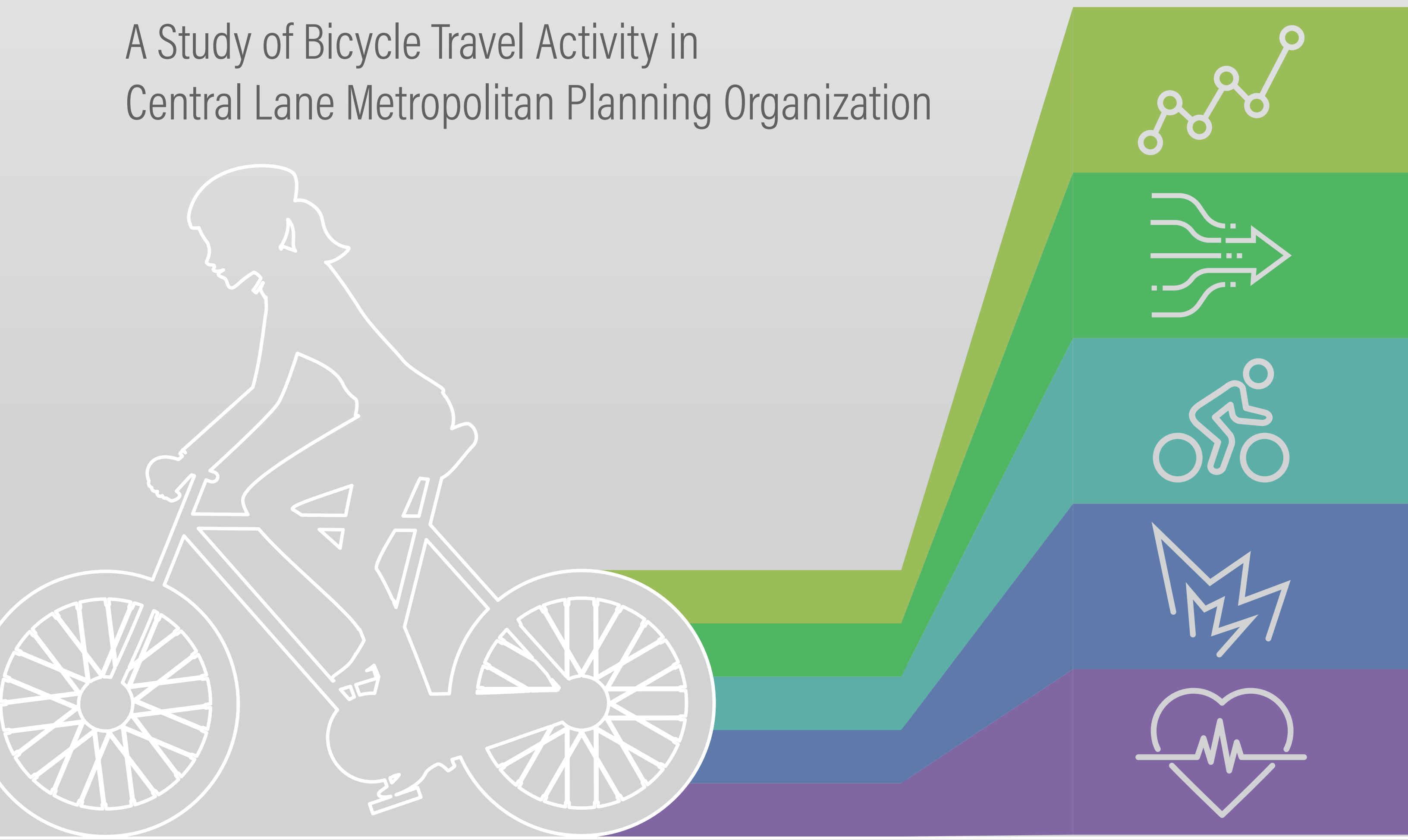
Oregon Department of Transportation: Research Report SPR 304-761

BICYCLE COUNT DATA: What is it Good For?

