

CHICAGO BIKE MONITORING

Technical Report

TO: Ron Burke, Executive Director, Active Transportation Alliance

FROM: Matt Berkow, Senior Planner; Nick Falbo, Planner, Alta Planning + Design

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INTRODUCTION

Growth in bicycle ridership in Chicago has been tremendous. Each year, more and more Chicagoan's take to the streets on two wheels. Bicycle commute to work rates have risen from 0.5 percent in 2000, to 1.3 percent in 2010 and 1.6 percent in 2012. This growth is poised to continue as Chicago continues to invest in protected bike lanes, bike share and bicycle parking facilities.

People are bicycling for more than just commuting. Chicagoans are making an estimated 125,000 trips every day by bike, in the process keeping 47 million pounds of CO₂ emissions out of our air every year.

If Chicago succeeds in increasing the citywide bicycle commute rate to 5%, these benefits become even greater.

Bicycling takes place all across the city of Chicago. Chicagoans make an estimated 125,000 trips by bike every day, over 45,400,000 trips per year. This bicycling activity prevents over 47 million pounds of carbon dioxide emissions every year.

This report tracks the state of bicycling in the city. It explores not only how valuable bicycling is to meeting Chicago's transportation needs today but makes the case for how vital it will likely be in the future.

THE DATA USED IN THIS REPORT

Data analysis presented here comes from a variety of national and local sources, including:

- City of Chicago bicycle counts from 2009 to 2013. These counts come from a variety of sources and include both 24 hour automated counts and 2-hour manual counts.
- Journey-to-work information collected by the U.S. Census Bureau's 2012 American Communities Survey (ACS) is the main input used in this analysis. Work commute trips are used as a base to estimate other types of bicycle transportation activity, including trips such as shopping and medical visits. Trips to school were calculated separately based on local school enrollment populations, a figure also provided by ACS. Social and recreational bicycling trips were not included in this analysis.
- The 2009 NHTS provides a substantial national dataset of travel characteristics, particularly for bicycling and walking trips. Data used from this survey include:
 - Bicycle mode share for school commute trips for college students
 - Average trip length by trip purpose and mode
- Local data regarding travel behavior for trips other than commute to work is collected in the 2009 Chicago Regional Household Travel Inventory. Data used in this report was retrieved from the 2010 Chicago Metropolitan Agency for Planning (CMAP) report *Chicago Regional Household Travel Inventory: Mode Choice and Trip Purpose for the 2008 and 1990 Surveys*.
- Studies from the Environmental Protection Agency (EPA) identify greenhouse gas and other emission factors for vehicle travel based on vehicle miles traveled (VMT). EPA sources were used to calculate the benefits of reduced or replaced auto trips.
- The National Center for Safe Routes to School (SRTS), which has published studies on the rates of walking and bicycling to school for children in grades K-8. Without another data source, national bicycle-to-school mode share from this study was used for all K-12 students in Chicago.

DISCLAIMER

As with any modeling projection, the accuracy of the result is dependent on the accuracy of the input data and other assumptions. Effort was made to collect the best data possible for input to the model, but in many cases the use of national data was required where local data was unavailable.

STATE OF BICYCLING IN CHICAGO

CENSUS TRENDS AND STATISTICS

Over the last 20 years the rate of bicycling for commuting has grown in cities across the country, and Chicago is no exception. From a stable rate of approximately 0.2% between 1980 and 1990¹ bicycle commuting experienced an eight-fold increase to 1.6% today². The rate of growth has accelerated in recent years and shows no sign of slowing down.

Figure 1: Chicago Bicycle Commute Mode Share Trends

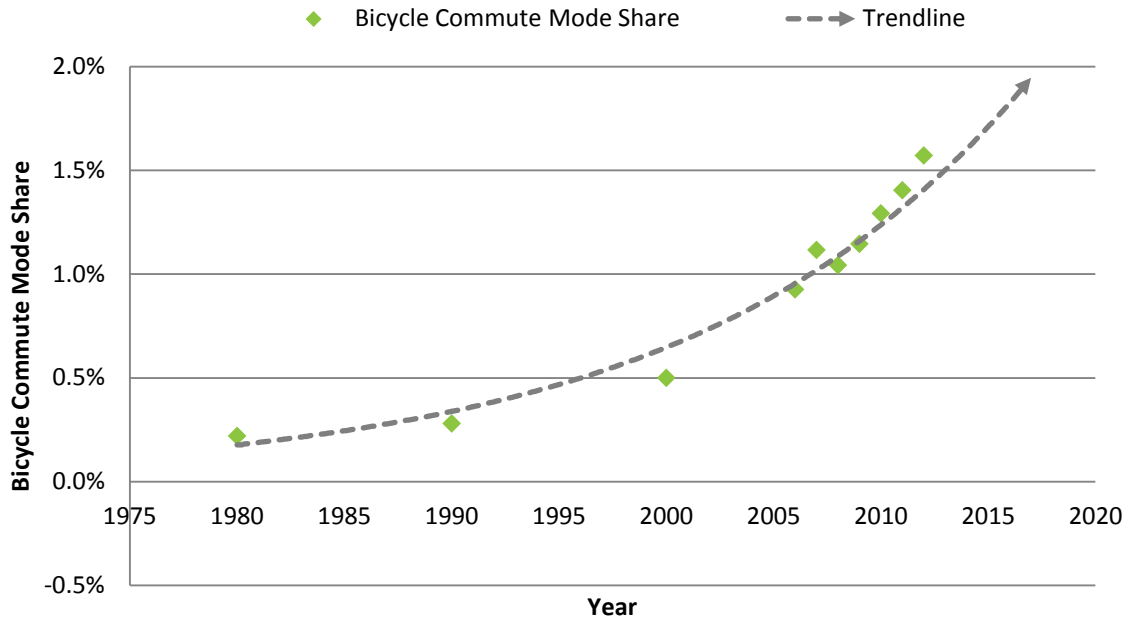


Chart Source: USDOT; US Census Bureau.

Table 1: Chicago Bike Commute Historic Mode Share

Year	Bicycle Commute Share	Data Source
1980	0.22%	Census 1980 – Chicago Metropolitan Statistical Area
1990	0.28%	Census 1990
2000	0.50%	Census 2000
2006	0.93%	ACS 2006 1-Year, B08301
2007	1.12%	ACS 2007 1-Year, B08301
2008	1.04%	ACS 2008 1-Year, B08301
2009	1.15%	ACS 2009 1-Year, B08301
2010	1.29%	ACS 2010 1-Year, B08301
2011	1.40%	ACS 2011 1-Year, B08301
2012	1.57%	ACS 2012 1-Year, B08301

Table Source: USDOT; US Census Bureau.

¹ 1980 Census figures reflect the bicycle mode share of the Chicago Metropolitan Statistical Area. As reported by USDOT. *Journey-To-Work Trends in the United States and its Major Metropolitan Areas 1960-1990*. 2003.

DEMOGRAPHICS OF BICYCLING

The American Association of State Highway Officials (AASHTO) prepares a transportation specific dataset based on the US Census American Community Survey (ACS) called the Census Transportation Planning Package (CTPP). The CTPP offers custom tabulations of data unavailable through traditional Census datasets. Released in October 2013, the most recent CTPP product is based on 2006 – 2010 5-year ACS Data³. These data sets go beyond how many people commute by bike, and provide some insight into the demographic characteristics of bicycle commuters.

