Valuing

Bicycling's Economic and Health Impacts in *Wisconsin*

Estimating the value of bicycling to tourism and health in Wisconsin and reviewing the potential to increase that value in the face of changing demographics, lifestyles, and economy

Prepared for
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Overview

More than 49% of Wisconsin residents engage in bicycling for recreation, according to the 2005-2010 Wisconsin Statewide Comprehensive Outdoor Recreation Plan (WI DNR, 2006). Wisconsin's extensive network of bicycle trails and scenic country roads helped the state be named #2 in the nation for bicycling in 2009 by the League of American Bicyclists. The state is home to Madison, one of only ten gold-level bicycle-friendly communities designated by the League of American Bicyclists. In addition, LaCrosse and Milwaukee have been awarded the bronze-level designation.

Bicycling enjoys a long history in Wisconsin. County construction of bicycle paths was authorized by the Wisconsin legislature in 1901, and bike lanes on roads have been in use since at least the early 1940s (WI DOT, n.d.). From 1993 to 2008, Wisconsin invested nearly $40 million of state and local funds in bicycle projects, with an additional $156 million contributed by the federal government (WI DOT, 2008). This infrastructure has served to improve the safety and convenience of bicycling for Wisconsin residents, as well as attract non-residents bicycle tourists.[1]

Bicycle vacations are growing in popularity, and bicycle transportation as a replacement for driving is increasingly recognized as having the potential to benefit personal health and fitness, improve air quality, and decrease greenhouse gas emissions in the state of Wisconsin. This study assesses the economic and health benefits of bicycling recreation in the state as well as the demographic trends characterizing current and future cyclists. It builds upon a 2006 study prepared for the Governor's Bicycle Coordinating Council by the Bicycle Federation of Wisconsin and the Wisconsin Department of Transportation titled *The Economic Impact of Bicycling in Wisconsin*. This previous study estimated that the economic impact of bicycle manufacturing, sales, and services in Wisconsin totaled $556,468,956 (2006 dollars).

This study estimates the economic impact of bicycle recreation and tourism in Wisconsin to be $924,211,000, and the total potential value of health benefits from reducing short car trips and increasing bicycle trips to total $409,944,167. The results of this study demonstrate that bicycling has the potential to contribute substantially to the health and economic well being of Wisconsin citizens. Understanding the demographics of current and future cyclists will help us target investments in bicycling infrastructure to maximize these benefits.

This study was commissioned by Wisconsin Representative Spencer Black, chair of the Assembly Natural Resources Committee. The assessment was completed as a capstone project for a National Science Foundation IGERT[2] interdisciplinary graduate certificate program on humans and the global environment (CHANGE) at the University of Wisconsin-Madison.

[1] Wisconsin currently ranks first in the nation in bicycle infrastructure, according to the League of American Bicyclists.
[2] IGERT is the NSF Integrative Graduate Education and Research Traineeship

I. Economic Impact of Bicycle Tourism & Recreation

Bicycling is one of the most popular outdoor recreation activities in the state and contributes significantly to Wisconsin's economy (WI DNR, 2006; Bicycle Federation of Wisconsin and WI DOT, 2006).[3] In addition to purchasing equipment, resident and non-resident recreational bicyclists support economic activity through expenditures on food and beverages, entertainment, transportation, accommodation, government fees, and other retail shopping while bicycling. This chapter quantifies the impact of such activity on the state's economy in terms of output and employment.

In the following section we lay out our methodology for determining the economic impact of bicycle recreation in Wisconsin. An overview of the economic impact analysis is as follows:

1. **Quantify Number of Bicycle Person-Days**
   - Determine number of resident and non-resident cyclists in Wisconsin annually
   - Determine the nature of their bicycling activities (road bicycling, trail bicycling, events, tours)
   - Determine the average number of days each cyclist bicycles per activity

2. **Determine Average Expenditure of Bicyclists**
   - Approximate the average expenditures for Wisconsin residents and non-residents for each type of bicycling trip (road bicycling, trail bicycling, events, tours).
   - Break average daily expenditures into categories to reflect the industries that they impact directly (e.g., food and beverage, entertainment, non-bicycle transportation, lodging, etc.)

3. **Model Total Economic Impacts Using Input/Output Model**
   - Multiply expenditures of bicyclists in Wisconsin (categorized by resident/non-resident and type of bicycling activity) times the number of bicycling person-days.
   - Input direct expenditures into input-output model to determine indirect and induced effects.

A detailed explanation of each component is provided below.

METHODS

Number of Bicycle Person-Days

The most difficult information to acquire is the number of days annually that people spend recreationally bicycling in Wisconsin. For simplicity, we refer to this as the annual "person-days" bicycling, which implies one person bicycling for at least part of one day for recreation. For example, if one person engages in five two-day bicycling trips over the course of a year, this translates into ten person-days.

According to the 2002 National Household Transportation Survey, 35,675,172 bicycle trips for social/recreational purposes were taken by Wisconsin residents in 2001, with an average trip length of 2.31 miles (USDOT 2001). Because many of these trips were short (less than 5 miles), it is probable that

[3] Bicycling is 12th in popularity out of 95 outdoor recreation activities, and is more popular than swimming, fishing, camping, running or jogging, golfing, hunting, snowmobiling, and skiing.

they did not contribute significantly to economic activity. Thus the statistic from the National Household Transportation Survey represents an upper bound to our estimates of recreational bicycling trips by Wisconsin Residents.

In 2007, overnight person-visits in Wisconsin totaled more than 38 million, with approximately 75% of these visits for leisure purposes (Davidson-Peterson Associates, 2008). Given the popularity of bicycling (a 1987 study by Gray, Hamilton, and Mistele estimated 22% of visitors to the Northwoods engaged in bicycle touring), a reasonable estimate of overnight visitors recreationally bicycling in Wisconsin would total more than 6 million. Yet such an estimate neglects locals and day-trippers who take recreational bicycling trips.

An alternate method for estimating the amount of recreational bicycling in Wisconsin is to sum available data on cyclist sub-populations. This is the primary method used for this study. To do so, we divided bicycling recreation into four main categories, which are then subdivided by whether the participants are Wisconsin residents or non-residents. The four groups are:

1. Bicyclists on roadways
2. Bicyclists on trails
3. Bicyclists at single day events/tours
4. Bicyclists on multi-day events/tours

<u>Number of Bicyclists on Roadways</u>

A 2005 University of Wisconsin-Madison report by Carleyolsen, Meyer, Rude, and Scott estimated the number of non-local trail and road cyclists in Jefferson County to be 146,817 annually. From the study's estimates of non-local cyclists and the total number of recreationists on Jefferson County roadways, we approximate the total number of road cyclists in Jefferson County to be 110,000 annually.

One way to estimate the number of cyclists on roadways in the entire state of Wisconsin is to extrapolate this number directly to all of Wisconsin's 72 counties, assuming that each county attracts the same number of cyclists. This would yield a total of 7,920,000 recreational cyclists on roadways in Wisconsin. However, we know that not all counties have the same number of cyclists on their roadways, and that the number of cyclists may be, in part, a function of the miles of roads in the county that are well-suited for bicycle touring relative to other counties. Thus, one way to extrapolate Jefferson County's road cyclist estimate to Wisconsin as a whole is to determine what proportion of Wisconsin's best bicycling roads lie in the county.

According to the Wisconsin Department of Transportation, Wisconsin has a total of 16,362 county roads rated "best" or "moderate" for bicycling. Of these, 196.5 miles (or 1.2%) lie in Jefferson County. Given that Jefferson County contains 1.2% of Wisconsin's best bicycling roadways, we find by extrapolating based on this proportion yields a total of 9,159,190 bicycling-days on roads in Wisconsin.[4]

In order to estimate the number of road cyclists that are Wisconsin residents, we used the percentage given in Schwecke, Sprehn, and Hamilton's 1988 report, *A Look at Visitors on Wisconsin's Elroy-Sparta Bike Trail,* which is 51.3% residents and 48.7% non-residents. This corresponds to 4,698,665 Wisconsin resident bicycling days, and 4,460,526 non-resident bicycling days.

[4] The precise percentage of miles of best or moderate county roads in Jefferson County is 1.2009795%.

Number of Cyclists on Trails

In order to estimate the number of cyclists on Wisconsin trails, we used data from the 2008 Wisconsin Department of Natural Resources (DNR) Trail Pass Survey. The survey asks trail pass holders to indicate how many times a year they use DNR trails, whether they bring children along, to list and rank their primary forms of recreation, and other demographic information. From this data, we were able to approximate the number of bicycle person-days on DNR trails to be 1,226,747.

We then extrapolated this number to the rest of Wisconsin's bicycle trails, including locally-managed trails and state trails not requiring trail passes. This was done by first summing the number of miles of state trails and locally managed trails open to bicyclists, which is 1,915.1 miles.[5] Then we summed the miles of trails requiring trail passes, which is 636.5 miles. Thus the number of miles of trail requiring trail passes for bicyclists represents 33.2% of all miles of trails open to cyclists in the state of Wisconsin. Using this percentage and assuming that our estimate of person-days on trails requiring trail passes is directly proportional, we estimated the total number of person-days bicycling on trails in Wisconsin to be 3,691,034. To calculate the number of trail cyclists that are residents versus non-residents, we averaged the percentage of non-resident cyclists on the Elroy-Sparta trail with the number of "non-locals" (cyclists traveling more than 50 miles to a trail) from a recent study of cyclists in national forests by Stynes and White (2006).

Number of Cyclists on Single-Day Events/Tours

To estimate the number of cyclists participating in single day events and single day tours, we conducted a survey of randomly-selected events and single-day tours in Wisconsin. Supplemental data was gathered from the 2009 Bikes Belong survey (for Wisconsin single-day tours only) and several events' websites. This data is presented in Appendix B.

Using data from our sample, we multiplied by the number of single-day events and tours found in the Bicycle Federation of Wisconsin's 2009 *Ride Guide*, as well as additional events found online. We estimate the number of bicycle person-days in this category to be 81,206, with 62.5% Wisconsin residents.

Number of Cyclists on Multiple-Day Tours

To estimate the number of cyclists participating in multiple day tours, we conducted a survey of randomly-selected multiple-day tours in Wisconsin. Supplemental data was gathered from websites. This data is also presented in Appendix B.

Using data from our sample, we multiplied the number of cyclists on each tour by the length (in days) of the tour, and then summed our results to get the total number of person-days. We then took the weighted average of person-days per tour and multiplied this by the number of multiple-day tours identified with the assistance of the Bicycle Federation of Wisconsin.

We estimate 62,217 person-days are spent on multiple-day tours in Wisconsin annually. 48.1% of these are Wisconsin resident.

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5 The total miles of state trails (trails in parks, forests, recreation areas, and "state trails") is found by summing the miles in the categories "bicycle touring trails" and "off-road bike trails" as reported in the DNR's "Wisconsin State Park System" publication (number PR002-09). This publication also reports how many miles require trail passes for bicycling. The total miles of locally-managed trails is found in the Governor's Bicycle Coordinating Council and Wisconsin Department of Transportation's 2006 *Economic Impact of Bicycling in Wisconsin* report.

Average Expenditures of Bicyclists in Wisconsin

Numerous studies have been performed to calculate the average daily expenditures of bicyclists. For road cyclists, we combined three statistics that are most applicable to the characteristics of road cyclists in Wisconsin.

The first statistic applies to the road cyclists characterized as “athletic.” A 2006 study on “athletic” bicycle tourists in Quebec estimated daily expenditures to be nearly $75 per day (after converting to US dollars and adjusting for inflation). Quebec’s “athletic” bicycle tourists spent more days vacationing by bicycle per year than average bicycle tourists, and were much more likely to choose tourist accommodations (bed-and-breakfasts, hotels, motels, etc) than typical bicycle tourists. We assume that this statistic closely matches the expenditures of many road cyclists in Wisconsin, as we assume that athletic cyclists generally prefer roads over trails due to distance and speed preferences. (For example, the Ironman Wisconsin bicycle course is solely on roadways, and attracts athletic cyclists.)

Not all cyclists on roadways can be characterized as “athletic” – many are casual vacationers or locals recreating. The 2005 University of Wisconsin study on Jefferson County estimated that 20% of road cyclists are locals living within the county. These cyclists are typically on short rides and spend an average of $4 per day. We therefore estimated that 20% of Wisconsin road cyclists are locals spending $4 per day, 40% are athletic tourists spending $75 per day, and 40% have a spending profile similar to Wisconsin trail cyclists of approximately $18 per day (described below). For non-resident road cyclists, we averaged the expenditures of athletic cyclists ($75) and non-resident trail cyclists (approximately $34).

