5. BIKE COMMUTE AND SAFETY DATA

To help them prioritize projects, stakeholders (e.g., engineers, planners, board members, users, and funders) want to know how many people are expected to use a proposed facility. It is also valuable to know how many people use an existing facility or how often they use a travel mode, in order to set a baseline. And then it is important to count how many people use a new or an improved facility, and to track usage over time. *Do people bike more often? Are more people bicycling? Where are people bicycling the most or least?* The trends in usage then again help prioritize future projects.

> Average trip lengths by bicycle are typically under three miles.
>
> – Pedestrian & Bicycle Information Center, 2015

The federal FAST Act (2015), which emphasizes performance measures, increased the demand for bicycle and pedestrian count data. Counts or estimates of bicycle and/or pedestrian mode share (i.e., commuting levels compared to other modes) are needed to apply for the State's Active Transportation Program (ATP) grants, and "before and after" count data are required for projects that are awarded funding.

Thus, it is not surprising that professionals, in a survey of those who would apply for ATP funds, said that one of their top challenges was their lack of knowledge or tools for estimating increases in bicycling and walking. Their top three requests for technical assistance were: (i) how to forecast increases in active transportation mode share; (ii) how to use safety data to forecast decreases in injuries and fatalities; and (iii) how to effectively evaluate project outcomes.(LGC, 2015 (Module 4)).

The following summarizes basic approaches to both estimating existing mode shares and to forecasting travel demand and future use. Thereafter, the chapter lists some guides where readers can find details on different tools for active transportation data collection.

CURRENT TRAVEL BEHAVIOR

When we want to understand overall how residents are traveling under existing conditions, we can use US Census data, which is publicly available. (Although, relevant Census information is most readily available for states, counties, and larger cities, and sometimes not available for smaller census tracks.) When we want to know how residents travel a particular roadway corridor, bike network, or school route, collecting raw data is best, except that it takes much more work and time. Below we discuss several ways we use statistical data and travel counts to understand travel habits.

STATISTICAL DATA

Finding Existing Data

The federal government routinely collects demographic data for public use. The U.S. Census Bureau publishes commute (journey to work) data from the decennial census (every ten years) and the continuous American Community Survey (ACS). Annually, the Bureau invites one in 38 households nationwide to complete the ACS, which used to be the decennial census long form. The U.S. Department of Transportation conducts the National Household Travel Survey every five to seven years, and has now conducted the National Survey of Bicyclist and Pedestrian Attitudes and Behavior twice, ten years apart.

The Census data helps estimate travel mode shares and other commuting habits. However, data relate only to "journey to work" travel, so they tell only a fraction of the transportation story. Also, the commute data is itself limited in some respects. First, for practical reasons, the survey asks residents only about how they commuted the week prior to answering the survey. Second, residents answer only which mode they used for the most distance; thus, multimodal trips would not be captured as such. For example, if a resident rides her bicycle to the bus station, takes the bus to the next city, and then walks a quarter mile to her business, only the bus trip would get counted.

The American Factfinder webpage (http://factfinder.census.gov) is one portal for getting Census data. You can find commute data by searching by Topic, and selecting from the pulldown menus: People, Employment, Commuting (Journey to Work).

The National Household Travel Survey (NHTS), as "the primary source of information about how people across the Nation travel," asks for more detailed information than the Census survey, albeit for travel on only a single day. The NHTS assigns a specific travel date to each participant (i.e., survey taker). On his/her assigned day, the participant keeps a diary of all trips he makes, documenting the starting point and time he departed, his destination and time he arrived, and the reason for the trip (e.g., work, school, social, medical, shopping, etc.). Thus, the NHTS will capture non-work trips as well as multi-modal trips.

The first NHTS was done in 1969. The FHWA (an agency of the US DOT) most recently collected data for the NHTS 2016. Reports with survey results usually take between one and two years to be published. The NHTS 2009 data is available in *Summary of Travel Trends: 2009 National Household Travel Survey* (June 2011) at http://nhts.ornl.gov/2009/pub/stt.pdf.

Another U.S. DOT survey, sponsored by the National Highway Traffic Safety Administration (NHTSA), is the National Survey of Bicyclist and Pedestrian Attitudes and Behavior. The NHTSA first administered this survey in 2002, the second in 2012. They collected data from phone interviews (landline and cell) with 7,509 U.S. residents aged 16 years or older (with an oversample of people aged 16- to 39-year-olds). The survey asked respondents how frequently they biked and walked outdoors; how they perceived bicycling and pedestrian activity, conditions and safety; if bike paths and lanes were available in the community; knowledge of various laws pertaining to bicyclists and pedestrians; and other questions. The 2012 Survey's *Findings Report* is online at www.nhtsa.gov/sites/nhtsa.dot.gov/files/811841b.pdf. Some survey results are described later in this chapter.