A series of figures below present a summary of key variables available from the CTPP.⁴

Figure 2: Minority Status of Chicago Bicycle Commuters (ACS CTPP 2006-2010)

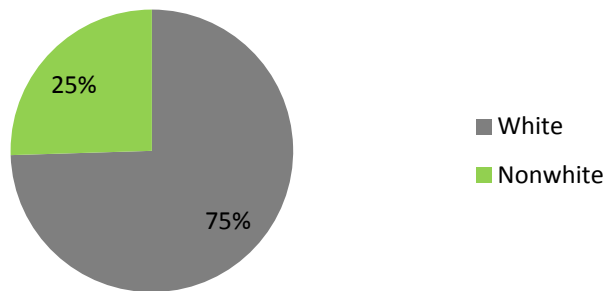


Figure 3: Chicago Bicycle Commute Mode Share by Income Group (ACS CTPP 2006-2010)

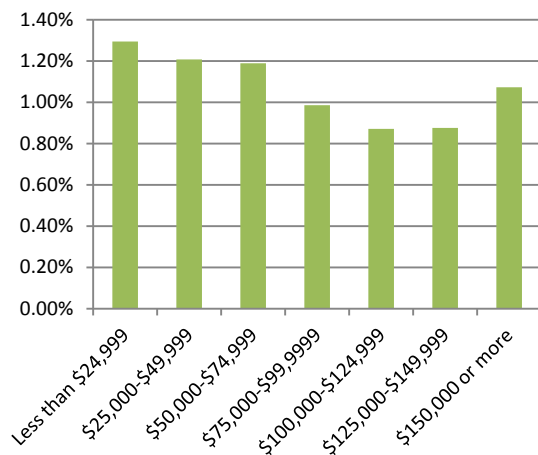
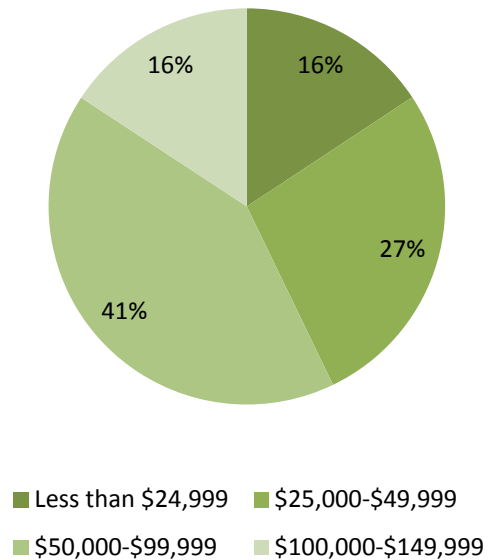


Figure 4: Incomes of Chicago Bicycle Commuters (ACS CTPP 2006-2010)



³ 2006-2010 ACS data reflect lower levels of bicycling than occur today. The bicycle mode share for Chicago commuters in this period was 1.11%.

⁴ The source for all figures in this section is *U.S. Census Bureau, American Community Survey 2006-2010 Five-year estimates. Special Tabulation: Census Transportation Planning*

Figure 5: Chicago Bicycle Commute Mode Share by Vehicle Availability (ACS CTPP 2006-2010)

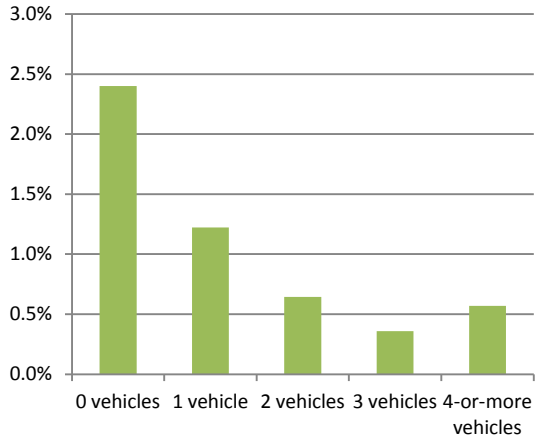


Figure 6: Vehicle Availability of Chicago Bicycle Commuters (ACS CTPP 2006-2010)

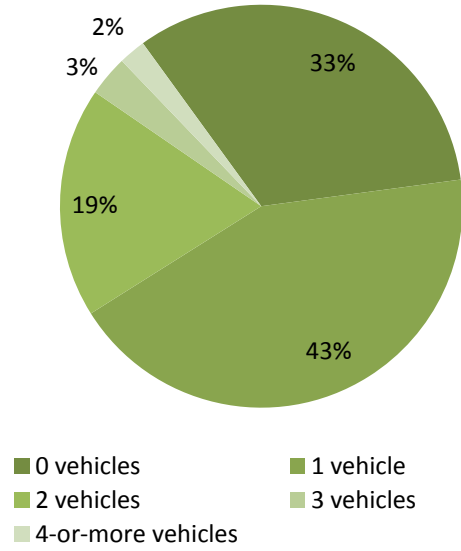


Figure 7: Chicago Bicycle Commute Mode Share by Age Group (ACS CTPP 2006-2010)

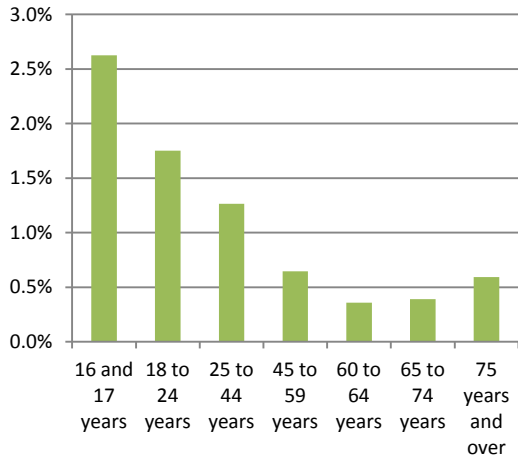
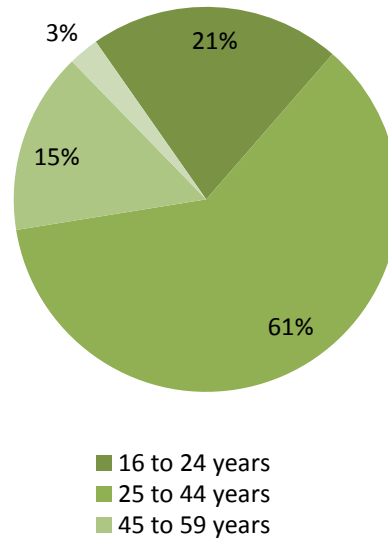


Figure 8: Age of Chicago Bicycle Commuters (ACS CTPP 2006-2010)



NEIGHBORHOOD BIKE COMMUTING

Bicycle commuting has increased in many of Chicago's neighborhoods. Figures 9-12 below and on the following pages illustrates the rate of bicycle commuting over time in Census tracts throughout the city. As illustrated in the figures, commute rates have increased in much of the city