For trail cyclists, we relied on a combination of the Elroy-Sparta study and the 2006 national forests study, both adjusted for inflation. These studies estimate that resident and non-resident cyclists on the Elroy-Sparta trail spent $21.97 and $32.13, respectively, while national forest resident and non-resident cyclists spent $14.01 and $35.77, respectively. We assumed that the expenditures from the Elroy-Sparta study would be most representative of cyclists on state trails, while the data from the national forest study would apply better to mountain bikers at state parks, forests, and recreation areas. To determine the overall spending levels of resident and non-resident trail cyclists, we averaged these two datasets.

To estimate expenditures for single-day event and multiple-day tour cyclists, we combined estimated expenditures from the Elroy-Sparta study with the daily average of event/tour fees.

Our findings are reported in the table below.

Table 1. Average Cyclist Expenditures per Recreational Trip

Expenditures		
Bicycling Activity	**Resident Daily Expenditure**	**Non-Resident Daily Expenditure**
Roadways	$39.57	$53.55
Trails	$17.99	$33.95
Single-Day Bike Events/Tours	$76.17	$76.17
Multi-Day Tours	$80.84	$80.84

Total Economic Impact Modeling

Economic impact resulting from bicycle recreation and, more specifically, bicycle tourism from out-of-state bicyclists, can be estimated using an input-output model such as IMPLAN (IMpact analysis for PLANning). Input-output modeling is the most commonly used method to assess the economic impact of tourism by many other states as well as at the national level.[6] An input-output model is a mathematical model that contains datasets describing an economy's inter-industry linkages. The model's databases are constructed from top to bottom using standardized secondary data sources that are internally consistent and use regional purchase coefficients for trade adjustments. (Shaffer, Deller, and Marcouiller 2004)

Because input-output modeling illuminates the inter-sectoral linkages of an economy, it can be used to measure impacts as they reverberate through the economy. Most industries are linked to multiple other industries through the purchase of intermediate inputs. For example, restaurants are linked to food processing firms and agriculture, as well as manufacturing, real estate, and other sectors. Thus many sectors indirectly rely on the revenue generated through final sales to consumers. Using this model, we can measure the degree to which the state's economy is directly and indirectly supported by bicycle tourism.

IMPLAN estimates the cumulative impact of a "shock" to one sector of the economy on the economy as a whole. The cumulative impact is measured in terms of changes in sales, tax revenues, and jobs ("direct impacts"); secondary effects on suppliers of an industry ("indirect impacts"); and the effects resulting from changes in household income ("induced impacts"). Thus input-output models trace the flow of money as it circulates through an economy to measure the total economic impact. (Stynes 1999).

[6] Department of Community Development and Applied Economics, The University of Vermont, Vermont Tourism Data Center, School of Natural Resources, The University of Vermont. (n.d.). IMPLAN Methodology for the Study of the Impact of Tourism on the Vermont Economy.

Indirect and Induced Impacts

In order to determine the indirect impacts, we must also know how cyclists' daily budgets are allocated (e.g., what proportion goes to lodging, food, souvenirs, etc.) We obtained estimates for these categories of expenditures from the Jefferson County study as well as the national forest study. These proportions are reported in Appendix C.

We then allocate total expenditures to the appropriate categories to and input this data into IMPLAN to obtain indirect and induced impacts.

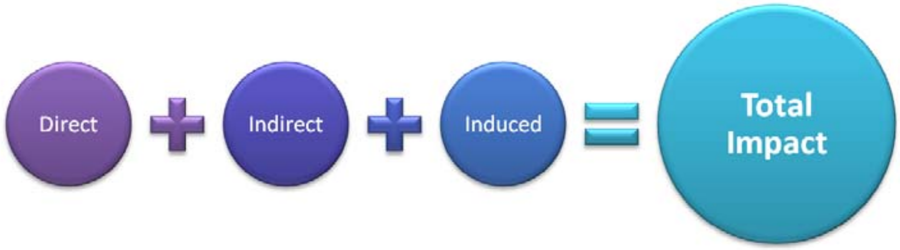

Figure 1. Components of Total Impact

RESULTS

Compiling the data on the number of cyclists and their average expenditures allows us to find aggregate direct economic impacts. Direct economic impact resulting from 12,993,647 days of bicycle recreation in Wisconsin totals $532,883,557.

Table 2. Direct Economic Impacts from Tourist and Recreational Bicycling

Summary of Direct Economic Impacts						
	Person Days		Expenditures		Direct Economic Impact	
Bicycling Activity	Resident Bicycle Person Days	Non-Resident Bicycle Person Days	Resident Daily Expenditure	Non-Resident Daily Expenditure	Direct Impact Residents	Direct Impact Non-Residents
Roadways	4,698,665	4,460,526	$39.57	$53.55	$185,926,157	$238,861,147
Trails	1,781,293	1,909,741	$17.99	$33.95	$32,045,462	$64,835,708
Single-Day Bike Events/Tours	50,754	30,452	$76.17	$76.17	$3,865,913	$2,319,548
Multi-Day Tours	29,926	32,291	$80.84	$80.84	$2,419,248	$2,610,374
Total	12,993,647				$224,256,780	$308,626,777
GRAND TOTAL					$532,883,557	

Using IMPLAN, we find the total economic impact (direct + indirect + induced) to be more than $924 million, which translates into 13,193 full-time-equivalent jobs. This data is summarized in the tables below, and detailed results (by two-digit NAICS code) are provided in Appendix D.

Table 3. Total Economic Impact (Output)

Output Impact				
	Direct	Indirect	Induced	Total
Wisconsin Resident	$224,256,800	$76,443,420	$87,966,590	$388,666,800
Non-Resident	$308,626,800	$105,832,000	$121,085,400	$535,544,200
Total	$532,883,600	$182,275,420	$209,051,990	
GRAND TOTAL				**$924,211,000**

Table 4. Total Economic Impact (Employment)

Employment Impact (full-time equivalent jobs)				
	Direct	Indirect	Induced	Total
Wisconsin Resident	4,171	595	786	5,552
Non-Resident	5,740	818	1,082	7,640
Total	9,911	1,414	1,868	
GRAND TOTAL				**13,193**

SCENARIO ANALYSIS

Below we report economic impact projections based on increasing non-resident bicycle tourism, as well as increasing all (non-resident and resident) bicycle recreation by 10% and 20%.

Table 5. Scenario Analysis Results

Scenario Analysis: Potential Impact from Increasing Bicycle Tourism and Recreation					
	Base Case: Current Economic Impact	Non-Resident Bicycle Tourism		All Bicycle Recreation (Resident + Non-resident)	
		10% Increase	20% Increase	10% Increase	20% Increase
Total Output	$924,211,000	$977,765,400	$1,031,319,800	$1,016,632,100	$1,109,053,200
Total Employment	0	13,957	14,721	14,512	15,831
Net Output Increase	--	*$53,554,400*	*$107,108,800*	*$92,421,100*	*$184,842,200*
Net Employment Increase	--	*764*	*1,528*	*1,319*	*2,638*

CONCLUSIONS

Bicycle recreation currently supports more than $924 million in economic activity in Wisconsin, of which nearly $533 million is direct impact occurring annually. Of the combined impacts, more than $535 million is attributable to bicyclists from other states, representing an infusion of outside dollars into the state economy. Increasing non-resident bicycling by 20% has the potential to increase economic activity by more than $107 million dollars and create 1,528 full-time equivalent jobs.

In the current economic climate that encourages people to forego exotic vacations for trips closer to home, Wisconsin stands ready to attract increasing numbers of bicycle recreationists from the Twin Cities, Chicago, and other neighboring areas. Bicycle tourism may serve as an important economic development strategy for many areas in Wisconsin, particularly those endowed with significant natural amenities and able to invest in infrastructure and marketing activities.

The impact of bicycling is not limited to bicycle tourism from nonresident visitors. Increasing both resident and non-resident bicycling by 20% could have an even more significant effect on the state economy, creating $184 million in new economic activity and generating 2,638 additional jobs.

Policy Recommendations

Wisconsin has long been a leader in bicycling and is one of the few states to have created a position for a state bicycle and pedestrian safety program manager (DOT, n.d.). Numerous agencies and organizations exist in the state to promote bicycling, including the Bicycle Federation of Wisconsin, the Wisconsin Department of Transportation, and the Wisconsin Department of Tourism. In addition the University of Wisconsin – Extension continues to provide assistance to communities and regions developing bicycle tourism plans.[7] Our primary recommendation for helping communities benefit from bicycle recreation and tourism is to continue and augment this assistance. This includes coordinated marketing efforts, sharing information among communities regarding event planning, assisting communities in developing realistic expectations for economic impacts, and conducting cost-benefit analyses for bicycle infrastructure development.

Limitations and Caveats

Currently little data exists on the total number of cyclists and their expenditures in Wisconsin. Similarly, there is little reliable information concerning preferences of Wisconsin cyclists by demographic group. Given resource and time constraints for our study (three months), we were unable to conduct a representative survey of cyclists in Wisconsin to obtain this information. We therefore relied heavily upon data from other geographic locations and from surveys conducted in the past. We cannot guarantee the accuracy of these studies, nor that they can be perfectly applied to the entire state of Wisconsin. However, given these limitations, we feel that our results are reasonable. Yet we strongly recommend that additional studies be conducted in the future that include the collection of primary data through surveys, interviews, and other methods.

Caution should be exercised when interpreting the results of this study, particularly the economic impacts. While direct effects are immediate, indirect and induced effects may take years to filter through the economy. In terms of job creation, the type and quality of jobs is not specified. New jobs could consist of numerous low-wage seasonal or part-time positions, rather than long-term, highly-paid positions.

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[7] See for example, Cycle Southwest Wisconsin (www.cyclesouthwestwisconsin.com)
http://www.uwex.edu/ces/cced/economies/tourism/documents/TourismTopicBikeTrail031609.pdf

These results reflect aggregate impacts for the state of Wisconsin. The actual economic impacts of increased bicycle tourism may vary significantly by community, based on the tourism amenities the community already possesses, the type of cyclists that it is able to attract, and competition from other nearby communities. It should be noted that this study is not a cost-benefit analysis, and is not intended to compare potential benefits of bicycle recreation to costs of constructing and maintaining bicycle infrastructure. Moreover, it should be kept in mind that investing in additional bicycle infrastructure or holding bicycle events is not in itself guaranteed to attract cyclists to a community, and may pull in bicycle tourists from neighboring areas rather than attracting new people to the region.

II. Valuing Bicycling's Impact on Health

PERSONAL FITNESS

According to the National Household Transportation Survey, 40% of U.S. automobile trips are less than 3.2 km; over one-quarter are less than 1.6 km (DOT 2001). Reliance on cars, even for these short trips has meant less physical activity and tightening waistbands. Almost 60% of people living in Wisconsin do not meet physical activity recommendations, and over 60% of people living in Wisconsin are overweight or obese (CDC 2005). One solution to this lack of physical activity is taking advantage of more active forms of transportation, such as bicycling and walking. Many of these short car trips to work could be replaced by walking or bicycling, so people would be able to incorporate physical activity into daily life. This section estimates the health benefit for the people of Wisconsin from increased bicycling to work.

Methods

Benefits to health are possible if short car trips are replaced with walking or bicycle trips. Quantitative estimates of varying levels of physical activity are included within the WHO Comparative Risk Assessment (CRA). Applying CRA criteria, the commute distances across our the cities in Wisconsin would place potential "active transport" commuters into the CRA's category of "sufficiently active" individuals — that is, those who acquire at least 150 minutes of moderate-intensity physical activity or 60 minutes of vigorous-intensity physical activity a week. According to the CRA, the benefit to health would reduce risk of ischemic heart disease by 47%, reduce risk of stroke by 39%, risk of breast cancer for women by 34%, risk for colon cancer by 43%, and risk for type II diabetes by 31% (Bull et. al. 2004). This would be especially beneficial in Wisconsin where, according to the Center for Disease Control and Prevention, on average 44.9% of adults do not meet recommended levels of physical activity (BRFSS 2007).