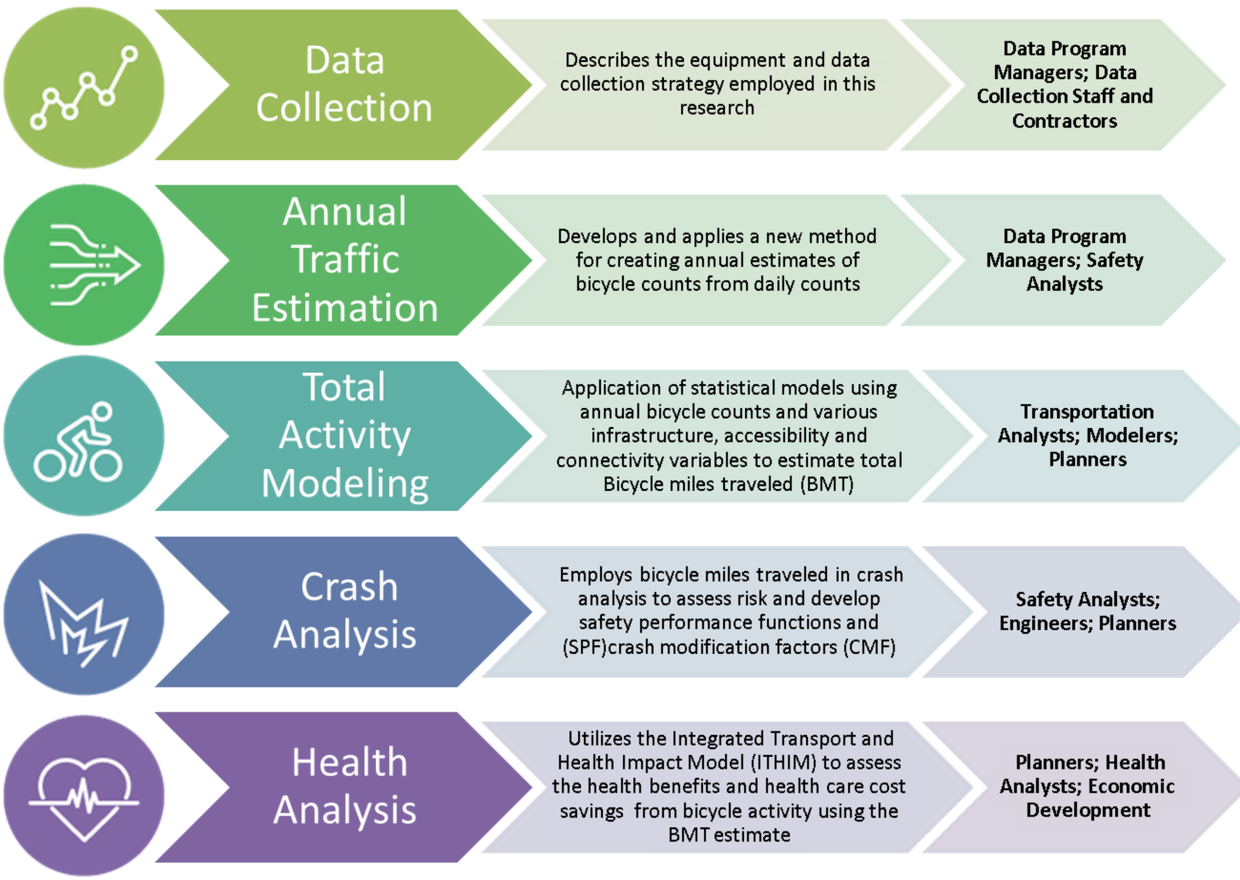
A Study of Bicycle Travel Activity in Central Lane Metropolitan Planning Organization



Oregon Department of Transportation

June 2018

The following research note summarizes key elements of research conducted by the Oregon Department of Transportation in SPR 761-304 *Bicycle Count Data: What is it Good for? A Study of Bicycle Travel Activity in Central Lane Metropolitan Planning Organization*. The report is summarized into five sections outlined below. The full report documents findings relevant to a variety of practioners and should be referenced for more details. Please click on the following link to go to the **full report**.