Figure 9: Chicago Bicycle Mode Share by Census Tract 1990

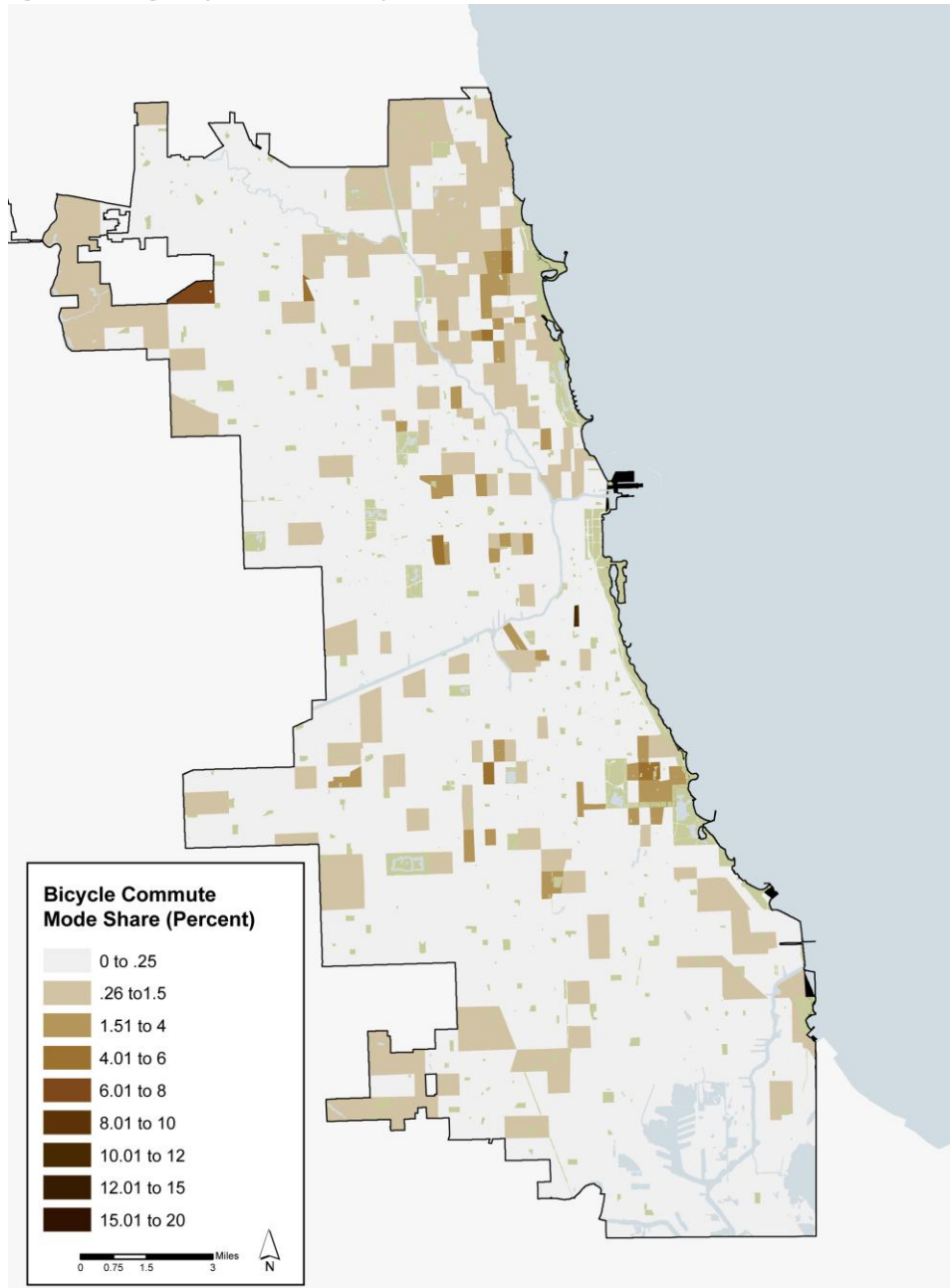


Figure Source: US Census Bureau. Census 1990.

Figure 10: Chicago Bicycle Mode Share by Census Tract 2000

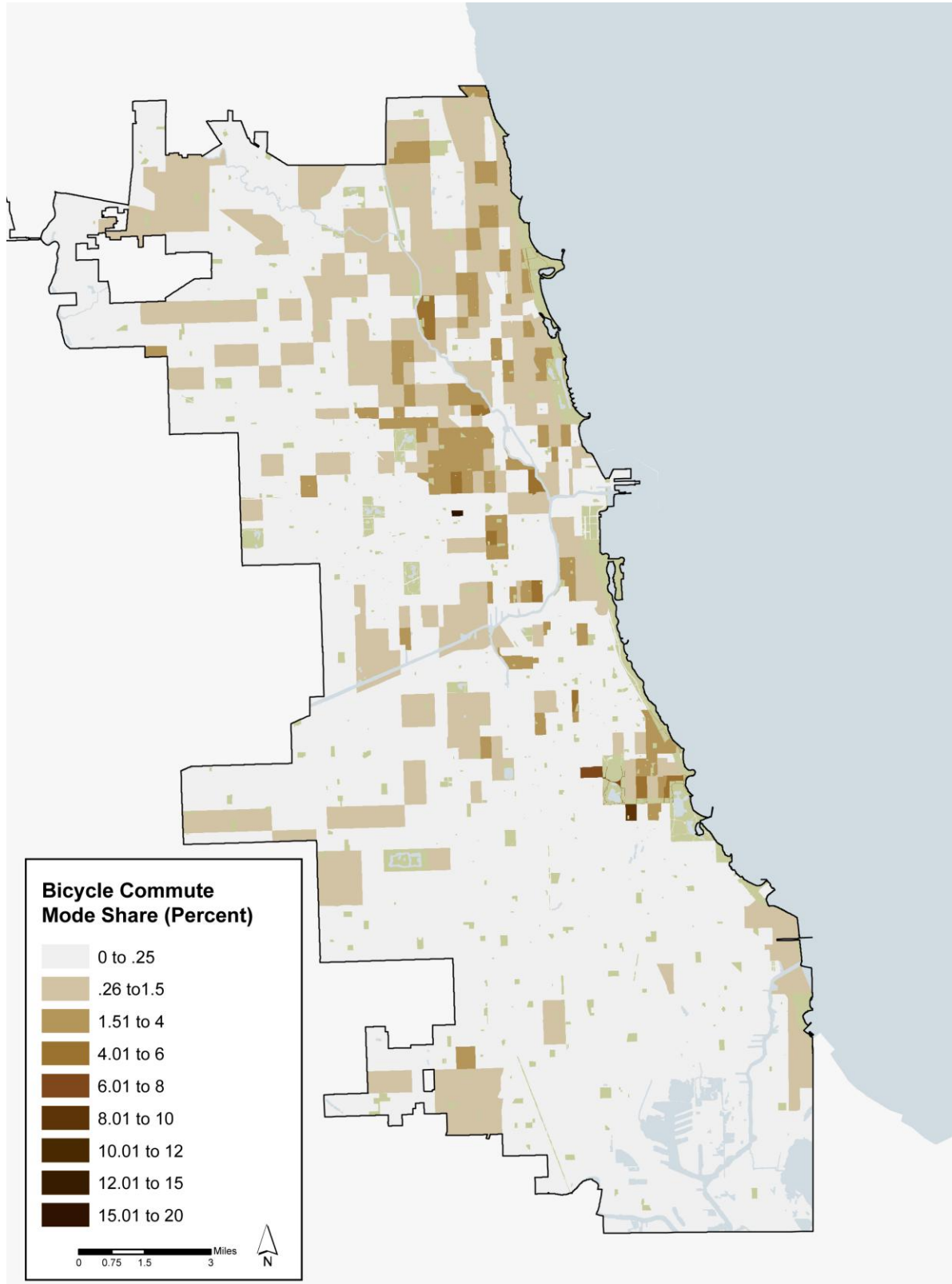


Figure Source: US Census Bureau. Census 2000.

Figure 11: Chicago Bicycle Mode Share by Census Tract (2005-2009)