Results

Applying the CRA outcomes to the Metropolitan Statistical Area (MSA) of Madison, WI and assuming everyone meets the recommended levels of physical activity, results in $6,077,390 of savings from reduced cases of breast cancer, $10,968,268 savings from reduced cases of colorectal cancer, $46,229,730 savings from reduced number of strokes, $29,749,437 savings from reduced cases of heart disease, and finally $68,959,156 in savings from reduced cases of diabetes mellitus type II. However, 49.7% of Madison residents are not meeting the physical activity recommendations, so if all "sedentary" residents of Madison meet the recommended level of physical activity, about $80.5 million could be saved due to reduced morbidity and healthcare costs (Table 6). Similarly, by applying the CRA outcomes to the Metropolitan Statistical Area of Milwaukee, the result is $22,404,963 in savings from reduced cases of breast cancer, $47,219,669 in savings from reduced cases of colorectal cancer, $34,284,967 in savings from reduced number of strokes, $119,271,759 in savings from reduced cases of heart disease, and finally $257,836,890 in savings from reduced cases of diabetes mellitus type II if everyone in Milwaukee met the recommended levels of physical activity (Table 6). Therefore, if residents of Milwaukee not meeting the recommended levels of physical activity (49.7%) were to meet the standards, about $239 million could be saved due to reduced morbidity and healthcare costs. Adding the total monetary savings in Madison and Milwaukee results in savings of over $319 million. This savings is only to the two largest cities in the state, not including the rest of the residents in Wisconsin. If more residents of the state living outside these two cities incorporate the recommended levels of physical activity into their daily routines, even more money could be saved.

Table 6. Savings in Madison and Milwaukee from reduced healthcare costs if sedentary people meet recommended physical activity standards

	Madison	Milwaukee
Breast Cancer		
Prevalence	1,755	6,470
Cost per Case	$10,185	$10,185
Total Cost	$17,874,675	$65,896,950
34% Reduction in Costs	$6,077,390	$22,404,963
Colorectal Cancer		
Prevalence	1,075	4,628
Cost per Case	$23,728	$23,728
Total Cost	$25,507,600	$109,813,184
43% Reduction in Costs	$10,968,268	$47,219,669
Stroke		
Prevalence	8,398	3,081
Cost per Case	$14,115	$28,533
Total Cost	$118,537,770	$87,910,173
39% Reduction in Costs	$46,229,730	$34,284,967
Heart Disease		
Prevalence	1,475	5,275
Cost per Case	$42,913	$48,108
Total Cost	$63,296,675	$253,769,700
47% Reduction in Costs	$29,749,437	$119,271,759
Diabetes		
Prevalence	23,661	88,468
Cost per Case	$9,402	$9,402
Total Cost	$222,448,892	$831,731,902
31% Reduction in Costs	$68,959,156	$257,836,890
Totals		
Total Reduction in Costs	$161,983,981	$481,018,248
Physically Inactive MSA	49.7%	49.7%
Total Potentially Saved	**$80,506,039**	**$239,066,069**
GRAND TOTAL	**$319,572,108**	

AIR QUALITY AND HUMAN HEALTH

Thirty to sixty percent of pollution from automobile emissions (particularly VOCs and carbon monoxide) occurs in the first few minutes following "cold starts," before pollution-control devices work effectively. Therefore, short trips cause more pollution per mile than longer trips. Nearly 300 cities (over 130 million people) exceed the health-based eight-hour ozone standards of the Environmental Protection Agency (EPA) and over 200 counties (over 88 million people) are in non-attainment of the EPA's health-based fine particulate matter ($PM_{2.5}$) standards, attributable, in part, to pollution from short car trips. In Wisconsin, nine counties are in nonattainment for EPA's health-based National Ambient Air Quality Standards (NAAQS) for 8-hr ozone pollution. Additionally, three Wisconsin counties are in nonattainment for EPA's health-based NAAQS for 24-hr PM2.5 pollution (EPA 2008 and EPA 2009). This section estimates the benefit to human health and economy from reduced air pollution, (particulate matter and ozone) using EPA's BenMAP program, from reduced short car trips and increased short bicycle trips for the two largest metropolitan statistical areas in the state of Wisconsin, Milwaukee and Madison.

Methods

Utilizing recent research conducted by Grabow et. al., we estimated the health and economic benefit to reducing 20% of urban and suburban short car trips (<8 kilometers) in Milwaukee and Madison. Though this estimation does not include an assessment of the entire state, we have results from reducing short car trips in the two largest metropolitan statistical areas, which still could have substantial results on health outcomes and the economy. By reducing vehicle miles traveled in these two cities, fine particulate matter ($PM_{2.5}$) is reduced by a total of 0.30 $\mu g/m^3$ (Grabow et. al. 2010 in press). Though this is seemingly a small reduction in $PM_{2.5}$, the health impact is quite staggering. Grabow et. al. estimated annual human health and monetary outcomes associated with modeled pollution reductions using the Benefits Mapping Analysis Program created by the EPA. From selected peer-reviewed papers using health impact dose-response functions, BenMAP calculates the relationship between hourly and seasonal pollution levels and specific health endpoints. These health impact functions relate a change in concentration of a pollutant to a change in incidence of a health endpoint, derived from estimated relationships between concentration of a pollutant and adverse health effects anticipated for a given population. A simplified example of this function is:

Health Effect = Air Quality Change × Health Effect Estimate × Exposed Population × Health Baseline Incidence

For this study, they looked at mortality, asthma exacerbations, chronic bronchitis, hospital admissions, acute myocardial infarctions, work loss days, acute and chronic respiratory infections, upper and lower respiratory infections, and school loss days.

Based on the model output of health effects, BenMAP further calculates monetary estimates associated with change in health outcomes by using economic valuation functions:

Economic Value = Health Effect × Value of Health Effect

This calculation assigns a monetary value to the reduction of adverse health effects in terms of decreased costs.

Results

For both Madison and Milwaukee combined, results show that reducing short car trips by 20% could substantially reduce morbidity and mortality in addition to reducing health care costs. Decreasing the amount of fine particulate matter ($PM_{2.5}$) between the cities of Milwaukee and Madison could reduce asthma exacerbations by about 110 cases, resulting in a savings of $6,000 per year, reduce nonfatal acute myocardial infarctions and cardiovascular hospitalizations by about 20 cases, resulting in a savings of over one million dollars, reduce chronic bronchitis by almost 4 cases for a savings of almost 1.5 million dollars, reduce respiratory symptoms, hospital admissions, and emergency room visits by almost 5,000 cases for a savings of over $300,000, and finally reduce mortalities by almost 16 cases for a savings of more than $80 million (Table 7).

Table 7. Health and Economic Benefit of Decreased PM2.5 in Milwaukee and Madison

MSA	Due to Decrease in PM 2.5	Mortality	Asthma Exacerbation
Madison	Fewer Annual Cases	1.79	14.96
	Annual Dollars Saved	$ 8,890,000	$ 1,000
Milwaukee	Fewer Annual Cases	14.99	96.62
	Annual Dollars Saved	$ 74,170,000	$ 5,000

MSA	Chronic Bronchitis	Respiratory Symptoms, Hospital Admissions & ER Visits	Nonfatal Acute Myocardial Infarctions & Cardiovascular Hospitalizations
Madison	0.55	756.68	2.49
	$ 232,000	$ 50,000	$ 129,000
Milwaukee	3.26	3,972.96	17.53
	$ 1,380,000	$ 264,000	$ 895,000

Source: Grabow et al 2010 (in press).Total Economic Benefit: $85,807,200

In terms of ozone reduction, replacing 20% of the short car trips in Milwaukee and Madison could result in a reduction of almost 800 school loss days for a savings of almost $80,000, a reduction of respiratory symptoms, hospital admissions and emergency room visits by almost 3,000 cases for a savings of almost $220,000, and a reduction in mortality for a savings of $3 million (Table 8).

Table 8. Health and Economic Benefit of Decreased Ozone in Milwaukee and Madison

MSA	Due to Decrease in Ozone	Mortality	Respiratory Symptoms, Hospital Admissions & ER Visits	School Loss Days
Madison	Fewer Annual Cases	0.054	640.103	147.009
	Annual Dollars Saved	$ 401,000.00	$ 49,000.00	$ 14,000.00
Milwaukee	Fewer Annual Cases	0.364	2,359.89	637.273
	Annual Dollars Saved	$ 2,693,000.00	$ 189,000.00	$ 61,000.00

Source: Grabow et al 2010 (in press). Total Economic Benefit: $3,407,000

These results are strictly for Madison and Milwaukee, so if other Wisconsin cities begin implementing more sustainable urban design that fosters other modes of active transportation, such as bicycling and walking, residents in these communities could potentially see similar health and economic benefits. It is important to note, however, that this data cannot be extrapolated to the entire state of Wisconsin because air quality chemistry is complex. Another study would need to be conducted looking at the entire state, including all 72 counties.

GREENHOUSE GAS MITIGATION

One important co-benefit of reducing vehicle miles traveled is the mitigation of greenhouse gases. The transportation sector contributes to 31 million metric tons of carbon dioxide per year, about 23 million metric tons that could be attributable to residential motor vehicles (EIA 2005). In Wisconsin, about 1/3 of all greenhouse gas emissions come from the transportation sector alone. This section estimates the reduction in greenhouse gas emissions in the state of Wisconsin from reducing short car trips and replacing them with bicycle trips.

Methods

Box 1: Process of Determining Change in Carbon Dioxide from Reduced Car Travel in Madison, WI

In Madison, 20% of workers commuted by bike, then there would be 23,750 bikers.

The average bicycle commute to work is 3.4 miles, with a grand total of 6.8 miles round trip.[8]

There are 52 weekends in a year × 2 days in a weekend = 104 weekend days.

The average worker has 26.7 paid vacations/holidays per year.

365 days/year – 104 weekend days – 26.7 paid vacations/holidays = 234.3 working days[9]

234.3 working days per year × 6.8 miles per day per person = 1593.24 miles per year per person

1593.24 miles per year × 23,750 bikers = 37,839,450 miles per year

CO_2 emissions from a gallon of gasoline = 2,421 grams × 0.99*× (44/12)**= 8,788 grams = 8.8 kg/gallon = 19.4 pounds/gallon[10]

*For all oil and oil products, the oxidation factor used is 0.99 (99% of the carbon in the fuel is eventually oxidized, while 1% remains un-oxidized)

**To calculate the CO2 emissions from a gallon of fuel, the carbon emissions are multiplied by the ratio of molecular weight of CO2 (m.w. 44) to the molecular weight of carbon (m.w. 12); 44/12

Fuel Economy Estimate for Passenger Car: 22.1 mpg[11]
19.4 lbs/gallon / 22 miles/gallon = 0.882 lbs CO_2 / Passenger Car mile

20% Madison bikers 37,839,450 miles per year × 0.882 lbs CO_2 = 33,374,395 lbs CO_2 SAVED (16,687 tons)

16,687 tons / 400,000 tons CO_2 emitted per year in Madison = 4.2% reduction in CO_2 emissions in Madison per year

[8] U.S. Department of Transportation Federal Highway Administration, NHTS 2001 Wisconsin add-on, 2001 Accessed at http://nhts.ornl.gov/quickStart.shtml.

[9] U.S. Department of Labor, U.S. Bureau of Labor Statistics. National compensation survey: Employee benefits in private industry in the United States, March 2006. 2006:1-35. Available from: www.bls.gov/ncs.

[10] U.S. Environmental Protection Agency. Emission Facts: Average Carbon Dioxide Emissions Resulting from Gasoline and Diesel Fuel. http://www.epa.gov/oms/climate/420f05001.htm

[11] Bureau of Transportation Statistics. Average Fuel Efficiency of U.S. Passenger Cars and Light Trucks. http://www.bts.gov/publications/national_transportation_statistics/html/table_04_23.html

Box 2: Process of Determining Change in Carbon Dioxide from Reduced Car Travel in Milwaukee, Wisconsin

In the Milwaukee metropolitan statistical area, the average commute distance is 6.4 miles.[12]

If 20% of workers who drive their cars 6.4 miles to work commuted by bike, then there would be 30,787 bikers.

The average commute to work for these commuters is 6.4 miles, with a grand total of 12.8 miles round trip.

There are 52 weekends in a year × 2 days in a weekend = 104 weekend days.