Full Report Key Findings

- A method is proposed for monitoring bicycle travel for tracking performance measures. The method uses elements of the bicycle network and population accessibility information as criteria for sampling strata.
- The Seasonal Adjustment Regression Method (SARM) method is proposed and demonstrated showing that annual estimates of bicycle traffic can be created with as little as 3 percent error using this method. The method removes the need for deriving and matching expansion factors from permanent count stations.
- Total bicycle travel activity is estimated using annualized bicycle traffic counts in a direct demand model resulting in an estimated 44 million bike miles per year (average for years 2013 through 2015) compared to 1.59 billion vehicle miles traveled per year on the study area's transportation network.
- While the off-street path system accounts for just 6% of the bike transportation network, it accounts for an estimated 17.5% of the total bicycle activity in the study region.
- The per capita bicycle miles traveled is 0.48 miles compared to 17.34 vehicle miles traveled per person, or about 2.7 percent of total travel for these two modes.
- Using the estimates of bicycle activity, bicycle crash rates are calculated and compared to motorized transport revealing a disparity where bicycle travel has a higher risk per mile traveled. These crash rates differ depending on the roadway type with arterials exhibiting higher risk (for both modes) followed by collectors, and local streets.
- Safety performance functions are estimated for bicycle crashes using data for both segments and intersections. Posted travel speed, number of lanes and daily vehicle volumes are all risk factors for bicycle crashes.
- A safety in numbers effect was established showing the bicycle crashes per bicycle rider is non-linear. These outcomes shows that when a given roadway increases bicycle usage from 25 to 125 daily users the bicycle crash rate decrease by nearly 50%. For crash frequencies, these results show that a doubling of bicycle travel would only result in the total number of crashes increasing by 47%.
- Using the Integrated Transport and Health Impact Tool (ITHIIM), it was estimated that the 44 million bicycle miles and associated physical activity reduces the number of premature deaths due to chronic disease illness by four to ten per year.
- An application of a cost of illness methodology shows that the bicycle activity and resulting physical activity reduces health care costs by $3.3 to $16.2 million per year. The off-street path system alone reduces the health care costs by nearly $4 million per year.
- Additional bicycle data collection will improve network wide estimates of bicycle travel. Further, the use of other data sets from smart phone applications or bike share could likely increase the precision of estimates provided.
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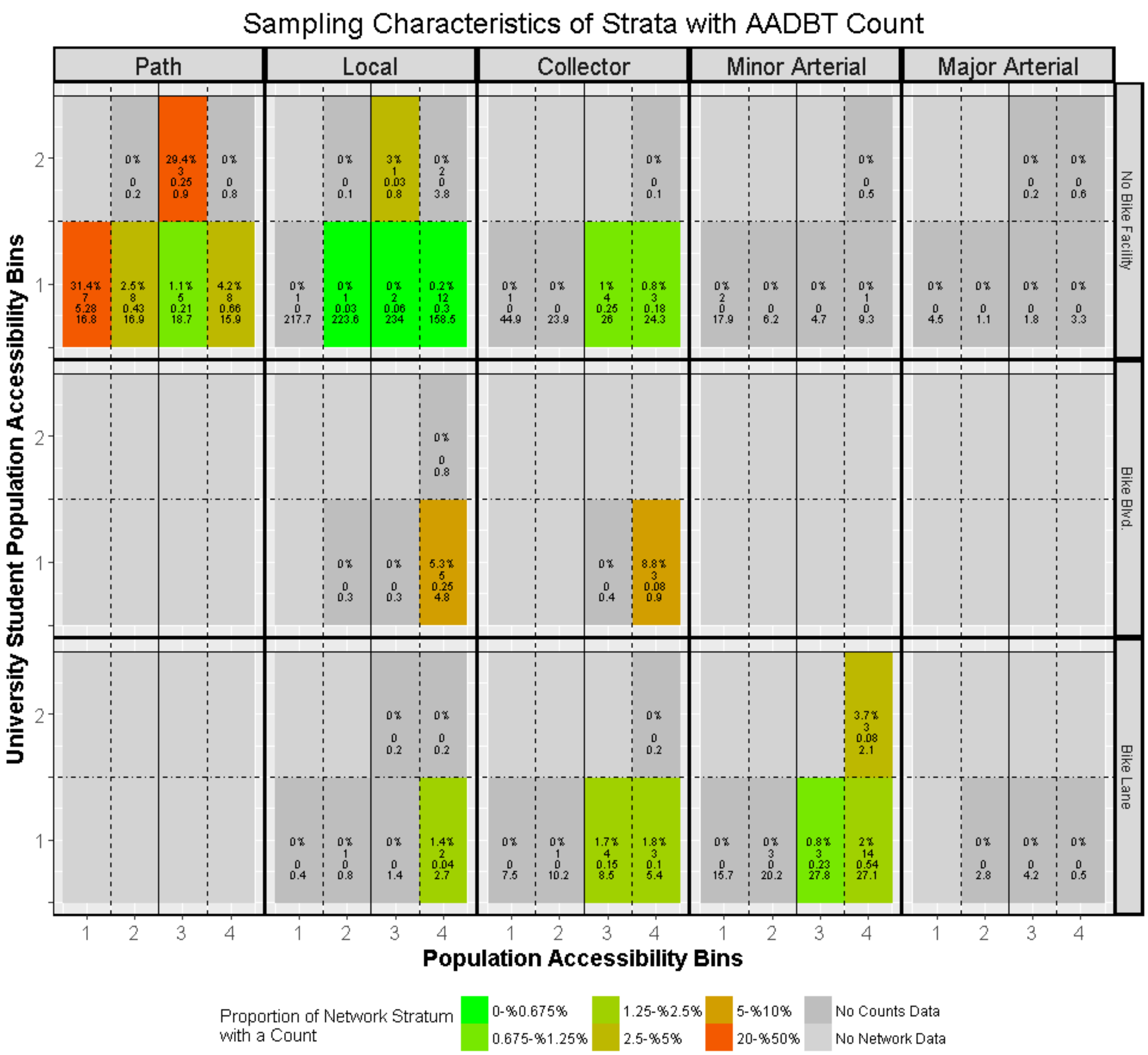
Data Collection

Methods of bicycle and pedestrian traffic data collection are well documented in Minnesota Department of Transportation's Bicycle and Pedestrian Data Collection Manual. The MNDOT report covers the important steps required for many aspects of nonmotorized data collection but does not include guidance on how to collect data in order to attain a proper number of samples usable in models that can estimate network wide bicycle activity. This report proposes a method that stratifies the network by functional classification, bicycle facility type, and two types of population accessibility. An ideal count program would attain 100% sampling in all strata but a more practical scenario would aim for 20-30%. Current data collection in the study area is deficient compared to the latter goal but future data collection should improve the sampling rate.