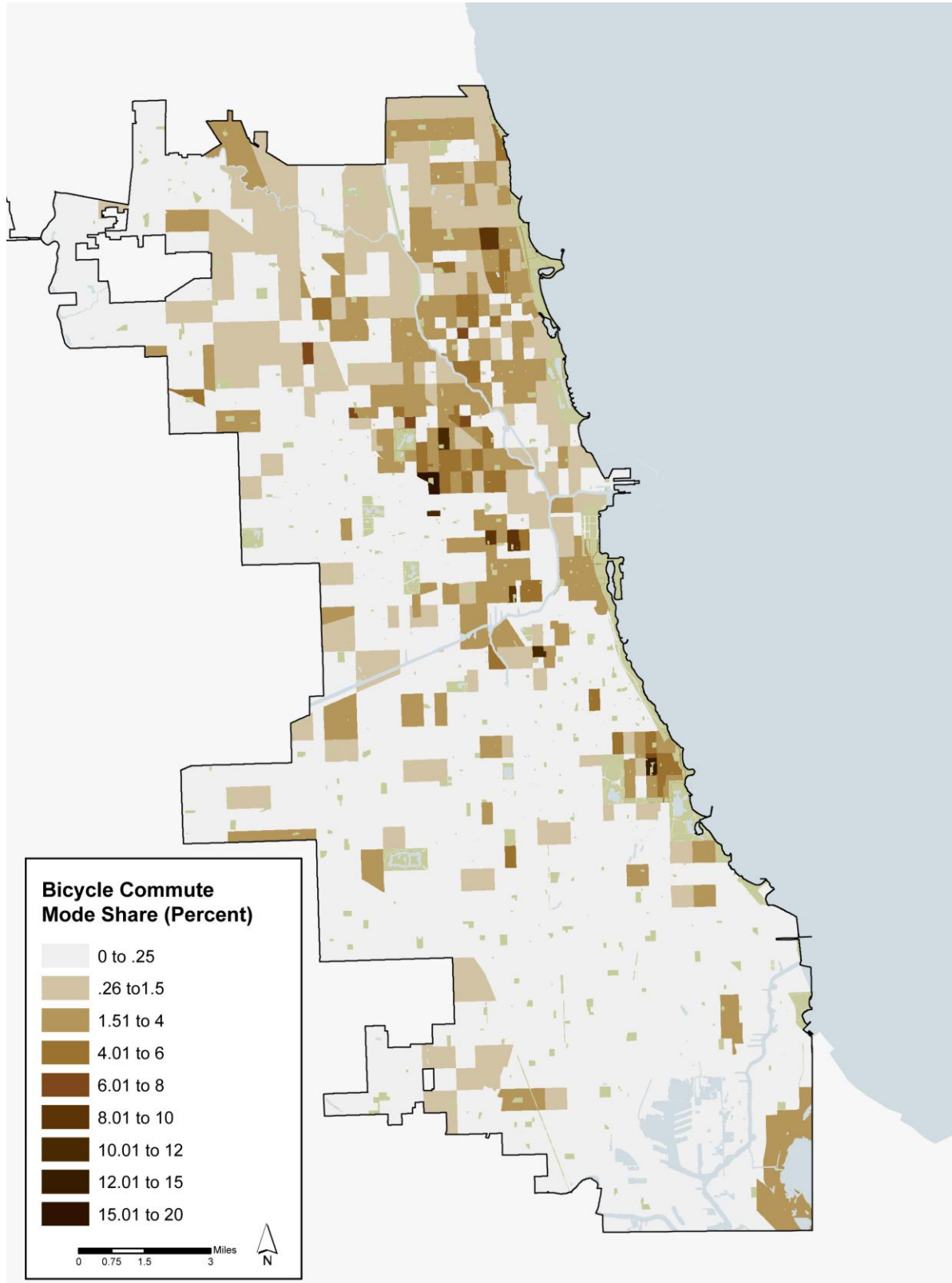


Figure Source: US Census Bureau. ACS5 5-year 2005-2009

Figure 12: 2012 Chicago Bicycle Mode Share by Census Tract (ACS 2009-2012)

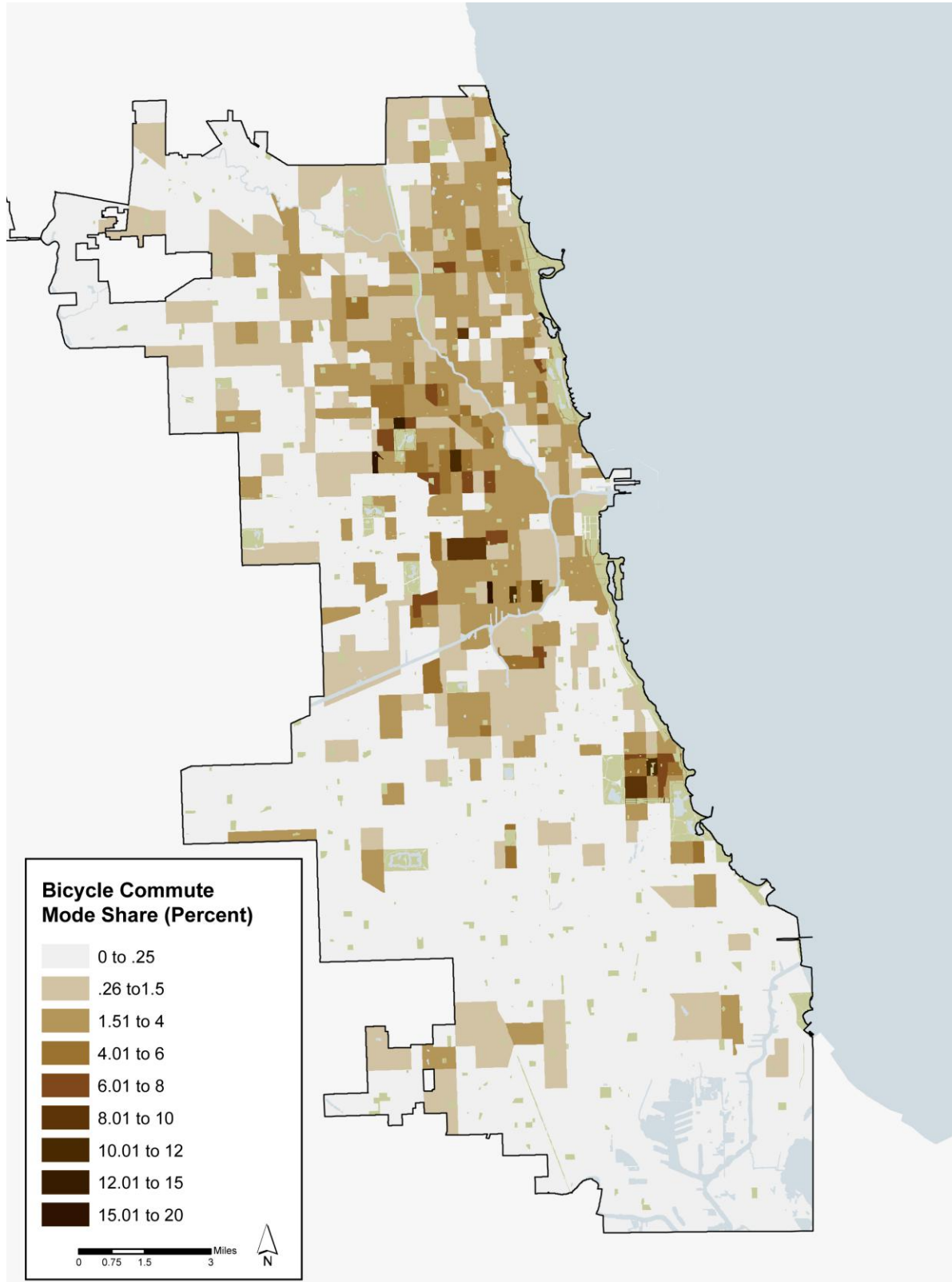


Figure Source: US Census Bureau. ACS 5-year 2009-2012

ESTIMATING DEMAND FOR ALL BIKE TRIPS

OVERVIEW

Bicycling is gaining new interest from communities across the United States after decades of neglect due to focused attention on motor vehicle transportation. Due to low existing levels of use and funding, bicycling faces an uphill battle to prove its utility as a viable, efficient mode of transportation. However, bicycling is becoming increasingly prevalent in Chicago, and the benefits created by bicycling increase with use. For each additional vehicle mile replaced by bicycling, about one pound of greenhouse gas emissions are prevented, a few cents are saved from being spent on gas, and a person gets several minutes closer to reaching their recommended healthy levels of physical activity. When bicycling becomes a part of people's daily activity, these benefits add up to create a healthier, more livable community. To communicate significance of these benefits, it is necessary to develop a better more robust picture of the scale of bicycle use happening in Chicago than currently exists.

EXISTING BICYCLING DEMAND

The model applied in this study uses local and national studies to estimate the number and purpose of bicycling trips taken today within Chicago. In isolation, data from ACS provides information only on work commute trips. Because the trip to work represents only a fraction of all trips taken, additional data is necessary to estimate and classify total bicycling activity in Chicago. The 2009 Chicago Regional Household Travel Inventory provides information on mode split for trips of all purposes, as shown in Figure 13. The 2009 National Household Travel Survey (NHTS 2009) provides information on where, why, and how far people are bicycling for transportation. These data sources are combined to estimate the number of other types of bicycling trips being made in addition to work trips.