The average worker has 26.7 paid vacations/holidays per year[13]

365 days/year – 104 weekend days – 26.7 paid vacations/holidays = 234.3 working days[14]

234.3 working days per year × 12.8 miles per day per person = 2,999.04 miles per year per person

2,999.04 miles per year × 30,787 bikers = 92,331,444.5 miles per year

CO_2 emissions from a gallon of gasoline = 2,421 grams × 0.99*× (44/12)**= 8,788 grams = 8.8 kg/gallon = 19.4 pounds/gallon[15]

*For all oil and oil products, the oxidation factor used is 0.99 (99% of the carbon in the fuel is eventually oxidized, while 1% remains un-oxidized)

**To calculate the CO_2 emissions from a gallon of fuel, the carbon emissions are multiplied by the ratio of molecular weight of CO_2 (m.w. 44) to the molecular weight of carbon (m.w. 12); 44/12

Fuel Economy Estimate for Passenger Car: 22.1 mpg[16]
19.4 lbs/gallon / 22 miles/gallon = 0.882 lbs CO_2 / Passenger Car mile

20% Milwaukee bicycle commuters 92,331,444.5 miles per year × 0.882 lbs CO_2 = 81,436,334 lbs CO_2 SAVED (40 718.167 tons)

[12] U.S. Department of Transportation Federal Highway Administration, NHTS 2001 Wisconsin add-on, 2001 Accessed at http://nhts.ornl.gov/quickStart.shtml.

[13] U.S. Department of Labor, U.S. Bureau of Labor Statistics. National compensation survey: Employee benefits in private industry in the United States, March 2006. 2006:1-35. Available from: www.bls.gov/ncs.

[14] U.S. Department of Labor, U.S. Bureau of Labor Statistics. National compensation survey: Employee benefits in private industry in the United States, March 2006. 2006:1-35. Available from: www.bls.gov/ncs.

[15] U.S. Environmental Protection Agency. Emission Facts: Average Carbon Dioxide Emissions Resulting from Gasoline and Diesel Fuel. http://www.epa.gov/oms/climate/420f05001.htm

[16] Bureau of Transportation Statistics. Average Fuel Efficiency of U.S. Passenger Cars and Light Trucks. http://www.bts.gov/publications/national_transportation_statistics/html/table_04_23.html

Box 3. Bicycling Avoided Emissions in terms of Wind Turbine Equivalency

Energy from Wisconsin Wind Turbines:
2,505.4 MWh of electricity, on average, are produced per installed MW of wind capacity in Wisconsin.[17]

The average Wisconsin wind turbine has a capacity of 1.47 MW.[18]

The average Wisconsin wind turbine produces 3,683 MWh of electricity per year
(1.47MW × 2,505.4 MWh = 3,683 MWh per wind turbine.)

Emissions Offsetting:
Coal plants produce, on average, 2,249 lbs CO2 / MWh[19]

If a wind turbine offsets coal energy only, an average Wisconsin wind turbine producing 3,682.9 MWh will offset 8,282,842.1 lbs of CO2 per year, or 4,141.4 tons of CO_2 annually.
(2,249 lbs CO2 × 3,683 MWh = 8,282,842 lbs CO_2 = 4,141.4 tons of CO2)

Tons of CO_2 bicycle commuting 20% in Madison and Milwaukee could annually offset:
Madison Avoided CO_2 from Bicycling: 16,687 tons
Milwaukee Avoided CO_2 from Bicycling: 40,718 tons
Combined Avoided CO_2 from Bicycling: 57,405 tons

Equivalent in terms of wind turbines:
57,405 / 4,141.4 = 13.9 wind turbines

Increasing bicycle commuting by 20% in Milwaukee and Madison is equivalent to installing nearly 14 wind turbines in Wisconsin.

Results

If 20% of Madison commuters biked to work, we could avoid 16,687 tons of CO_2 emissions. To calculate the potential savings based on the European Climate Exchange, this is equivalent to a value of $366,577. Similarly, if 20% of Milwaukee commuters biked to work, we could avoid 40,718 tons of CO_2 emissions. To calculate the potential savings based on the European Climate Exchange, this is equivalent to a value of $821,282. If 20% of short car trips were replaced by bicycle trips in Milwaukee and Madison, there could be a combined estimated reduction of 57,405 tons of CO_2 between both cities. Furthermore, Wisconsin could theoretically save a total value of $1.2 million in a carbon market based on the European Climate Exchange if carbon dioxide emissions were offset by these additional bicycle trips.

In order to gain an understanding of how much emissions are avoided by the increase in bicycling, we can compare the amount of emissions potentially avoided by bicycling to the amount of emissions avoided by a typical Wisconsin wind turbine. This is equivalent to the emissions offset by nearly 14 wind turbines in Wisconsin, simply from increasing bicycle commuting by 20% in Milwaukee and Madison.[20]

[17] Based on average of We Energies' turbines in Byron, Wisconsin, and expected electricity generation from WEPCO's Blue Sky Green Field wind farm. http://psc.wi.gov/apps/erf_share/view/viewdoc.aspx?docid=107019, http://www.wisconsinenergy.com/performrpt/pdf/env/env_renewable.pdf

[18] Renew Wisconsin lists 449 wind turbines with a combined capacity of 306 MW. http://www.renewwisconsin.org/windfarm/windwisconsin.htm

[19] Source: http://www.epa.gov/cleanrgy/energy-and-you/affect/coal.html

[20] This assumes that the wind turbine offsets coal only, as opposed to a mix of fuels.

CONCLUSIONS

Incorporating physical activity into the lives of those living in Milwaukee and Madison by replacing 20% of short trips with bicycle trips could result in substantial reductions in morbidity and mortality. The health and economic benefit to residents of these two cities alone has significant implications for the entire state of Wisconsin. Incorporating physical activity into the lives of everyone in the state of Wisconsin could result in substantial reductions in healthcare costs, increased worker productivity, increased life expectancy, and improved quality of life among residents.

If the number of short car trips (under 8 km) were reduced within urban areas, less ozone and fine particulate matter would be anticipated, as would a decrease in associated adverse health outcomes. Such incremental reductions in pollution would have significant human health and economic benefits due to the large populations who would experience improved environmental conditions in the state (including the metropolitan areas and outside these areas).

By replacing 20% of commuting trips with bicycle trips, a substantial reduction in CO_2 emissions could occur in Wisconsin alone. This reduction could play a role in meeting targets for greenhouse gas emissions, resulting in major public-health benefits for the citizens of Wisconsin.

Policy Recommendations

Bicycling can be fun and recreational; however, bicycling can also be useful for commuting to work and for small trips such as going to the post office to mail a letter or picking up something from the local grocery store. Since 50% of the working population currently commutes five miles or less to work, a distance that is considered bikeable, this provides a prime opportunity for bicycle promotion and improvement in personal health, air quality, and reduced greenhouse gas emissions. However, the ways our cities are designed often prohibit people from feeling safe or wanting to ride their bikes for these utilitarian purposes. As a result, we recommend that policy makers and urban planners:

- Accelerate development of bicycle routes, lanes, and paths throughout the state so that all who choose to bike have the opportunity for safe and convenient routes.
- Institute bicycle parking racks in cities across the state, eliminate motor vehicle parking at bike racks, and provide bicycle parking at all city, county, and state buildings and transit centers.
- Create communities of compact, walkable, transit and bicycle-oriented mixed-use neighborhoods, districts, and corridors.
- Encourage cities to apply for Safe Routes to School Funding.
- Coordinate bicycle plans and activities with public and private K-12 schools across the state.
- Pilot an individualized marketing campaign to people receptive to replacing automobile trips with bicycling.
- Encourage bicycle education, support, and outreach for adults and children.
- Promote business-based bicycling programs and incentives.
- Encourage regular bike programs/workshops at neighborhood centers and nonprofit organizations.

- Encourage minority, low-income, and other under-represented groups in the state to bicycle more and promote programs that make bicycles available to everyone regardless of income level (both used and new bikes).
- Promote existing rides, tours, events, programs, and groups that promote bicycling throughout the state.

Limitations and Caveats

Many of the results in this section reported for Milwaukee and Madison cannot be extrapolated directly to the rest of the state. Estimates of the value of health benefits rely on incidence rates and monetary valuations specific to these cities. Air quality effects are complex, and results from dense urban areas cannot be expected to extend in the same manner to small towns and rural areas.

In addition, the inclusion of the value of avoided CO_2 emissions and the equivalent number of wind turbines is intended for contextual illustration only. It is unlikely that avoided emissions due to replacement of vehicle trips with bicycle trips would be traded in a carbon market. Further, the analogy of carbon offset by wind turbines in Wisconsin assumes that the fuel displaced is only coal, when in reality wind typically offsets a mix of fuels.

III. Bicycling Demographics: Gathering evidence for investments in bicycling infrastructure

A recent review article in Scientific American (Baker 2009) brought together studies and interviews with researchers from across the globe that suggest that the bikeability of a city can be measured by the ratio of female to male commuters. Scientists have pinpointed women as an "indicator species" of bike-friendly cities because 1) previous studies have shown that women are more adverse to risk than men, and 2) women do much of the childcare and household errands/shopping. These characteristics translate into bikeability indicators such as safety of bike routes (e.g. designated bike lanes or routes) and the availability of practical routes, organized around important urban destinations. Goddard et al (2007) showed that in addition to bicycling infrastructure, women are also concerned with comfort, the feeling that they need a car, and uncertainty regarding bike maintenance. And finally, Bernhoft and Carstensen (2009) assessed the preferences and behavior of pedestrians and cyclists and found significant differences when the sample population was stratified by age and gender.

The summary message from these studies is that assessing the demographics and the diverse set of needs and expectations of different populations of bike commuters can help focus investments in bike infrastructure to meet the needs of a community. Analyzing current trends in bike commuter demographics in Wisconsin and comparing them to projected population trends for the state can help policy-makers plan for the future. Additional analyses of the projected population trends for Wisconsin's neighboring states, Minnesota and Illinois, may provide insight into the changing demands of Wisconsin's bicycle tourists.

METHODS

In order to analyze the current bicycling demographics of Wisconsin, we utilized on an online survey conducted by the Department of Natural Resources (DNR) with people who purchased state trail passes between February and December 2008. Survey respondents who stated that they use their trail pass for bicycling were extracted for sub-analysis. We also garnered secondary data from the Alliance for Biking and Walking[21] report, "Bicycling and Walking in the U.S." (2007). The report compiled data from three surveys for cities, states, and advocacy organization as well as secondary data from advocacy organizations and government agencies in order to assess the trends in bicycling and walking levels, polices, and provisions across the United States and 50 major U.S. cities. Current Wisconsin state spending on bicycle infrastructure projects is also included in the report and included below as a benchmark for comparison to other states. Finally, a statistical abstract on recreational activities from the U.S. Census Bureau (2009) provided nationally representative data on income class of participants in popular recreational activities. A summary of the top four outdoor activities was included below in order to compare income of bikers with that of participants in other sports.

Future bicycling trends in Wisconsin and neighboring states were assessed by first analyzing population projections for the states. Wisconsin population projection data were obtained from the Wisstat application from the Applied Population Lab at the University of Wisconsin-Madison[22] and from the State of Wisconsin Department of Administration database.[23] Descriptions and summary figures of

[21] Formerly known as Thunderhead Alliance.
[22] http://www.wisstat.wisc.edu/ and http://www.apl.wisc.edu/index.html

these data from the Demographic Services Center at the Department of Wisconsin Administration (Egan-Robertson et al 2008) were also included in this report.

Minnesota and Illinois population projections were obtained from the Minnesota State Demographic Center (Minnesota Department of Administration) and the Illinois Department of Commerce and Economic Opportunity, respectively. The Minnesota projections were based on 2005 U.S. Census data, and the Illinois projections were calculated using the 2000 U.S. Census data.

The second step in the bicycling trend projection analysis was to carry out a literature review to assess bicycling preferences by age and gender. By studying what Wisconsin's population will look like over the next couple decades and combining this data with bicycling preferences by demographic group, we can predict what types of bicycling infrastructure might be necessary to accommodate a changing Wisconsin population.