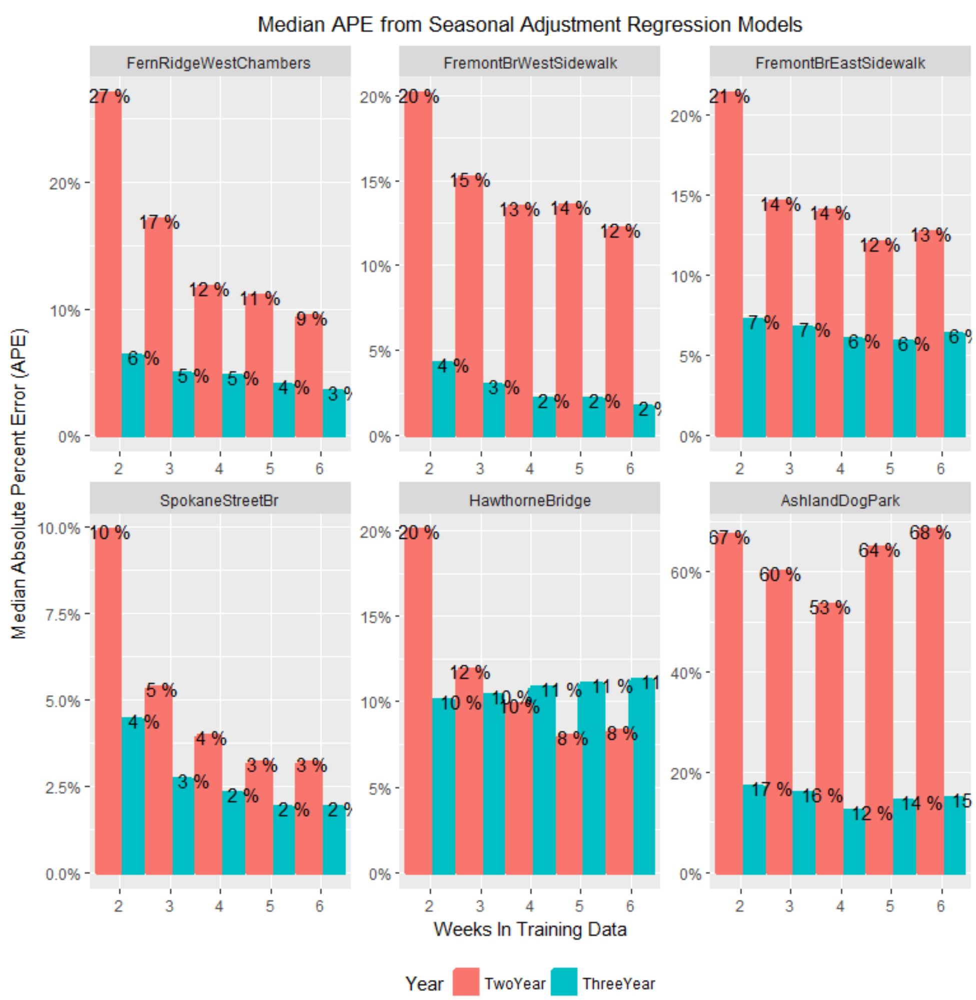


Annual Traffic Estimation

Annual Average Daily Bicycle Traffic (AADBT) Estimation

This report features a new process to adjust short term daily counts to an annual average daily bicycle traffic (AADBT) estimate. The process, termed Seasonal Adjustment Regression Method (SARM) bypasses the need for traditional traffic factors created from permanent counter data by using relationships between daily counts and daily conditions like temperature, rainfall, minutes of daylight, and day of the week.

The figure below highlights key findings from validation tests, demonstrating that with at least 2 weeks of data from two years of data collection, annual traffic estimates can be as low as 4% compared to observed values. However, it may be optimal to collect more data, perhaps three weeks of data from more years to ensure lower error. Lastly, for areas that exhibit primarily recreational users like in the Ashland dog Park, the SARM approach produces high levels of annual traffic estimation.