Figure 13: City of Chicago Mode Share for All Trip Types (CMAP 2010).

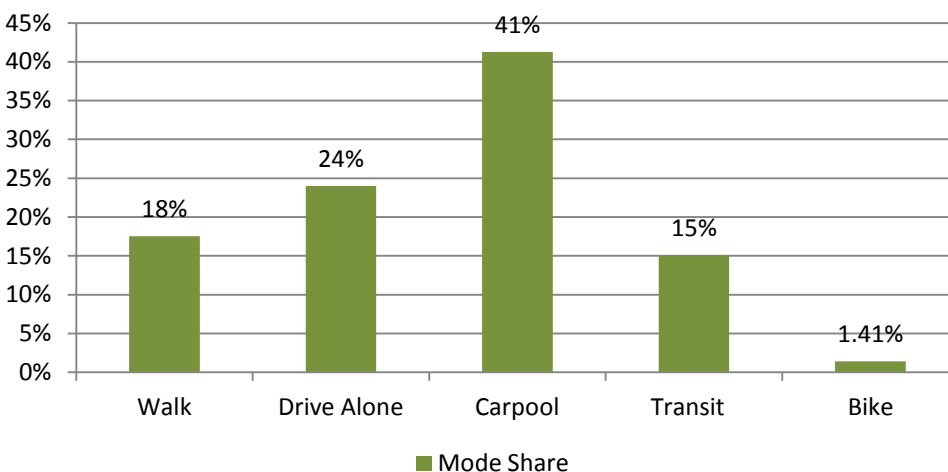


Figure Source: CMAP 2010

CURRENT DEMAND AND BENEFITS

Table 2 shows the results of the overall bicycle trip activity model. Using the Chicago Regional Household Travel Inventory, US Census and NHTS as a basis, the model estimates and classifies the 124,595 bicycle trips that occur in Chicago each day for transportation purposes. This number does not include purely exercise/recreational bicycle trips in the area, which if added would further increase the number of daily trips. The majority of Chicago area bicycling trips are utilitarian trips not related to work or school, such as trips for medical/dental services, shopping/errands, family or personal business, obligations, meals, and other trips.

Table 2: Model Estimate of Current Daily Bicycling Trips

	Daily Trips (All Modes)	Bicycle Mode Share	Average Daily Bicycling Trips
All Trips in the City of Chicago	8,847,638	1.41%	124,595
Work Commute Trips	1,218,908	1.6%	26,334
K-12 School Trips	426,145	1.0%	4,203
College Commute Trips	242,742	1.7%	3,151
Utilitarian Trips	Remainder of All Trips		90,907

Table Source: ACS 2007-2011, NHTS 2009, SRTS 2009, CMAP 2010

ESTIMATING BICYCLING BENEFITS

Numerous studies have estimated benefits of bicycling. For each bicycle trip, the city and residents benefit from improved health from increased physical activity, money saved on gas and vehicle insurance, and reduced public costs of road maintenance from less wear and tear on local roads. Table 3 shows the estimate annual impact of bicycling in Chicago, including air quality benefits calculated using vehicle emissions data from the EPA. The benefits of bicycling in Chicago are based on the number of regular bicycle transportation users and miles traveled estimated in the overall demand model.

KEY FINDINGS OF EXISTING BICYCLING BENEFITS ANALYSIS

Current levels of bicycling in Chicago have recently grown to over twice the national average, and this increased local use of active transportation returns significant benefits to the community in the form of improved air quality, reduced transportation costs, and improved health. Vehicle miles traveled reductions are calculated using average bicycle trip distances for each trip purpose category and the vehicular mode share of that trip type. Existing rates of bicycling transportation result in over 27 million trips annually, preventing an estimated 30 million pounds of carbon dioxide emissions.

The transportation sector accounts for 21% of all greenhouse gas emissions in the city of Chicago, as shown in Figure 14. Existing bicycling activity in the city is estimates to reduce transportation-related greenhouse gas emissions by around 0.3%.

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Figure 14: Chicago's Greenhouse Gas Emissions 2000

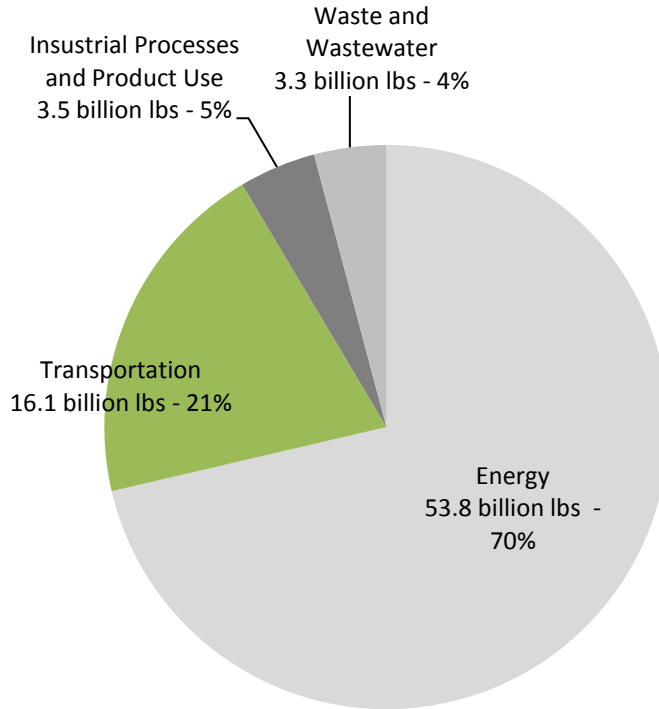


Figure Source: Center for Neighborhood Technology. Chicago's Greenhouse Gas Emissions. 2008.

Table 3: Bicycling Activity Annual Benefits

Benefit Type	Benefit Value
Bicycle Trips	45,477,000 trips
Miles Bicycled	100,323,000 miles
VMT Reduced	56,015,000 miles
CO2 Emissions Reduced	45,569,000 pounds
Other Vehicle Emissions Reduced	1,818,000 pounds

Table Source: ACS 2007-2011, NHTS 2009, SRTS 2009, EPA 2007

DIFFICULT-TO-QUANTIFY BENEFITS OF BICYCLING AND WALKING

In addition to the air quality benefits estimated above, bicycling has many other benefits that are challenging to quantify. Bike lanes can improve retail business directly by drawing customers and, indirectly, by supporting the regional economy. Patrons who bike to local stores have been found to spend more money than patrons who drive.⁵ By replacing short car trips, bicycling can help middle-class families defray rising transportation costs. Families that drive less spend 10 percent of their income on transportation, compared to 19 percent for households with heavy car use,⁶ freeing additional income for local goods and services.

⁵ The Clean Air Partnership. (2009). *Bike Lanes, On-Street Parking and Business: A Study of Bloor Street in Toronto's Annex Neighborhood*.

⁶ Center for Neighborhood Technology. (2005). *Driven to Spend: Pumping Dollars out of Our Households and Communities*.

CITY OF CHICAGO BICYCLE COUNTS

Six sites are part of the Chicago Bicycle Program's monthly bike count program. On a specified weekday each month, volunteer or staff use a standardized entry form to manually count and track bicycle movements at these locations. These monthly counts provide a detailed understanding of behavior over time and across seasons. For example, average winter ridership volumes equal nearly 40% of average summer volumes.

The monthly counts support a long history of bicycle counts in Chicago. Since 2008, the Chicago Bicycle Program and Department of Transportation have conducted bicycle counts at 41 different locations. The majority of this data was collected manually by trained volunteers using a standardized entry form similar to the monthly count program. Additional data was collected using automated "tube" counters that were deployed for a 24-hour period.

These other count sites don't allow for the same detailed analysis as the monthly bicycle counts, but they do illustrate the presence and scale of bicycling activity across the city.

Figure 15 on the following page reveals that people are bicycling throughout the city of Chicago. While the highest volumes have been observed in Central Chicago and in the neighborhoods north of the Chicago River and east of I-90, the bicycle counts indicate that significant bicycling activity occurs in all parts of the city.

