<input type="text"/>

3. On average, about how much do you spend on a typical Nice Ride trip to the following entertainment, recreation, & nightlife locations? (\$)

(If you have not used Nice Ride to get to one of the following locations, enter 0 or leave the answer for that location blank)

Bar, pub, or nightclub	<input type="text"/>
Movie theater	<input type="text"/>
Play or dance performance	<input type="text"/>
Music concert	<input type="text"/>
Spectator sport event (i.e., at Target Field or the Metrodome)	<input type="text"/>
Museum	<input type="text"/>
Bowling Alley	<input type="text"/>

4. If you had not used Nice Ride, how would you have gone to the following entertainment, recreation, & nightlife locations?

	N/A	Drive	Use my own bike	Transit (bus or rail)	Walk	Get a ride from somebody else	Taxi	I would not have made this trip
Bar, pub, or nightclub	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Movie theater	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Play or dance performance	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Music concert	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Spectator sport event (i.e., at Target Field or the Metrodome)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Museum	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Bowling Alley	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Personal Errands

Bikes Belong Nice Ride Survey

1. Have you ever used Nice Ride to get to the following personal errands locations? (Check all that apply)

- ☐ Library
- ☐ Post office, FedEx or UPS store
- ☐ Banking or other financial service
- ☐ Hair appointment or barber shop
- ☐ Health care appointment (i.e., doctor or dentist)
- ☐ Pharmacy
- ☐ Friend's or relative's house
- ☐ Transit stop or station

2. In the past 7 days, about how many times have you used Nice Ride to get to the following personal errands locations?

Library	<input type="text"/>
Post office, FedEx or UPS store	<input type="text"/>
Banking or other financial service	<input type="text"/>
Hair appointment or barber shop	<input type="text"/>
Health care appointment (i.e., doctor or dentist)	<input type="text"/>
Pharmacy	<input type="text"/>
Friend's or relative's house	<input type="text"/>
Transit stop or station	<input type="text"/>

Outdoor Recreation

1. Have you ever used Nice Ride to get to the following outdoor recreation locations? (Check all that apply)

- ☐ Park
- ☐ Lake
- ☐ Festival or street fair
- ☐ Fitness center or recreation class
- ☐ No particular destination - just riding for fun

Bikes Belong Nice Ride Survey

2. In the past 7 days, about how many times have you used Nice Ride to get to the following outdoor recreation locations?

Park

Lake

Festival or street fair

Fitness center or recreation class

No particular destination - just riding for fun

Your Household

1. Some additional information about you and your household:

In what year were you born?

How many people live in your household?

How many of the people in your household are licensed drivers?

How many of the people in your household are children under 16 years old?

How many personal vehicles (cars, SUVs, vans, small trucks, and motorcycles) does your household have?

How many working bicycles does your household have?

2. What is the highest level of school you have completed or the highest degree you have received?

- ☐ Some grade school or high school
- ☐ High school diploma or equivalent (GED)
- ☐ Some college
- ☐ Associate's or Technical degree
- ☐ Bachelor's degree
- ☐ Master's degree
- ☐ Professional degree
- ☐ Doctoral degree

Bikes Belong Nice Ride Survey

3. What is your current employment status?

- ☐ Full-time
- ☐ Part-time
- ☐ Not employed
- ☐ Retired

4. Are you a student?

- ☐ Yes, full-time
- ☐ Yes, part-time
- ☐ No

5. What is your annual household income?

6. We need your help understanding how Nice Ride subscribers plan their trips and choose routes. Do you mind taking a few extra minutes to tell us about a recent trip you made using Nice Ride? (You can choose to record up to 5 of your recent trips)

- ☐ Sure, no problem!
- ☐ No thanks, complete the survey.

Trip Record 1

Please think about one trip you took recently using a Nice Ride bike. Can you tell us more details about this particular trip?

1. Where did this trip start?

What is the street & nearest cross-street to your starting point?

What city was this in?

What kind of location is this? (home, work, school, a store, etc.)

Which Nice Ride station did you use to pick up a bike?

About how far (in minutes) did you walk to get from your starting point to the station?

Bikes Belong Nice Ride Survey

2. How long in minutes did it take you to bike between stations?

3. Where did this trip end?

Which Nice Ride station did you use to return your bike?

About how far (in minutes) did you walk to from the station to your destination?

What is the street & nearest cross-street to your destination?

What city was this in?

What kind of location is this? (home, work, school, a store, etc.)

4. What route did you take between Nice Ride stations? Please include major streets, any bike lanes or trails that you used, and if you switched bikes along the way, which additional Nice Ride stations you used.

5. If you had not used Nice Ride, how else would you have made this trip?

- ☐ Drive
- ☐ Use my own bike
- ☐ Transit (bus or rail)
- ☐ Walk
- ☐ Get a ride from somebody else
- ☐ Taxi
- ☐ I would not have made this trip

Bikes Belong Nice Ride Survey

6. What was the primary purpose of this trip?

- ☐ Work & School
- ☐ Groceries & Shopping
- ☐ Dining & Food
- ☐ Entertainment, Recreation, & Nightlife
- ☐ Personal Errands and Travel
- ☐ Outdoor Recreation

Other (please tell us more)

7. In a typical month, how often do you make this particular trip using Nice Ride?

- ☐ Daily
- ☐ 4-6 Times a week
- ☐ 2-3 Times a Week
- ☐ Once a Week
- ☐ 2-3 Times a Month
- ☐ Once a Month
- ☐ Less than Once a Month

8. Is there anything else you would like to tell us about this trip?

9. Would you like to tell us about a second trip? (This will take you to a second page just like this one to record a different trip. You may record up to 5 trips total)

- ☐ Sure!
- ☐ No thanks, complete the survey.

Trip Record 2

Please think about one trip you took recently using a Nice Ride bike. Can you tell us more details about this particular trip?

All trip record pages are identical to Trip Record 1. These pages are repeated until respondent no longer wants to enter trips in the survey or has included up to 5 trips; not included here. At that point, respondent is directed to the “End of Survey” page.

Bikes Belong Nice Ride Survey

8. Is there anything else you would like to tell us about this trip?

End of Survey

Thank you very much for your time and participation!

1. Is there anything else you would like to tell us about trips you take using Nice Ride bikes?

2. OPTIONAL: The UofM will use this survey to improve our understanding of how Nice Ride fits into land use planning in the Twin Cities. If the need arises, may we contact you for additional information or for future research about Nice Ride?

- ☐ No
☐ Yes

3. OPTIONAL: Are you interested in logging more trips during the Nice Ride season?

- ☐ No
☐ Yes

4. OPTIONAL: If you would like to enter the drawing for one of the three gift card prizes of \$50 each, please provide your e-mail address here.