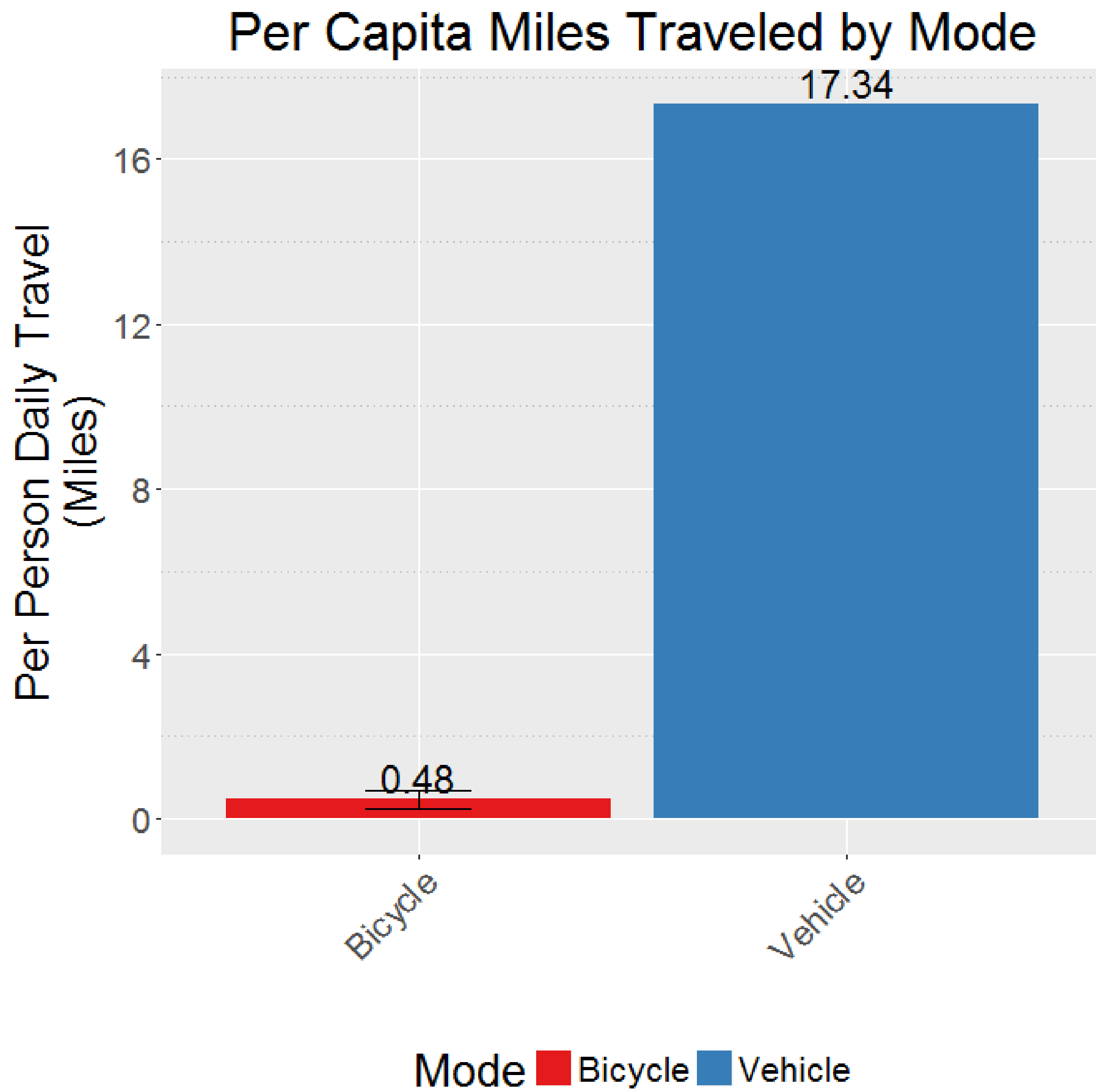
Annual Traffic Estimation

Estimation error is shown to be comparable with traditional methods of factoring. The estimates of the SARM method are compared to estimates from traditional factoring approach. One permanent count site in the study area is used to create traditional traffic factors. Six candidate sites were used to apply these factors and were identified by comparing weekend to weekday index (WW) and the hourly profiles. A comparison of the SARM derived AADBT and the traditional factor approach revealed that two methods produced very similar results with absolute percent difference being as low as 1.1% and as high as 7.8% for the six sites where factors were applied. The table below summarizes these comparisons.

	AADBT Estimate			Days Used in Estimate		Monthly Factor Info	
Location	**Traditional**	**SARM**	**APE**	**Traditional**	**SARM**	**Factor**	**Month**
Heron Bridge South Fern Ridge	398	415	4.3%	7	45	0.984	April
DeFazio Br. South River	484	457	5.6%	7	33	0.83	September
DeFazio Br. North River	445	453	1.9%	7	25	0.83	September
15th Ave. West Jefferson St.	556	513	7.8%	7	34	1.29	February
Frohnmayer South River	749	741	1.1%	7	47	0.835	May
North bank South Greenway Br.	464	471	1.6%	8	43	1.479	November