Bicycling activity decays as a function of increasing distance from downtown Chicago. This is consistent with historic bicycling trends shown in Figure 1 and Figure 2, and may be related to trip length, or the conditions of available bicycle facilities and completeness of the bikeway network.

Figure 15: City-wide Bicycle Volumes: 2 hour highs from counts conducted from 2008-2013

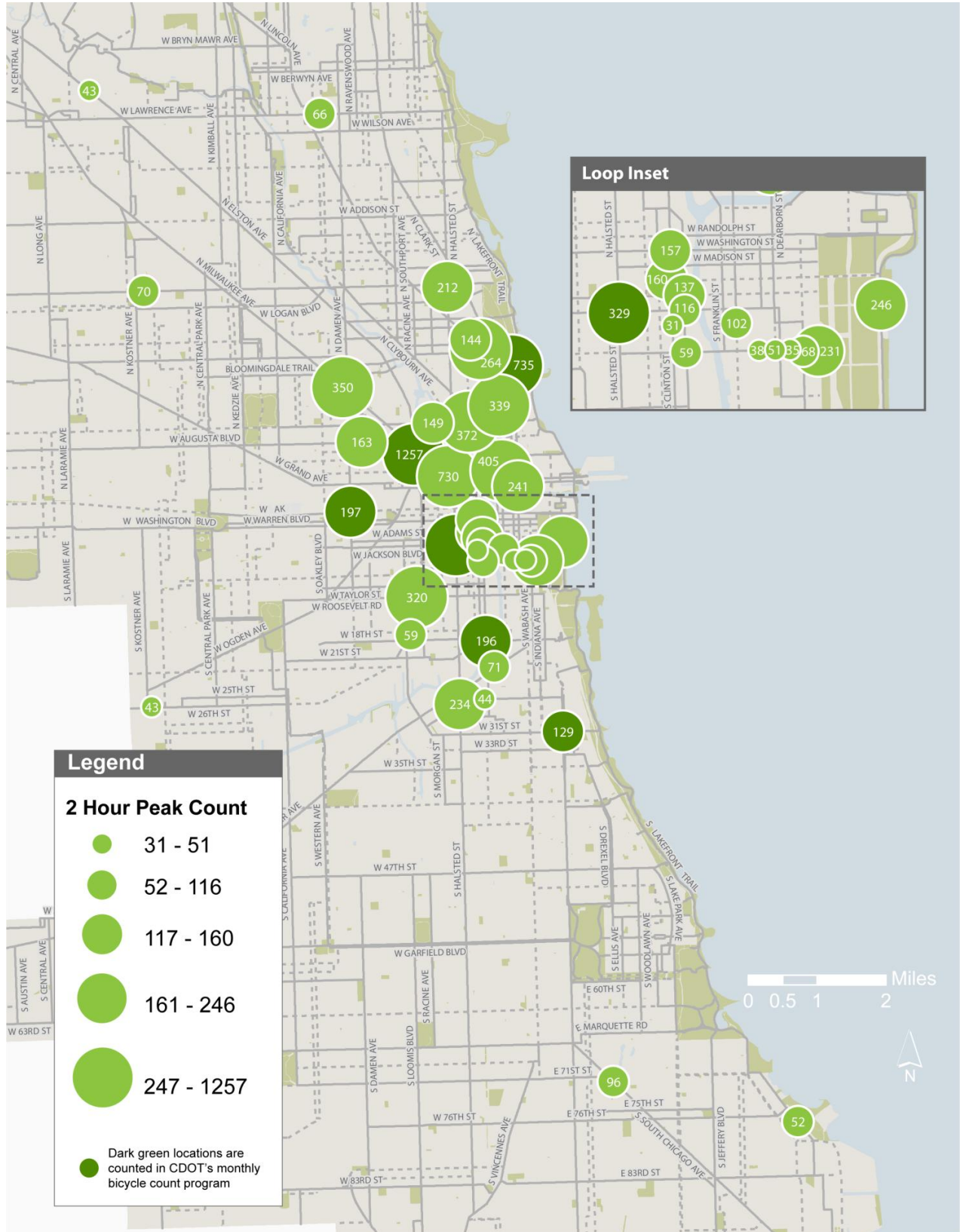


Figure Source: CDOT Bicycle Counts.

MONTHLY BIKE COUNTS AT SIX SITES

In 2012, the Chicago Bicycle Program began collecting monthly bicycle counts at six key intersections (Clark at Lincoln/Wells, Elston at Milwaukee, Lake at Damon, Jackson at Halsted, 18th at Canal, and King at 31st) and has continued this practice in 2013. These locations represent a diverse cross-section of geography, ethnicity and income. These sites were selected based upon planned bicycle projects, existing bike facilities, ease of implementation and current ridership.⁷

With a limited count history at these locations, it is not yet possible to examine annual trends and comparisons. Over time, these counts will allow for annual comparisons reflecting longer term change. The current dataset does allow us to better understand monthly and seasonal changes in ridership.

Figure 16 below shows combined bicycle volumes for all six count locations during the morning and afternoon peak periods. The data shows that more people choose to ride bikes in the warm months of June through September, yet thousands of people continue to ride through the harshest months of winter. Both men and women ride year-round, although the data shows that in all months, male bicyclists are over-represented compared to the general population of Chicago, which is 48% male.

Figure 16: 2012 Bicycle Volumes: Combined AM and PM Peak Periods (7-9am + 4-6pm)

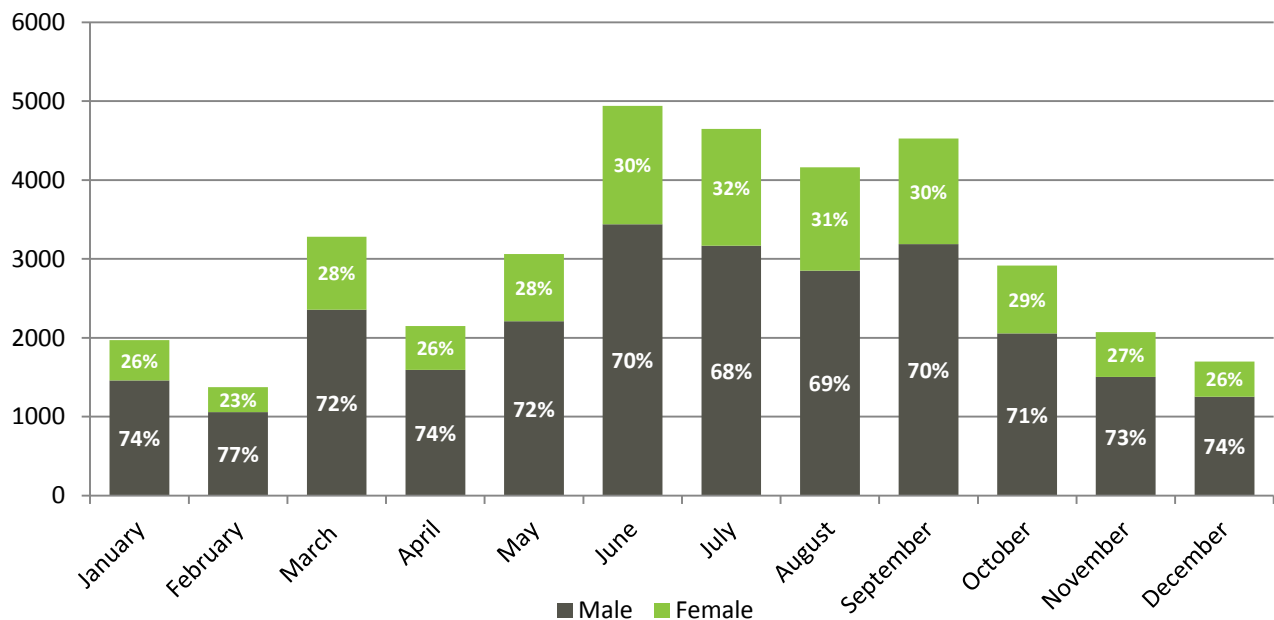


Figure Source: CDOT Bicycle Counts.