RESULTS

Current Bicycling Demographic Trends

Over 3,000 trail pass purchasers filled out the online DNR survey, and the cleaned dataset contained 2,824 of these responses. Approximately 78,000 trail passes are sold annually, resulting in a 3.6% response rate for the survey. 88% of survey respondents typically purchase an annual state trail pass as opposed to a daily pass, and about 10% of survey respondents said they used trails that require a state trail pass to commute to work. About half of all survey respondents use their state trail pass 20 times or more during the year. The majority of survey respondents (57%) use their trail passes for bicycling on state trails (Figure 1). Of these bicyclists, 67% were male and 33% were female. The median age of bicycling respondents was 47. A smaller study by the Wisconsin Department of Transportation in 1999 asked a subset of survey respondents to keep a bicycling trip diary over a three-day period. The majority of respondents of this survey were less than 14 years old. Excluding these young cyclists from the dataset, more than a third of the remaining respondents were between the ages of 45 and 54. Although this survey only included approximately 250 people, this age distribution corroborates the findings from the trail pass data within a random sample of the Wisconsin population.

The Alliance for Biking and Walking report states that 0.6% of Wisconsin residents bike to work. Of these bike commuters, 26% are women and 74% are men, a distribution relatively consistent with the trail pass data. Currently, 1.81% of Wisconsin's federal transportation dollars go to bicycling and pedestrian projects (U.S. median = 1.41%, range = 0.24% (SC) – 5.40% (RI)). In comparison, the 2009-11 Wisconsin Transportation Budget has allocated 63.3% of its $6.8 billion budget towards building new and maintaining existing roads (WI Dept of Transportation 2009). Total per capita annual spending on bicycling and pedestrian projects in Wisconsin (including both federal and state funding) is $4.79 (U.S. median = $4.18, range = $1.02 (SC) – $38.16 (AK)).

[23] http://www.doa.state.wi.us/subcategory.asp?linksubcatid=105&linkcatid=11&linkid=64&locid=9

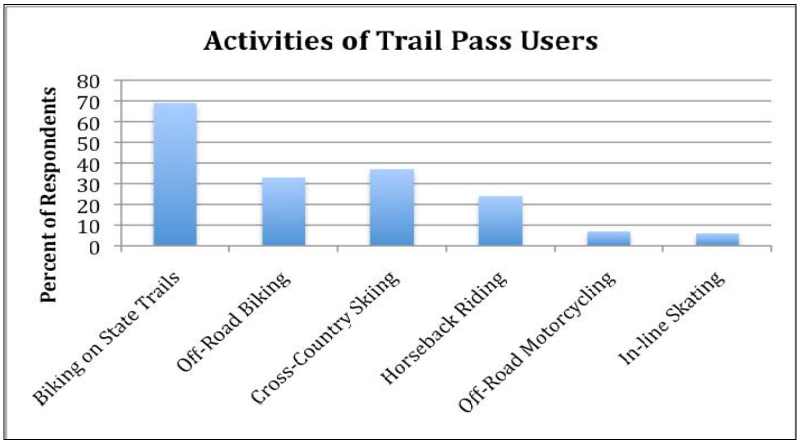

Figure 2. Trail Pass User Activities by Popularity

The U.S. Census Bureau (2009) statistical abstract on recreational activities ranked the most popular recreational activities based on participant numbers. Road bicycling was ranked seventh on the list, and mountain bicycling was seventh on the list of “Series II” sports. Compared with the income categories of the participants in the top six activities (The top four outdoor activities are shown below; bowling and exercising with equipment were not included in the figure.), road bicycling follows a similar trend where a higher percentage of participants are in higher income classes (Figure 3).

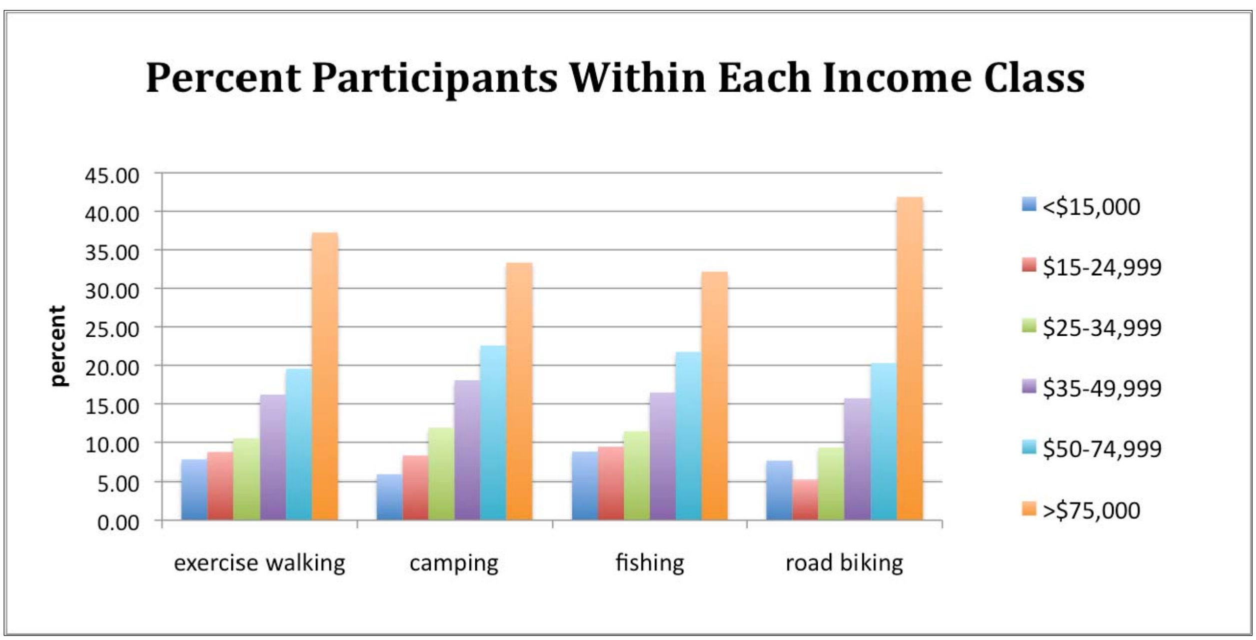

Figure 3. Outdoor Activity Participation by Income Class

Projected Wisconsin Population Trends

A brief summary of broad demographic trends is included here. For more detailed information, refer to Egan-Robertson et al (2008).

The total state population is projected to increase 24% between 2000 and 2035. Amid this growth, there will be significant changes to the population within age groups that will alter the overall population composition in Wisconsin. The 0-17 age group is projected to increase by 6% between 2000 and 2035, and the 18-24 age group will likely increase by almost 11%. The 25-44 age segment will likely fall 0.6% of their 2000 census total. Persons 45-64 and over 65 are projected to increase by 32.1% and 111.5%, respectively, by 2035. These shifts in proportions of the age groups in the Wisconsin population are summarized in Figure 3. This image shows the growth in the elderly population (>65 years) from just under half of the size of the 0-17 year old population in 2000 to exceeding the size of the youngest age group by 2035.

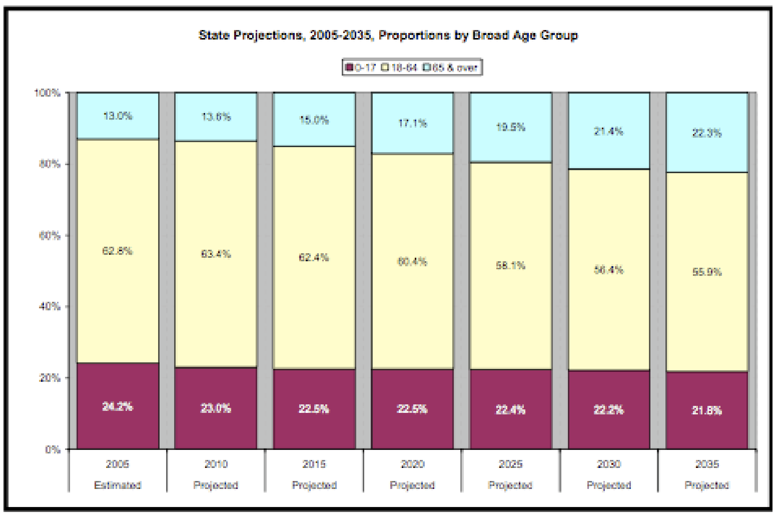

Figure 4. Wisconsin Projected Population Proportions by Broad Age Groups

As the Baby Boom generation ages, the distribution of the Wisconsin population among age groups will become more even so that by 2035, the number of people in each five-year age group is approximately equal until 75 years of age. Figures 5-7 show population pyramids for Wisconsin where the dashed lines demarcate the Baby Boomers as they age.