Bicycle Miles Traveled

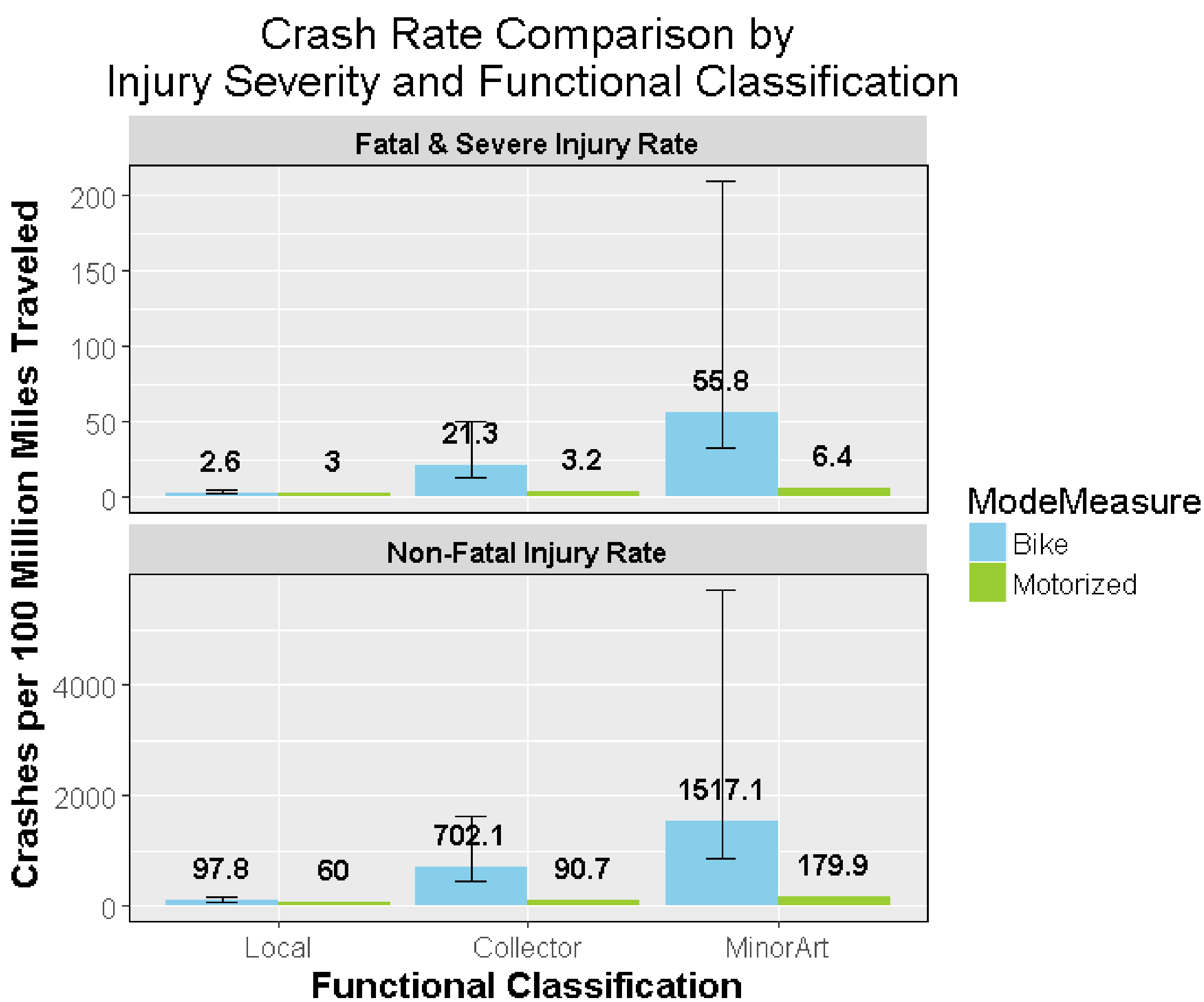
Using a modeling technique commonly described as a facility demand (or direct demand) total bicycle miles traveled (BMT) are calculated for the bike-able travel network in the study area. Results reveal that nearly 44 million BMT are traveled per year (2013-2016) with nearly 8 million of those miles occurring on the off-street path system. The total system usage equates to 0.48 bicycle miles per person per day compared to 17.34 vehicle miles per person per day or about 2.6% of the total for these two modes.