Figure 17 presents the bike counts averaged by season. As illustrated in the figure, average winter ridership volumes equal nearly 40% of average summer volumes. Women made up an average 25%

⁷ <http://chicagocompletestreets.org/your-streets/bikeways/bike-counts/>

of observed bicyclists during the winter months, compared to 31% during the summer months. Studies have shown that women are more sensitive to safety concerns while bicycling⁸. If winter conditions are less safe or feel less safe than summer months due to weather or bikeway maintenance practices, it may result in fewer women choosing to ride.

Figure 17: 2012 Average Bicycle Volumes by Season: Combined AM and PM Peak Periods (7-9am + 4-6pm)

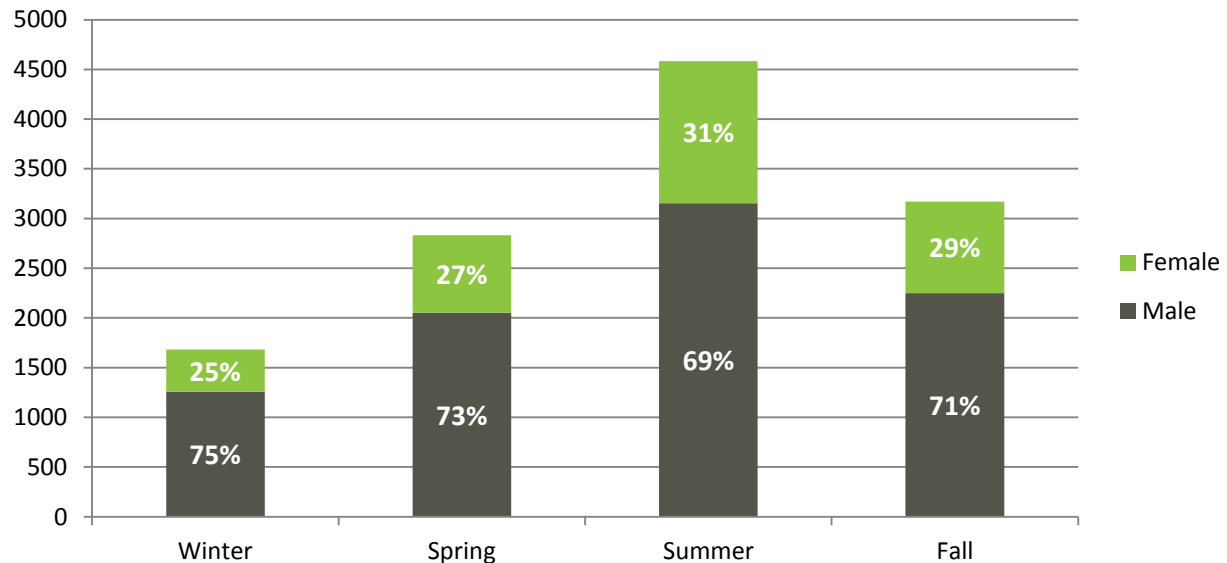


Figure Source: CDOT Bicycle Counts.

HISTORIC BICYCLE COUNT DATA

Table 4 below provides additional details about each data point included on the map, such as the time, month, and year of the count. Note that only manually counted locations include statistics on observed gender.

Table 4: City-wide Bicycle Volumes: 2 hour highs from counts conducted from 2008-2013

Location	Male Riders	Female Riders	2 Hour Peak Riders	Time Counted*	Month Counted	Year Counted
Elston and Milwaukee	891	366	1257	Morning	June	2012
Clark and Lincoln/Wells	469	266	735	Morning	August	2012
Milwaukee and Halsted	-	-	730	Morning	September	2009
Wells and Ontario	-	-	405	Morning	August	2010
Division and Larrabee	-	-	372	Afternoon	June	2010
Milwaukee and North	-	-	350	Morning	September	2010
Wells and Schiller	-	-	339	Morning	September	2009

⁸ Garrard, J., Rose, G., Lo, S.K., 2008. Promoting transportation cycling for women: the role of bicycle infrastructure. *Preventive Medicine* 46; Pucher, J., Dill, J., Handy, S., 2010a. Infrastructure, programs and policies to increase bicycling: an international review. *Preventive Medicine* 48

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Jackson and Halsted	242	87	329	Afternoon	June	2013
Roosevelt and Throop	-	-	320	Morning	June	2010
Lincoln and Dickens	-	-	264	Afternoon	August	2010
Lakefront Trail and Jackson	176	70	246	Afternoon	September	2011
Dearborn and Hubbard	-	-	241	Afternoon	July	2010
Halsted and 27th	-	-	234	Afternoon	September	2009
Michigan and Harrison	169	62	231	Afternoon	September	2011
Halsted and Diversey	-	-	212	Morning	June	2010
Lake and Damen	-	-	197	Afternoon	July	2013
18th and Canal	133	63	196	Afternoon	July	2013
August and Honore	-	-	163	Afternoon	July	2010
Monroe and Clinton	-	-	160	Morning	September	2011
Washington and Clinton	117	40	157	Morning	September	2011
Division and Cherry	-	-	149	Afternoon	June	2010
Lincoln and Dickens	-	-	144	Morning	November	2009
Adams and Canal	106	31	137	Afternoon	September	2011
King and 31st	87	42	129	Afternoon	July	2013
Jackson and Canal	88	28	116	Morning	September	2011
Van Buren and Wells	79	23	102	Afternoon	September	2011
South Chicago and 71st	-	-	96	Afternoon	August	2010
Archer and Cermak	-	-	71	Afternoon	September	2010
Diversey and Kildare	-	-	70	Morning	July	2010
Wabash and Harrison	47	21	68	Afternoon	September	2011
Lawrence and Leavitt	-	-	66	Afternoon	August	2010
Harrison and Canal	41	18	59	Morning	September	2011
Blue Island Ave and 16th	-	-	59	Morning	July	2010
South Shore Drive and 78th	-	-	52	Afternoon	August	2010
Plymouth and Harrison	37	14	51	Morning	September	2011
26th and Normal	-	-	44	Afternoon	September	2010
26th Ave and Pulaski	-	-	43	Afternoon	August	2009
Elston and La Crosse	-	-	43	Afternoon	May	2010
Clark and Harrison	28	10	38	Afternoon	September	2011
State and Harrison	24	11	35	Morning	September	2011
Van Buren and Clinton	25	6	31	Morning	September	2011

Figure Source: CDOT Bicycle Counts.

* Morning counts were conducted on a Tuesday, Wednesday or Thursday from 7-9 am. Afternoon counts were conducted on a Tuesday, Wednesday or Thursday from 4-6pm.

THE FUTURE OF BICYCLING IN CHICAGO

CONTINUED GROWTH OF BICYCLING IN CHICAGO

The City of Chicago Bike 2015 Plan⁹ calls for bicycle use to increase to 5% of all trips under five miles. Achieving and exceeding this goal is possible through a concerted effort to complete the bikeway network, continued success of Divvy bike share, and marketing bicycling as a preferred transportation option for Chicagoans.

A COMPLETED NETWORK

The Chicago Streets for Cycling 2020 Plan presents a citywide network of Spoke, Crosstown and Neighborhood Bike Routes designed to provide the option to bicycle to all Chicagoans. As evidenced from other cities, completing the bikeway network across the city is likely to result in a corresponding increase in bicycling. This growth in bicycling may be due to meeting the unmet demand for bicycling present today as well as convincing non-bicycling Chicagoan’s who previously would not consider bicycling to identify the activity as a safe, comfortable and viable alternative for traveling. In either case, more bikeways are likely to translate into more bicycling.

EVIDENCE FROM PORTLAND, OREGON

In the city of Portland, Oregon the Willamette River bridges act as a portal to downtown jobs from the more residential east side. Many trips to downtown must cross this river, and bridge bicycle traffic is used as one indicator of overall bicycle use in the city. Annual counts of bridge bicycle traffic since 1991 reveal a dramatic increase in ridership which corresponds with a steadily growing network of bikeways throughout the city.