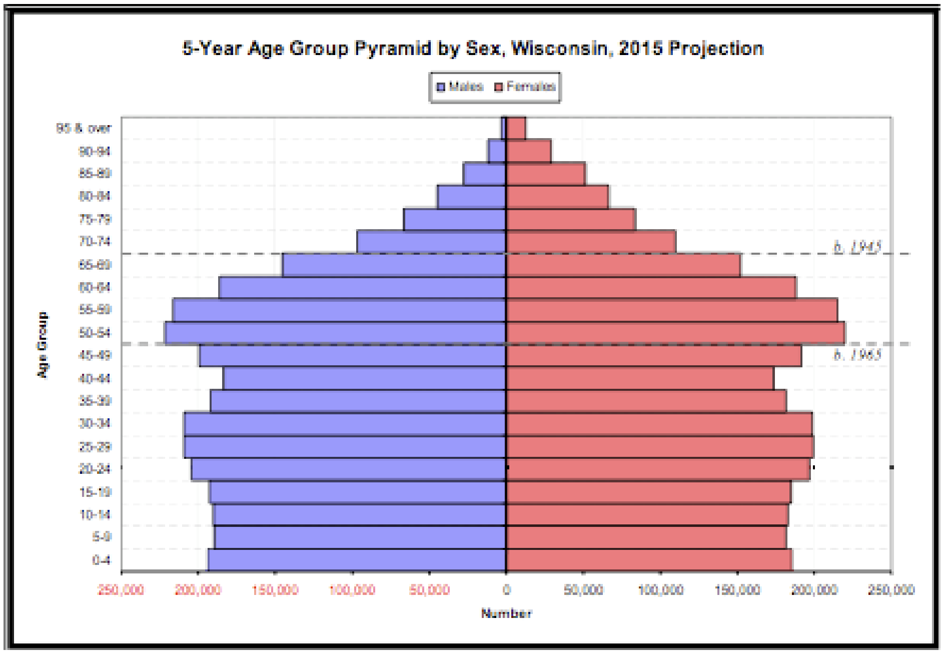

Figure 5. Wisconsin Population Pyramid by Age and Sex - 2015

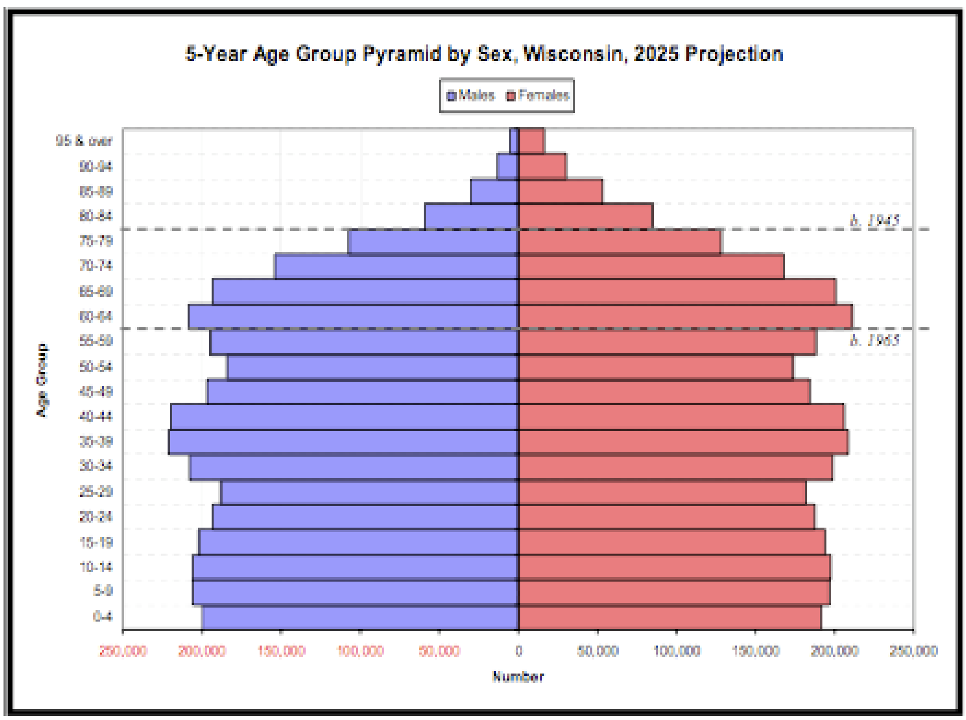

Figure 6. Wisconsin Population Pyramid by Age and Sex - 2025

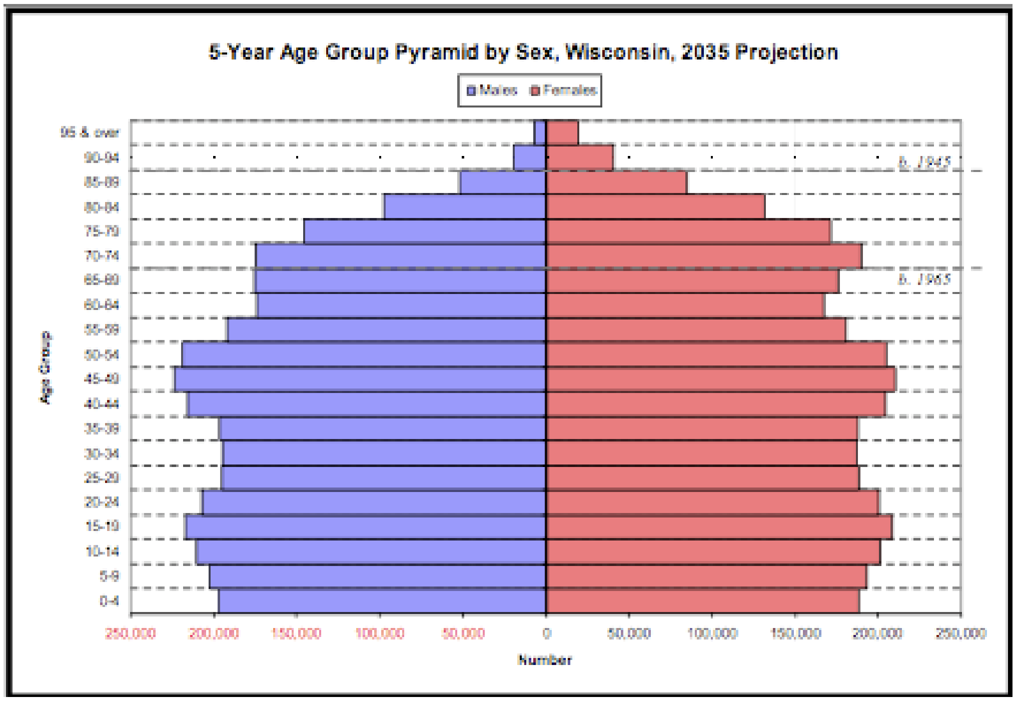

Figure 7. Wisconsin Population Pyramid by Age and Sex - 2035

Examining the population projections geographically can also provide some insight into the types of bicycling infrastructure that should be promoted in different parts of the state.

Figure 5 shows the percentage of each county's 2020 projected population that falls within four broad age groups: less than 15 years, 15-34, 35-54, and over 55 years of age.

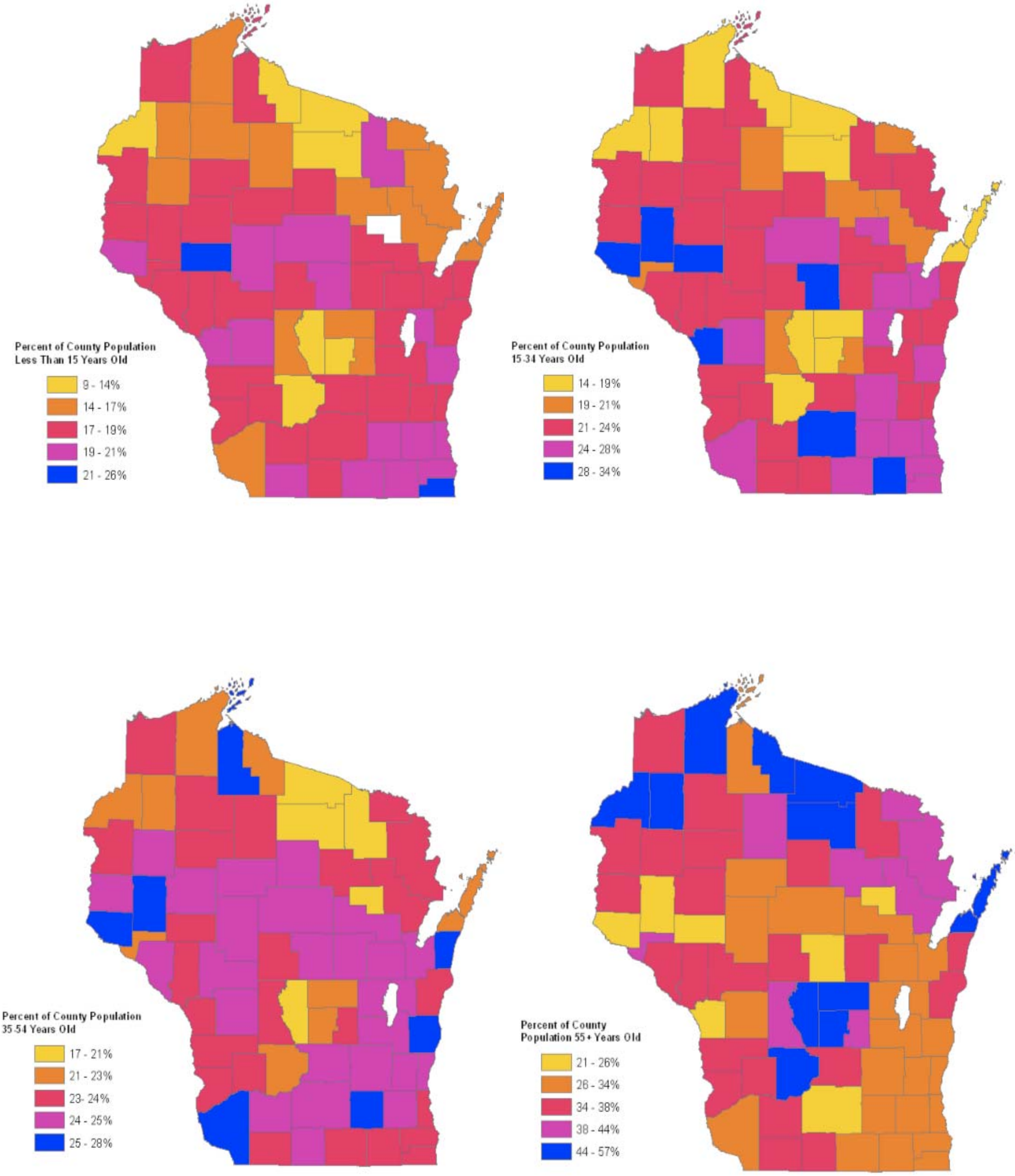

Figure 8. Percentage of County Projected 2020 Population Within Broad Age Groups

In addition to these changes in population, Wisconsin has experienced significant growth in the number of seasonal homes throughout the state (Wisconsin Department of Natural Resources 2009). Between 1950 and 1990, there was a 164% growth in the number of seasonal houses. Additionally, in six northern counties (Burnett, Bayfield, Sawyer, Vilas, Florence, and Forest), over 40% of the housing is seasonal housing.

Projected Population Trends for Neighboring States – Minnesota and Illinois

Minnesota will experience similar trends in population growth from 2009-2035 (Minnesota State 2007). The number of children less than 14 years of age will increase, and the number of young adults between the ages of 15-24 will decline over the next two decades. The population 25-44 years of age will remain relatively stable, and the number of people over the age of 44 will increase dramatically as the baby boomer generation ages. The fastest growth will occur in the over 65 population. The growth in the older population will be focused in the eastern part of the state that borders Wisconsin (Figure 9).

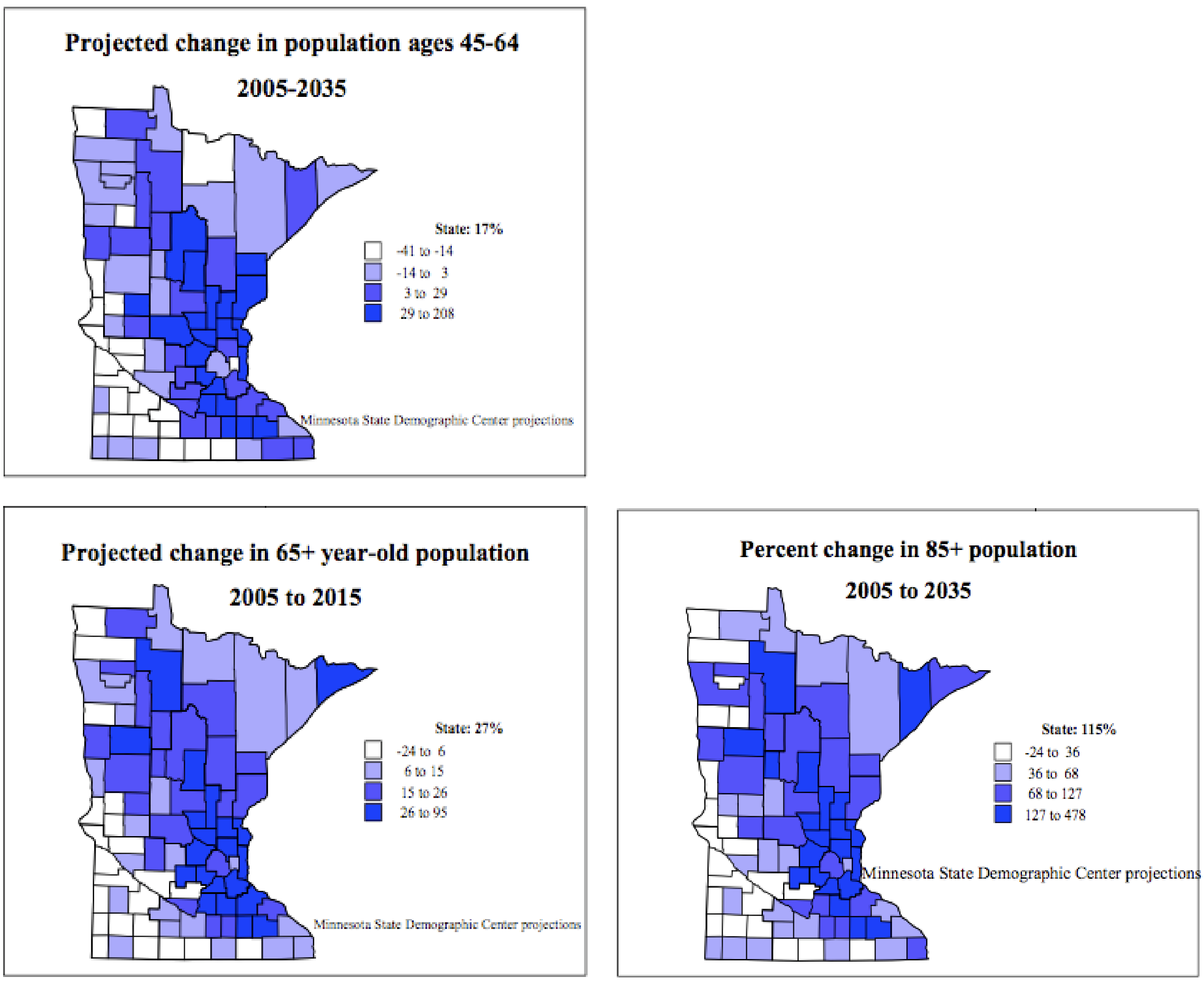

Figure 9. Projected Change in Population by Age Group in Minnesota (2005-2035)

Illinois will likewise see the largest increases in the population over 65 years of age (Illinois Department of Commerce 2009). The 55-64 age segment of the population will experience less dramatic, although still significant, increases. The population aged 40-54 will remain stable, and the 20-40 year age group will increase slightly. The population less then 20 years old will also see small increases in size.

Tourists from Minnesota and Illinois tend to travel the North, Central, and Western parts of the state (Figure 10). The Southwestern section of the state may be bypassed because it has fewer recreational resources because of the landscape (Wisconsin Department of Natural Resources 2009). The SCORP report published by the Wisconsin Department of Natural Resources (2006) compiled data from two surveys to calculate the number of tourists from outside Wisconsin who participate in a variety of activities to create an activity ranking. On this list of 21 activities, mountain bicycling is number 9.