Demographic Data

Other demographic data can be used to indirectly characterize or extrapolate travel habits. For example, of all demographic features, average age is most directly linked to potential bicycle riding. According to a nationwide survey in 2002, bicycle ridership declines steeply as adults age. Of the survey respondents who were 16-24 years old, nearly 40% had ridden a bicycle in the month preceding the survey; of respondents aged 45-54 years old, 26% had. Only 9% of those surveyed over the age of 65 had ridden a bicycle in the previous month.[1] This data suggest that a lower average age corresponds to a higher potential for bicycle riding.

Humboldt County's population is approximately 6% under five years old, 20% under 18 years old, and 13% 65-years or older (U.S. Census 2010). Thus, about 67% of the population is 18 to 64 years old (compared to 63.7% for the state overall). Humboldt County's median age is 37-years old (statewide and nationwide median age is 35-years old). Based on California Department of Finance estimates, Humboldt's countywide population grew by only 64 people from January 1, 2015 to January 1, 2016, or 0.5%.

Table 5.1 **Humboldt County Population Estimates with Annual Percent Change**

Jurisdiction	Jan 1, 2015	Jan 1, 2016	% of Countywide Population (2016)	% Change 2015 to 2016
Arcata	18,085	18,169	13.4	0.5
Blue Lake	1,278	1,287	0.9	0.7
Eureka	26,811	26,765	19.8	-0.2
Ferndale	1,435	1,434	1.0	-0.1
Fortuna	11,882	11,848	8.7	-0.3
Rio Dell	3,414	3,416	2.5	0.1
Trinidad	368	367	0.2	-0.3
Unincorporated	71,779	71,830	53.1	0.1
Countywide	**135,052**	**135,116**	**100.0**	**0.5**

Source: State of California, Department of Finance, *May 2016 Tables of City Population Ranked by Size, Numeric and Percent Change.*

Commute-To-Work Data

The average household in the U.S. generates about 10 vehicle trips per day. Work trips, on average, account for less than 30 percent of daily trips.

Both the decennial census and the annual ACS include commute (journey to work) data. However, from one to the other, the Census Bureau uses different survey methods to collect the data. For example, survey questions are sometimes different, and trips may be

[1] Survey conducted by the Bureau of Transportation Statistics and the National Traffic Safety Administration in the summer of 2002. The sample size was 9,616. There has been no follow-up survey to date.

grouped and counted differently. Thus, the statistical results from each source can vary. Table 5.2, below, shows how the data for bicycle commuting varies between the two. (We note that the time elapsed between the two can also contribute to the differences in results.)

Table 5.2 **Bicycle Commuting in Humboldt County, Census and American Community Survey Data**

Census Designated Place	**Census 2000 Commute by Bicycle** (%)[1]	**ACS 2010-2014 Commute by Bicycle** (%)[2]
Humboldt County (countywide average)	1.7	1.7
INCORPORATED CITIES		
Arcata	5.2	6.2
Blue Lake	2.5	1.0
Eureka	1.7	2.3
Ferndale	0.3	0.0
Fortuna	1.2	1.4
Rio Dell	1.5	0.0
Trinidad	0.0	0.0
UNINCORPORATED COMMUNITIES		
Cutten	0.6	1.7
Humboldt Hill	1.7	0.0
Hydesville	0.0	0.0
McKinleyville	1.1	0.7
Myrtletown	1.3	0.3
Pine Hills	0.4	2.0
Redway–Garberville	0.0	0.0
Westhaven-Moonstone	0.7	0.0
Willow Creek	0.0	0.0
AMERICAN INDIAN RESERVATIONS		
Big Lagoon	n.a.	n.a
Blue Lake Rancheria	0.0	0.0
Hoopa Valley Reservation	0.5	0.0
Karuk Reservation	0.0	0.0
Table Bluff Reservation	0.0	0.0
Yurok Reservation	0.0	0.0

[1] U.S. Census Bureau, 2000 Census.

[2] U.S. Census Bureau, 2010-2014 American Community Survey 5-Year Estimates (Table S0801).