Figure 18: Combined Bicycle Traffic over Four Main Portland Bicycle Bridges and Bikeway Miles¹⁰

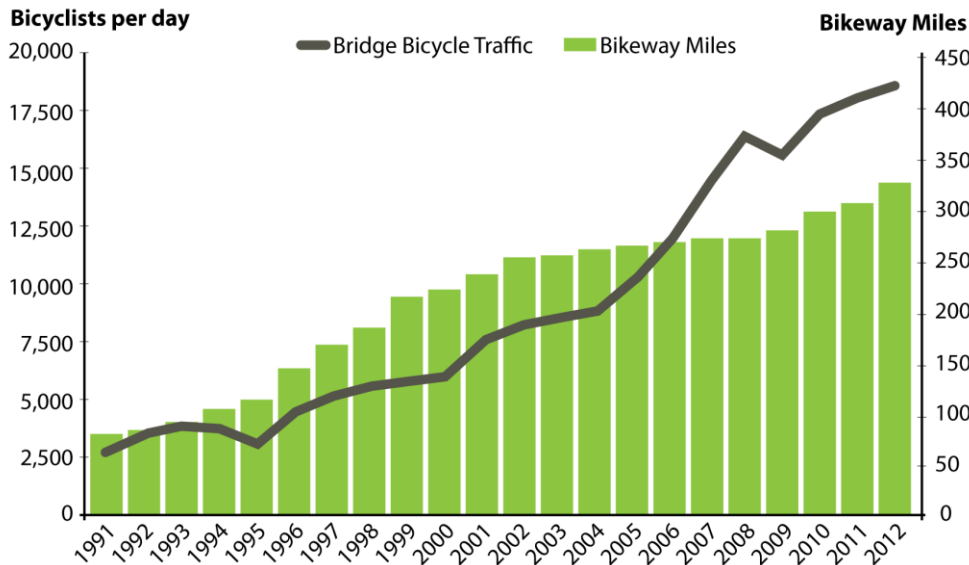


Figure Source: City of Portland Bicycle Count Report 2013.

⁹ City of Chicago. Bike 2015 Plan. January 2006.

¹⁰ Adapted from City of Portland. 2012 Bike Count Report. 2013.

THE BIKE SHARE BOOST

Regular bike commuters make up only one part of Chicago’s future growth in bicycling. Social, spontaneous, and casual ridership is also likely to increase thanks to the Divvy bike sharing system.

While citywide bike sharing systems are new in the US, the Capital Bikeshare program from the Washington D.C. area launched in 2010 is one of the country’s most mature systems. Experiences and trends from Capitol Bikeshare offer a glimpse of the potential of Divvy to increase bicycling trips over time. Ridership history for Capitol Bikeshare is graphed below in Figure 19.

Similar to the 2012/2013 Chicago bike counts, Capitol Bikeshare ridership fluctuates monthly to correspond with seasonal variation. However, year-over-year growth had continued across all seasons. Growth has increased so that winter ridership in 2013 is only slightly below peak summer ridership two years earlier.

If Divvy ridership follows a similar pattern, it will continue to play an increasing role in trip making by bicycle in Chicago.

Figure 19: Capital Bikeshare Record of Monthly System Wide Trips¹¹

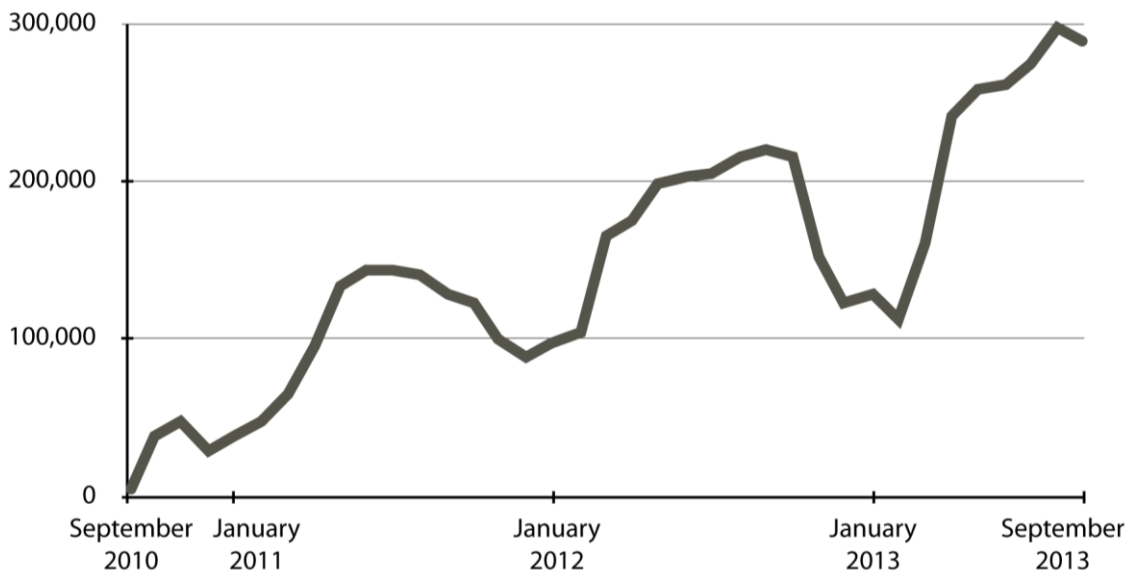


Figure Source: Capital Bikeshare Dashboard.

¹¹ Retrieved and adapted from Capital Bikeshare Dashboard.
<http://cabidashboard.ddot.dc.gov/CaBiDashboard/> November 2013

MONITORING OUR PROGRESS

Moving forward the Chicago Bicycle Program should continue to count at the same six locations to allow for annual comparison.

Increasing capacity of the count program may also allow counting at additional sites. For example, new count sites could be added in advance of planned bikeway investments. Monitoring before and after effects of new or enhanced bikeways may help quantify the benefits such investments bring.

GETTING TO 5% AND BEYOND

As described above, achieving Chicago's mode share targets is possible by completing the bikeway network, continued promotion of Divvy bike share, and continued marketing bicycling as a preferred transportation option for Chicagoans.

Like Chicago, other cities have mode-share targets for biking and walking. The City of Portland adopted mode share target is for 25% of trips by bicycle by 2030¹² and the City of Vancouver, BC has adopted a target of at least half of all trips be by foot, bike or transit by 2020.¹³

Achieving a 5% or higher bicycle mode share will bring increased benefits to Chicago in the form of reduced VMT and greenhouse gas emissions. Estimates for the total level of trip making and resulting benefits are provided in Table 5.

Table 5: Potential Future Bicycling Benefits

Benefit Type	Current Estimate (1.57% Mode Share)	Future Estimate (5% Mode Share Scenario)	Future Estimate (10% Mode Share Scenario)
Annual Commute to Work Bicycle Trips	9,611,794	30,595,000	61,189,000
Annual Bicycle Trips (Estimated for All Trips)	45,477,000	144,760,000	289,510,000
Annual Miles Bicycled	100,323,000	319,330,000	638,660,000
Annual VMT Reduced	56,015,000	178,300,000	356,590,000
CO2 Emissions Reduced (pounds)	45,569,000	145,050,000	290,090,000
Other Vehicle Emissions Reduced (pounds)	1,818,000	5,787,000	11,573,000

Table Source: CMAP 2010, ACS 2007-2011, NHTS 2009, SRTS 2009, EPA 2007

The important factor to consider with these future assumptions is not the accuracy of the mode share percentages, but the benefits that would accrue to Chicago if those numbers are reached. As more cities across the country track changes in bikeway mileage over time and participate in annual bicycle counts, more data will be available to better understand and refine mode share predictions.

¹² City of Portland. Bike Plan for 2030. 2010.

¹³ City of Vancouver, Transportation 2040.