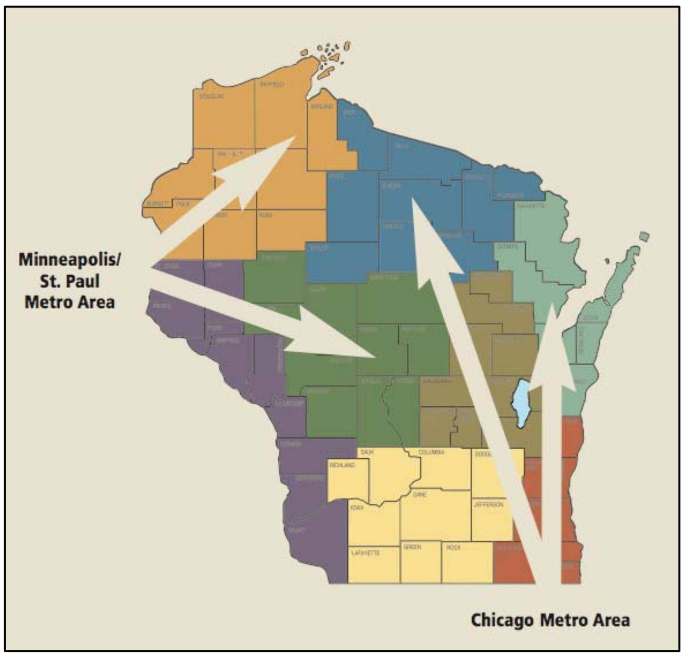

Figure 10. Recreational Travel Movement from Outside of Wisconsin (Wisconsin Department of Natural Resources 2006)

Bicycling Preferences by Demographic Group

The literature review of bike preferences by demographic group research turned up a particularly interesting article by Bernhoft and Carstensen (2008) that surveyed older cyclists (above 70 years of age) and younger cyclists (aged 40-49) in two cities in Denmark. The survey contained questions that asked respondents to prioritize the bicycling conditions they find most important when choosing their route, to rank the bicycling conditions they find most dangerous, and to choose how and why they would react in several bicycling scenarios.

The authors of this study found that, in general, older cyclists are more cautious, more likely to obey traffic laws, and consider traffic signals and bicycling paths necessary for their safety when traveling by bike. Younger respondents were more concerned with finding the quickest route to their destination and were less likely to obey traffic laws if they were seen as an inconvenience during their trip. Although the younger groups appreciated the presence of bike paths and traffic signals, they did not find bicycling to be dangerous if they were missing.

More specifically, both the older and younger groups stated that bike paths were the most important bicycling condition necessary for their comfort, although a significantly higher proportion of the older group ranked bike paths highest on their list. Signaled crossings were the second item on the list from the older group while the younger group ranked access to a smooth bicycling path or road as their next most important comfort condition. Marked bicycling lanes and bicycling lanes in round-abouts were also ranked high for both age groups.

When choosing their bicycling route, 59% of the older group said that the presence of a bicycling path was the most important consideration, followed by the location of routes with the least traffic. Only 42% of the younger group responded that they chose their route according to bike path location. This group was more concerned with finding the fastest and most direct route.

When asked which conditions were most dangerous for bikers, 71% of the older groups said that the absence of a bicycling path is the most important factor. Only 52% of the younger group agreed with this statement. The younger group found it more dangerous to ride near parked cars or to ride straight ahead while there are turning cars. Also, a higher proportion of the younger group said that uneven riding surfaces were dangerous for bikers.

A greater proportion of the older bikers said that they never run red lights, bicycle against the direction of traffic, or bike on sidewalks. They were also more likely than the younger group to stop their bikes before turning left. Older bikers said that they obeyed these traffic laws because it made them feel safer, while most younger bikers who obeyed these laws said they did so because it was too dangerous not to do so. A larger proportion of older bikers said that it was not an inconvenience to stop in order to obey traffic laws.

In terms of gender differences, within the older group, women were more likely to desire bicycling paths for their comfort. Within the younger group, more women ranked bicycling paths and signaled crossings high on their comfort list, and men were more likely to choose the fastest route as opposed to the route that follows a bike path or has the least amount of traffic.

CONCLUSIONS

Policy Recommendations

Based on the available data on current Wisconsin bicycling trends, the primary bicycling age group (on bike trails) is 40-60 years old. Additionally, significantly more men than women bike recreationally on bike trails and bike commute to work. According to Wisconsin, Minnesota, and Illinois projected population trends, by 2035, this Baby Boomer generation will make up a significant proportion of the total population. We assume that people who bike when they are 10, 30, or 50 years old are more likely to keep bicycling when they surpass 65 years of age. If the goals of bicycling investments in the state of Wisconsin are to develop infrastructure that targets the largest population segment while also planning for the future, then we would recommend the following investment strategy based on the data presented in this report:

- **Immediate investments should focus on the younger segments of the population (<60 years of age).** It is important to develop a culture of bicycling for recreation and transportation in the Baby Boomer generation as well as younger generations so that their participation in bicycling will continue into old age. According to the Bernhoft and Carstensen (2008) study, bicycling infrastructure for younger bikers should include designated bike lanes and smooth, even roads on primary thoroughfares that serve as the quickest and most direct routes to a variety of destinations. This age segment, particularly women, appreciates designated bike paths and traffic signals although the absence of these amenities does not generally prohibit them from bicycling. Policies to address the dangers of bicycling near parked cars and the need of cyclists to travel straight ahead while cars are turning could also be points of intervention to increase bicycling within this population.

- **Near-future investments, ideally within the next two decades, should focus on investment in bicycling paths and traffic signals in order to accommodate the aging population in Wisconsin.** The presence of this type of infrastructure not only makes older bikers feel safer when on the streets, it also prevents bicycling accidents and unnecessary mortality.

Although these investments are specifically targeted to the adult population, it is reasonable to assume that generational benefits will accrue from this approach. For example, a daughter who sees her mother strap on her helmet and bike to work everyday is more likely to begin bicycling at an early age and continue bicycling throughout life, eventually passing on positive bicycling behavior to her family. In this way, by investing in bicycling infrastructure to target the adult community, we can ensure that both utilitarian and recreational bicycling will be maintained and likely increase as the Wisconsin population grows.

Based on available data, the current bicycling population in Wisconsin is predominately mid-aged males. The population of Wisconsin and surrounding states is aging, and by 2035, a significant proportion of the population will be over 65 years old. It is important to encourage bicycling in the younger generations so that they will continue bicycling through old age. In order to work towards this goal, early investments in bike infrastructure should focus on bike paths and smooth roads on major direct bicycling routes, stated preferences of the younger age group. Near-future investments should be geared towards the needs of the older population segment, including traffic signals and designated bike paths.

We would like to note that as evident in the Wisconsin population pyramids (Figure 4), the Baby Boomer bulge is repeated approximately every 25 years as the children and grandchildren of the Baby Boomer population start to have families. The take-home message from this study is that investing in bicycling infrastructure in Wisconsin is good for the economy and health of Wisconsin and its residents. Dollars are limited, and it is essential that we prioritize investments so as to maximize the benefit for the largest number of people. Based on the cyclical age pattern of Wisconsin's population, bicycling lanes or paths, traffic signals, or policies to address bicycling safety at any time will have some benefit for a portion of Wisconsin's population. The key is to time these investments so that they are introduced into the population as the next large generation reaches the age when their bicycling preferences and needs require a change in infrastructure or policies.

Limitations and Caveats

This study was conducted to provide an estimate of current trends in cyclist demographics that could be compared to the projected populations trends for Wisconsin. Although this study was based on the best available data, there are several limitations that need to be considered. The DNR trail pass data is not a representative sample of bikers in Wisconsin, or even of trail pass users because survey respondents were self-selected and only included trail pass purchasers who visited the DNR website. In addition, the median age of trail pass users was likely an overestimate because in many cases, a parent likely purchased trail passes for their children who were not considered in the analysis. Demographic data on the number of cyclists in Wisconsin, recreational or utilitarian, is sparse and difficult to piece together from disparate sources. And finally, the study used to assess bicycling preferences by age group and gender, although thorough and rigorous, may not represent the beliefs and behaviors of Wisconsin residents because it was based on information from Denmark.

Summary and Conclusions

In this study, we estimated the economic value of recreational bicycling in Wisconsin as well as the potential health benefits from increasing bicycle commuting in the state. When combined with the economic impact from manufacturing sales and services as calculated in 2006 by the Bicycle Federation of Wisconsin and the Wisconsin Department of Transportation, the combined potential value of bicycling in Wisconsin totals nearly $2 billion (see table below). The results of this study demonstrate that bicycling has the potential to contribute substantially to the health and economic well being of Wisconsin citizens. Understanding the demographics of current and future cyclists will help us target investments in bicycling infrastructure to maximize these benefits.

Table 9. Estimated Potential Value of Bicycling in Wisconsin

Economic Impact of Manufacturing, Sales, & Services*	$593,787,990
Economic Impact of Tourism & Recreation	$924,211,000
Value of Additional Physical Activity	$319,572,108
Value of Air Quality Improvement	$89,214,200
Value of Greenhouse Gas Reductions	$1,157,859
TOTAL POTENTIAL VALUE OF BICYLING IN WISCONSIN	**$1,927,943,157**

*Value of Manufacturing, Sales, and Services from Bicycle Federation of Wisconsin and Wisconsin Department of Tourism (2006) adjusted for inflation.

Recommendations for Further Study

Through this study, we have completed a thorough assessment of economic, health, and demographic data related to bicycling. While we believe that our conclusions are reasonable and conservative, our assessments are limited by a general lack of representative data specific to Wisconsin. Better data would enable further refinement of the results of this study. We specifically recommend the following data collection initiatives to more fully capture the benefits of bicycling:

- Conduct a state-wide survey over the course of a year on bicycling behavior and preferences. Survey participants should be randomly selected and include a variety of age groups, income classes, athletic ability, geographic areas, and family status. Questions should include what infrastructure they find necessary for their safety and comfort as bikers, their bicycling frequency and type of bicycling (e.g. recreational or utilitarian), and perceived obstacles to bicycling.

- Incorporate questions regarding bicycling and other recreational activities (duration, frequency, spending) into the current annual surveys conducted on behalf of the Wisconsin Department of Tourism. Currently the Department of Tourism interviews approximately 2,000 visitors annually at more than 100 sites across Wisconsin regarding trip expenditures (Davidson-Peterson Associates 2008). Expanding this survey would provide valuable data with minimal additional cost.

- If possible, obtain statistics from the National Household Transportation Survey regarding the length of Wisconsin recreational bicycling trips in order to determine how many can be estimated to involve expenditures. Knowing the actual distribution of the length of these trips would provide the necessary information.