According to the 2000 U.S. Census, 1.7 percent of all employed County residents commute primarily by bicycle (i.e., 50 percent of the time or more), which is above average compared to California (0.8%) and the United States (0.4%). According to more recent estimates from the ~~2005~~2011-~~2009~~ 2015 American Community Survey, ~~2.65~~1.8 percent of employed people (16 years and older, and excluding people who work from home) commute to work by bicycle.

To understand overall mode shares for cities and communities, we can use the Census Bureau's data for "Means of Transportation to Work" or the ACS data for "Sex of Workers by Means of Transportation to Work" (ACS Tables B08006 and C08006). Bear in mind that commute trips are only a portion of overall trips for daily needs; hence, using only commute data will undercount bicycle and walking trips.

Table 5.3 **Means of Transportation to Work (Workers 16 Years and Over), 2010-2014**

Census Designated Place	Car (Alone)	Carpool	Public Transit	Bicycle	Walk	Other	Work at Home
Humboldt County (countywide average)	73.5	9.3	1.2	1.7	6.5	1.2	6.6
INCORPORATED CITIES							
Arcata	60.5	8.5	1.8	6.2	17.8	0.8	4.5
Blue Lake	73.6	4.4	0.0	1.0	9.8	1.6	9.6
Eureka	71.9	9.9	2.3	2.3	7.9	2.0	3.7
Ferndale	67.4	4.6	0.0	0.4	15.2	2.2	10.6
Fortuna	71.5	13.2	2.1	1.4	6.5	1.1	4.2
Rio Dell	86.7	7.8	0.0	0.0	1.0	0.0	4.5
Trinidad	48.1	6.0	0.0	0.0	9.0	0.0	36.8
UNINCORPORATED COMMUNITIES							
Cutten	77.1	10.9	0.0	1.7	2.0	3.5	5.0
Humboldt Hill	80.6	11.6	0.1	0.0	3.4	4.1	0.1
Hydesville	94.9	2.9	0.0	0.0	0.0	0.0	2.2
McKinleyville	82.2	9.6	0.9	0.7	1.5	0.2	5.0
Myrtletown	82.5	8.2	0.1	0.3	2.3	0.0	6.6
Pine Hills	77.6	8.6	0.9	2.0	0.0	2.5	8.4
Redway – Garberville	69.0	3.1	0.0	0.0	10.3	0.0	17.4
Westhaven-Moonstone	80.0	6.7	3.0	0.0	5.5	0.0	4.8
Willow Creek	68.4	12.8	1.6	0.0	3.0	0.0	14.2
American Indian Reservations							
Big Lagoon Rancheria	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Blue Lake Rancheria	20.5	0.0	0.0	0.0	79.5	0.0	0.0
Hoopa Valley Reservation	83.8	8.6	0.0	0.0	1.4	0.0	6.2
Karuk Reservation	68.6	19.6	0.0	0.0	7.8	0.0	3.9
Table Bluff Reservation	64.3	7.1	0.0	0.0	28.6	0.0	0.0
Yurok Reservation	64.3	16.1	0.0	0.0	5.5	1.7	12.5

Source: U.S. Census Bureau, 2010-2014 American Community Survey 5-Year Estimates (Table S0801).

The ACS 2015 data below show very similar results for bicycle commuting countywide. This data reveals that almost five times more men than women commute to work by bike.

Table 5.4 **Active Transportation Commutes to Work in Humboldt County, 2015**

	ACS 2015 5-Year		**ACS 2015 1-Year**	
	Totals	%	Totals	%
Countywide:	*N* = 56,522	100%	N = 55,938	100%
Bicycle	1,028	1.8% ±0.4%	1,211	2.2% ±1%
Walked	3,781	6.7% ±0.9%	4,050	7.2% ±1.6%
Public Transportation (excluding taxicab)	956	1.7% ±0.5%	1,560	2.8% ±1.8%
Male:	29,790	52.7% ±1.2%	28,558	51.1% ±2.5%
Bicycle	815	1.8% ±0.4%	1,000	1.8% ±0.9%
Walked	1,901	6.7% ±0.9%	2,078	3.7% ±1.2%
Public Transportation (excluding taxicab)	491	1.7% ±0.5%	839	1.5% ±1.3%
Female:	26,732	47.3% ±1.1%	27,380	48.9% ±2.1%
Bicycle	213	0.4% ±0.2%	211	0.4% ±0.5%
Walked	1,880	3.3% ±0.6%	1,972	3.5% ±1.2%
Public Transportation (excluding taxicab)	465	0.8% ±0.3%	721	1.3% ±1%

[1] U.S. Census Bureau, 2011-2015 American Community Survey 5-Year Estimates: Table B08006 – Sex of Workers by Means of Transportation to Work.