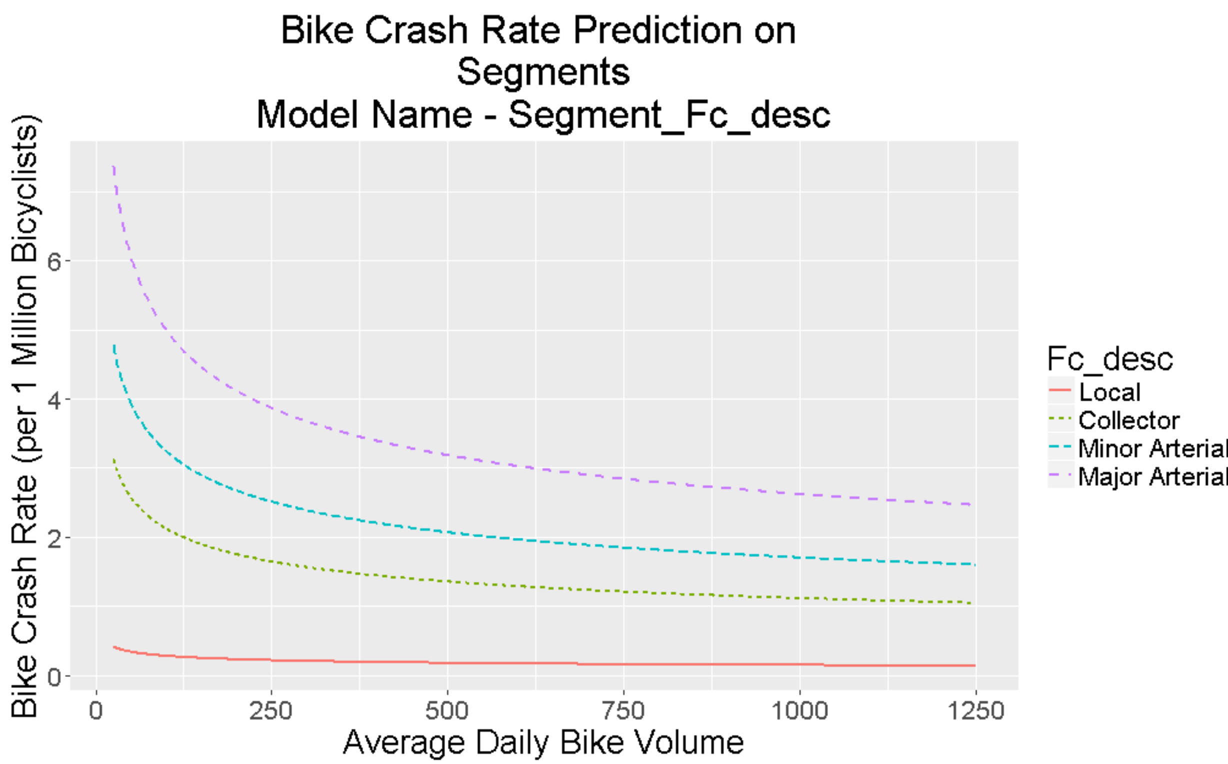
Crash Analysis

Crash Analyses

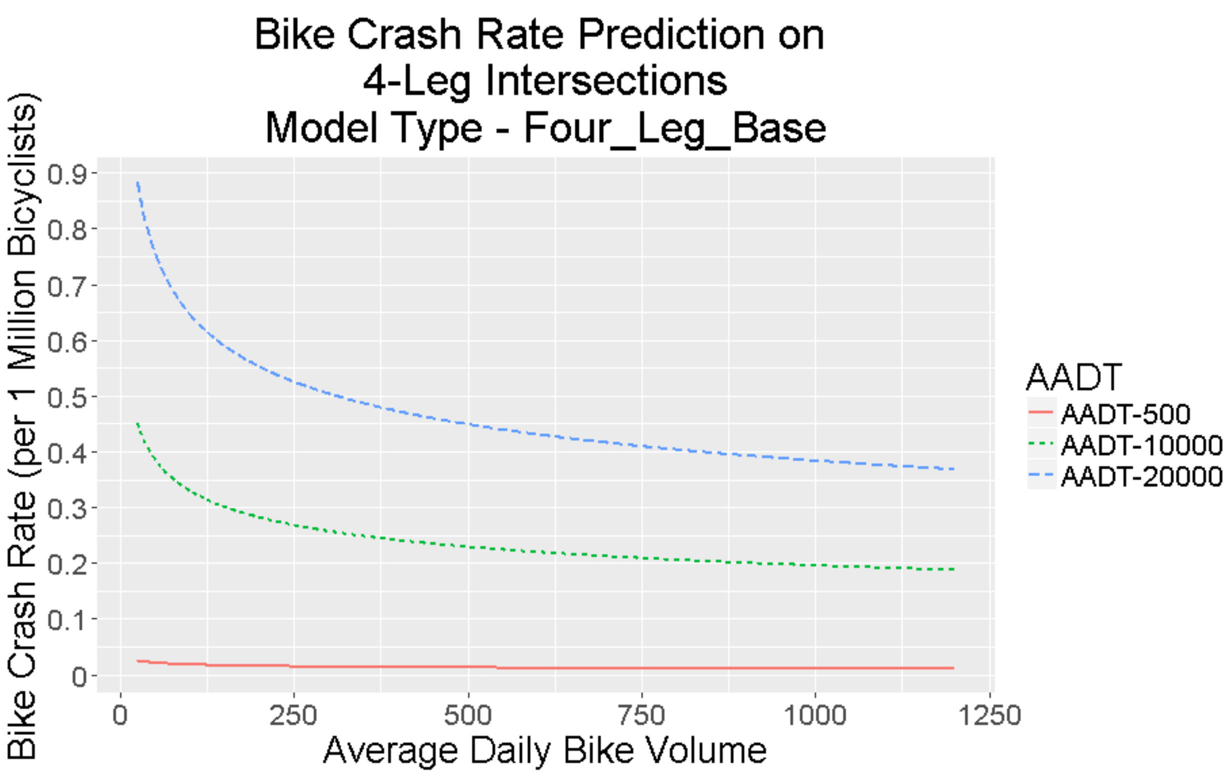
Using the BMT estimates created from facility demand modeling, crash rates are calculating for bicycle and motorized transport. This analysis shows that crash rates for bicycle travel are higher compared to vehicle travel and that this disparity exists across functional classification of roadways though changes in magnitude likely do so changes in vehicle volumes and speeds.