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Appendix A – Wisconsin Trails

State Parks, Forests, & Recreation Areas			
	Bicycle Touring Trails (Miles)	Off-Road Biking Trails (Miles)	Miles Requiring Trail Pass
Black River State Forest		33	33
Blue Mound State Park		13.5	13.5
Brule River State Forest		34	0
Brunet Island State Park	1		0
Copper Falls State Park		8	0
Devil's Lake State Park		6	0
Flambeau River State Forest		15	0
Governor Dodge State Park	1	8	8
Harrington Beach State Park	2		0
Hartman Creek State Park	2	7	0
High Cliff State Park		10	0
Kettle Moraine - Lapham Peak		5	0
Kettle Moraine - Northern Unit	6.6	15	15
Kettle Moraine - Pike Lake	1		0
Kettle Moraine - Southern Unit		20	20
Kohler-Andrae State Park	2.5	2.5	0
Lake Wissota State Park		11	0
Lakeshore State Park	1		0
Mirror Lake State Park		9	0
New Glarus Woods State Park	2		0
Newport State Park		15	0
Northern Highland/Am. Legion St. Forest		47	47
Peninsula State Park	9	12	12
Point Beach State Forest	5	4	0
Potawatomi State Park		8	0
Richard Bong State Rec. Area		12	12
Willow River State Park	1		0
Wyalusing State Park		8	0
Yellowstone Lake State Park		3	0
State Trails			
400 State Trail	22		22
Ahnapee State Trail	29		0
Bearskin State Trail	18		18
Capital City State Trail	10		10
Chippewa River State Trail	26		26
Eisenbahn State Trail	25		0
Elroy-Sparta State Trail	32		32
Fox River State Trail	20		20
Friendship State Trail	5		0
Gandy Dancer State Trail	6		0
Glacial Drumlin State Trail	47		47
Great River State Trail	52		52
Green Circle State Trail	24		24
Hank Aaron State Trail	24		0
Hillsboro State Trail	5		0
La Crosse River State Trail	4		4
Mascoutin Valley State Trail	22		22
Military Ridge State Trail	19		0
Mountain-Bay State Trail	40		40
Nicolet State Trail	89		89
Oconto River State Trail	28		0
Old Abe State Trail	8		0
Red Cedar State Trail	20		20
Saunders State Trail	15		15
Sugar River State Trail	24		24
Tomorrow River State Trail	18		0
Tuscobia State Trail		65	0
White River State Trail	11		11
Wild Goose State Trail	32		0
Wiouwash State Trail	35		0
Total	**744.1**	**371**	**636.5**

Appendix B – Survey Responses

Single Day Tours (n = 31)

Source	Days	Event	Participants	% WI Residents	Fees	What do fees cover	Add'l Spending
Survey Response	1	Menomonee Park Road Criterium	310	80%	$27	park fees, USA cycling fee, insurance, race supplies	$25
Survey Response	1	Cam-Rock Cyclocross	190	80%	$20	park rental, insurance, officials, organization fees	$150
Survey Response	1	Festival of Summer Bike Ride	125	80%	$25	ride, sag wagon, food, t-shirt	$50
Survey Response	1	KR Bike Club Annual Ride	101	80%	$25	map, food, drinks	$30
Survey Response	1	Neighborhood Ride & Dine	50	100%	$0	n/a	$0
Survey Response	1	WA County Bicycle Club - Club Road Ride	12	100%	$0	0	$0
Survey Response	1	Wheel-A-Way	400	95%	$30	1 meal, snacks, souvenirs	$10
Survey Response	1	Badger Prairie Cyclocross Race	250	85%	$35	N/A	$20
Survey Response	1	Insane Terrain Challenge	350	33%	$55	1 meal, snacks, gear transport	$75
Survey Response	1	Ridges Ride for nature	350	65%	$25	1 meal	$150
Survey Response	1	La Crosse Criterium	300	80%	$30	0	$200
Survey Response	1	Tour de Cure Green Bay	150	99%	$25	Two + meals, snacks, souvenirs, etc	$1
Survey Response	1	Tour de Cure Milwaukee	500	99%	$0	0	$0
Survey Response	1	Oshkosh YMCA Strong Kids Benefit Ride	150	90%	$18	1 meal, snacks, souvenirs	$10
Survey Response	1	Mondays Around Monona	15	99%	$0	N/A	$10
Survey Response	1	River Valley Bike Ride	1400	95%	$25	2+ meals, snacks, etc	$50
Survey Response	1	Arcadia Memorial Bike Tour	125	75%	$25	1 meal, snacks, souvenirs	$20
Survey Response	1	Trempealeau's Hip Breaker	150	75%	$20	Snacks, souvenirs	$20
Survey Response	1	Bayshore bike club weekly rides	40	100%	$0	N/A	$20
Survey Response	1	Twelve Hours of Blue Mound	90	90%	$35	0	$60
Survey Response	1	Ride for Renewables	50	98%	$30	snacks, souvenirs/gifts	$40
Survey Response	1	COG Magazine Bicycle Polo Invite	75	15%	$30	2+ meals, snacks, souvenirs, court reservation fees	$150
Survey Response	1	Udder Century	1500	2%	$27	one meal, snacks	$20
Survey Response	1	Harmon Hundred	650	35%	$20	SAG, rest stops w/food, water, etc, insurance.	$5
Bikes Belong Survey	1	Maywood Earth Ride	825	N/A	$30	0	$50.00
Bikes Belong Survey	1	Heatstroke 100 Bike Ride	300	N/A	$25	0	$0.00
Bikes Belong Survey	1	Tour De Vour	206	N/A	$20	0	$10.00
Bikes Belong Survey	1	Greater Milwaukee Recumbent Bike Club rally	28	N/A	$0	0	$0.00
Websites	1	Wright Stuff Century	750	N/A	$55	0	$38.46
Websites	1	Tyranena Oktoberfest	951	N/A	$50	0	$38.46
Websites	1	Door Co Century	2000	N/A	$55	0	$38.46
Websites	1	Horribly Hilly Hundreds	600	N/A	$65	0	$38.46

Multi-Day Tours (n = 11)

Source	Days	Event	Participants	% WI Residents	Fees	What do fees cover	Add'l Spending
Survey Response	6	Bike Northwoods Tour	400	56%	$300	lodging, snacks, one lunch	$35
Survey Response	7	GRABAAWR	500	36%	$250	lodging, snacks, one lunch	$35
Survey Response	3	Trempealeau Invitational "TIRE"	50	70%	$50	1 meal, snacks, souvenirs	$75
Survey Response	3	Chequamegon Fat Tire Festival	2500	40%	$67	event entry	$250
Survey Response	6	Pedal Across WI - Door County Holiday	120	16%	$550	2 dinners, all breakfasts, lodging, snacks	$180
Survey Response	8	Pedal Across WI - Northwoods Merrill to Eagle River	148	17%	$650	2 dinners, all breakfasts, lodging, snacks	$210
Survey Response	2	Bike MS: Best Dam Bike Ride	1600	90%	$40	snacks, gear transport, ride support, entertainment	$50
Survey Response	2	Heart of Wisconsin (2-day Portion)	60	100%	$60	one lunch, one end-of-ride meal, snacks	$150
Websites	4	Shuttleguy Theater & Art	50	0%	$475	some meals & entertainment	$100
Websites	6	Shuttleguy BREW tour	50	0%	$550	some meals & entertainment	$200
Websites	7	Europe in Your Backyard	40	0%	$1,645	lodging, meals, snacks	$50

Appendix C – Expenditures

For Road Touring			
	Proportion	Daily	
		WI Resident	Non-Resident
Dining and Drink	21.59%	$8.55	$11.56
Grocery and Convenience Stores	14.40%	$5.70	$7.71
Retail Shopping	6.60%	$2.61	$3.53
Entertainment	4.41%	$1.75	$2.36
Transportation (gas & auto)	22.02%	$8.71	$11.79
Accomodation	15.98%	$6.33	$8.56
Govt. Revenue (fees collected)			
Other (miscellaneous retail)	15.00%	$5.93	$8.03
Total		$39.57	$53.55

For Trails				
			Daily	
Category	**Est % for WI Residents**	**Est % for Non-Residents**	**WI Resident**	**Non-Resident**
Dining and Drink	20.51%	26.32%	$3.69	$8.94
Grocery and Convenience Stores	16.66%	13.79%	$3.00	$4.68
Retail Shopping	4.88%	4.33%	$0.88	$1.47
Entertainment	4.03%	3.30%	$0.72	$1.12
Transportation (gas & auto)	35.14%	19.70%	$6.32	$6.69
Accomodation	3.58%	25.31%	$0.64	$8.59
Govt. Revenue (fees collected)	10.32%	2.93%	$1.86	$0.99
Other (miscellaneous retail)	4.88%	4.33%	$0.88	$1.47
Total	1.00000	1.00000	$17.99	$33.95

For Single Day Event Rides			
		Daily	
	Estimated Proportion	WI Resident	Non-Resident
Dining and Drink	11.61%	$8.84	$8.84
Grocery and Convenience Stores	7.74%	$5.89	$5.89
Retail Shopping	3.55%	$2.70	$2.70
Entertainment	2.37%	$1.81	$1.81
Transportation (gas & auto)	11.83%	$9.01	$9.01
Accomodation	8.59%	$6.54	$6.54
Govt. Revenue (fees collected)	0.00%	$0.00	$0.00
Other (miscellaneous retail)	8.06%	$6.14	$6.14
Event Promoter	46.25%	$35.23	$35.23
Total		$76.17	$76.17

For Multi Day Rides			
		Daily	
	Estimated Proportion	WI Resident	Non-Resident
Dining and Drink	11.19%	$9.04	$9.04
Grocery and Convenience Stores	7.46%	$6.03	$6.03
Retail Shopping	3.42%	$2.76	$2.76
Entertainment	2.29%	$1.85	$1.85
Transportation (gas & auto)	11.41%	$9.22	$9.22
Accomodation	8.28%	$6.69	$6.69
Govt. Revenue (fees collected)	0.00%	$0.00	$0.00
Other (miscellaneous retail)	7.77%	$6.28	$6.28
Event Promoter	48.19%	$38.96	$38.96
Total		$80.84	$80.84

Appendix D – Total Impacts (Detailed)

Total Impact on Output

Sector	Description	Direct	Indirect	Induced	Total
1	11 Ag, Forestry, Fish & Hunting	$0	$1,688,502	$1,580,176	$3,268,678
20	21 Mining	$0	$151,530	$73,549	$225,079
33	22 Utilities	$0	$9,818,757	$4,132,092	$13,950,849
34	23 Construction	$0	$3,327,301	$1,661,323	$4,988,625
41	31-33 Manufacturing	$0	$24,965,790	$14,786,776	$39,752,560
319	42 Wholesale Trade	$0	$9,304,872	$9,795,452	$19,100,324
320	44-45 Retail trade	$296,908,800	$2,200,414	$24,264,890	$323,374,100
332	48-49 Transportation & Warehousing	$0	$10,320,261	$4,797,303	$15,117,563
341	51 Information	$0	$17,758,299	$8,244,695	$26,002,980
354	52 Finance & insurance	$0	$17,646,043	$24,509,650	$42,155,710
360	53 Real estate & rental	$0	$20,265,559	$36,475,270	$56,740,830
367	54 Professional- scientific & tech svcs	$0	$19,236,173	$7,568,321	$26,804,490
381	55 Management of companies	$0	$8,958,237	$2,017,257	$10,975,495
382	56 Administrative & waste services	$0	$14,980,657	$4,687,216	$19,667,877
391	61 Educational svcs	$0	$700,841	$3,374,038	$4,074,879
394	62 Health & social services	$0	$16,126	$33,619,540	$33,635,670
402	71 Arts- entertainment & recreation	$27,711,870	$1,748,713	$3,479,460	$32,940,030
411	72 Accomodation & food services	$203,056,890	$5,510,394	$10,737,458	$219,304,660
414	81 Other services	$0	$5,425,938	$8,581,349	$14,007,286
427	92 Government & non NAICs	$5,206,055	$8,251,040	$4,666,130	$18,123,224
TOTAL		**$532,883,600**	**$182,275,420**	**$209,051,990**	**$924,211,000**

Total Impact on Employment

Sector	Description	Direct	Indirect	Induced	Total
1	11 Ag, Forestry, Fish & Hunting	0.0	16.9	15.2	32.1
20	21 Mining	0.0	0.6	0.3	0.8
33	22 Utilities	0.0	16.3	6.9	23.2
34	23 Construction	0.0	31.4	16.4	47.8
41	31-33 Manufacturing	0.0	84.9	37.3	122.3
319	42 Wholesale Trade	0.0	54.3	57.1	111.4
320	44-45 Retail trade	5,762.7	36.9	399.0	6,198.6
332	48-49 Transportation & Warehousing	0.0	106.7	40.8	147.4
341	51 Information	0.0	74.8	29.0	103.8
354	52 Finance & insurance	0.0	88.0	117.7	205.8
360	53 Real estate & rental	0.0	146.6	84.9	231.6
367	54 Professional- scientific & tech svcs	0.0	153.9	62.7	216.5
381	55 Management of companies	0.0	40.6	9.1	49.7
382	56 Administrative & waste services	0.0	260.8	82.9	343.8
391	61 Educational svcs	0.0	11.4	58.0	69.4
394	62 Health & social services	0.0	0.1	378.2	378.3
402	71 Arts- entertainment & recreation	375.6	48.1	54.6	478.2
411	72 Accomodation & food services	3,752.9	114.3	223.9	4,091.1
414	81 Other services	0.0	66.3	168.2	234.4
427	92 Government & non NAICs	20.0	61.1	25.4	106.3
TOTAL		**9,911.2**	**1,413.7**	**1,867.8**	**13,192.7**