Since it is widely recognized that that crash rates are non-linear, safety performance functions were estimated for segments and intersections. SPFs account for more detailed information and aim to describe how these details predict crash outcomes. The figure below shows bicycle crash rates for segment locations and examines the difference in expected crash rate on different functional classifications. Vehicle traffic speed is generally higher on arterials compared to local and collector streets which appear to increase risk and crash frequency for people riding bicycles. However, as more people ride on a given segment the crash risk decreases. In this model the crash rate decrease by over 50% as the number of bicycle riders increases from 25 to 125 riders per day.



The chart below shows the predicted bicycle-injury crash rate for a four-leg intersection and shows the difference in crash rate at intersections with different amounts of annual average daily traffic (AADT) for motorized vehicles. Intersections with 500 AADT have less crash risk than four-leg intersections with 10,000 vehicles a day which is lower than the bicycle crash risk for intersections with 20,000 AADT. Similar to the segment results presented above, there is a safety in number effect where crash risk is reduced as more people ride bicycles at a given four-leg intersection.



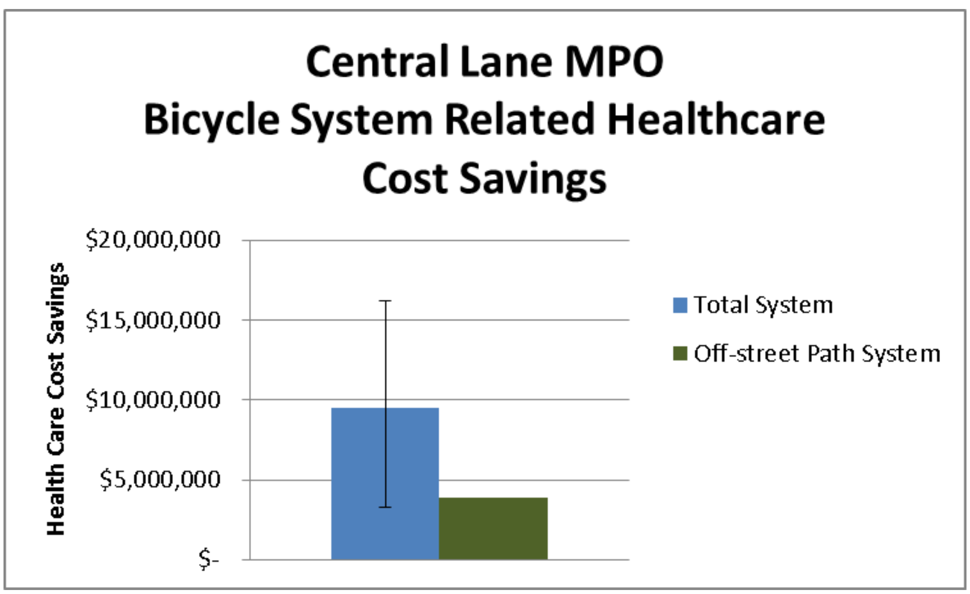
Health Analysis

Health Impact Assessment

Results from a health impact assessment using the Integrated Transport and Health Impact Model (ITHIM) reveal the physical activity associated with bicycle travel in the CLMPO result in 4-10 deaths avoided and a decrease in disability adjusted life years (DALYs) of between 125 to 316. These reductions in negative health outcomes translate into at least $3.5 million in health care cost savings even after accounting for the costs associated with fatal and severe bicycle injury costs. The off-street path system alone accounts for nearly $5 million in health care cost reductions.

Measure	Bicycle Activity (Miles)		Health Measures		Annual Health Care Costs Savings*
	Annual (Millions)	Weekly	DALY	Deaths Avoided	
Total System	44.1	3.5	222	6	$ 9,474,847
Lower Bound	64.6	5.1	125	4	$ 3,302,153
Upper Bound	23.5	1.8	316	10	$ 16,215,562
Off-street Path System	7.7	0.6	65	2	$ 3,922,993

*Includes $4.5 Million in Bike Crash Costs



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To read the full research report go to:
https://www.oregon.gov/ODOT/Programs/ResearchDocuments/304-761%20Bicycle%20Counts%20Travel%20Safety%20Health.pdf

For additional information about this research project, contact Josh Roll at 503-986-2853, or via email at josh.f.roll@odot.state.or.us

RESEARCH

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