[2] Ibid: Table C08006 – Sex of Workers by Means of Transportation to Work.

Calculating Ridership from Statistical Data

As noted above, the statistical commute data is readily available, but has limitations for bicycling and other active transportation modes. Many government agencies, universities, and transportation professionals have researched how to utilize the existing, established data to measure and forecast the demand for bicycling. Below are formulas devised by professionals who researched this topic for the National Cooperative Highway Research Program (NCHRP) of the Transportation Research Board (TRB) of the National Academies of Sciences, Engineering, and Medicine. The information is from *NCHRP Report 552: Guidelines for Analysis of Investments in Bicycle Facilities* (TRB 2006).

ESTIMATING EXISTING BICYCLE COMMUTERS FROM POPULATION AND MODE SHARE CENSUS DATA

To apply this formula, the user defines the geographic area.

(1) Choose and identify ¼-, ½-, and/or 1-mile geographic area of subject facility (or 400-, 800-, and/or 1,600-meter buffer).

(2) Establish residential population *(R)* by multiplying area by user-defined population density.

(3) Multiply R by 0.4. (Multiplier assumes area's demographics are consistent with national averages: 80% of residents are adults and 50% of adults are commuters.)

(4) Daily existing bicycle commuters = $R * 0.4 * C$

where C is bicycle commute share % for adults (Census data)

ESTIMATING TOTAL BIKE SHARE

Because the census data are confined to work-commute trips only, they leave out how people generally travel to school and other utilitarian trips, not to mention walking and biking recreationally and for exercise. Below is a formula to convert bike-commute trip data to a statistical estimate for total bike trips (not just bike commute trips).

"On any given day, roughly 1% of the adults in the United States ride a bicycle." There is, of course, a range of low to high rates for different geographic areas (different in size or location). Researchers have observed that "the lower bound for the number of daily adult bicyclists is equal to the commute share…" However a more accurate or "A 'most likely' value would be 0.4% plus 1.2 times the commute share; this was the best fit at the MSA (metropolitan statistical area) level, and also describes the United States as a whole" (TRB 2006).

Thus, to estimate total number of daily adult cyclists *(T)*:

Ranges: $T_{low} = C$

$T_{moderate} = 1.2C + 0.4\%$

$T_{high} = 3C + 0.6\%$

where C = % bicycle commute share (Census data)

Multiply low, moderate and/or high T by number of adults in study area (assumes adults are 80% of total population).

Total daily existing adult cyclists = $T_j * R * 0.8$

where R = total population

Here is the example using Humboldt County's 2015 ACS datum:

If bike commute share $C = 1.8$, then

$T_{low} = 1.8\%$	$T_{moderate} = (1.2 \text{ x } 1.8\%) + 0.4\%$ $= 2.16\% + 0.4\%$	$T_{high} = (3 \text{ x } 1.8\%) + 0.6\%$ $= 5.4\% + 0.6\%$
Percentage = 1.8%	Percentage = 2.2%	Percentage = 6%
Total = 1.8% x 135,116 x 0.8 = 1,945	Total =2.2% x 135,116 x 0.8 = 2,378	Total = 6% x 135,116 x 0.8 = 6485

These estimates say that the "most likely" number of bicycle riders in Humboldt County (average on any given day) is 2,378 or 2.2% of the adult population. The estimated high range says that the upper bound of bicyclists is 6%, meaning that up to an estimated 4.2% (4,540) more people ride a bike for non-commute trips, which are not captured by the ACS data.

The *NCHRP Report 552* gives a second equation to use to predict total riding share at the MSA and city level. (Note that they researched larger metropolitan cities such as Portland, Sacramento, Cincinnati, and Houston.)

Equation 2 for the percentage of the adult population who bicycle in a day *(A)*:

$A = 0.3\% + (1.5*C)$

where C = bicycle commute share %

Equation 2 applied to Humboldt County's 1.8% datum:

A = 0.3% + (1.5 * 1.8%)
= 0.3% + 2.7%
= 3.0%
where *A* is the adult population who bicycle in a day
"Overall,…the hypothesis that overall bicycling rates will correlate with bicycle commuting rates seems to be supported: indeed the correlation seems quite strong at this geographical level (metropolitan statistical areas)" (TRB 2006).

Inferences from National Surveys

The *2012 National Survey of Pedestrian and Bicyclist Attitudes and Behaviors* (NHTSA 2013) offers some data that could be used to inform predictions for bicycling behavior for smaller populations below the national level. Some examples follow.

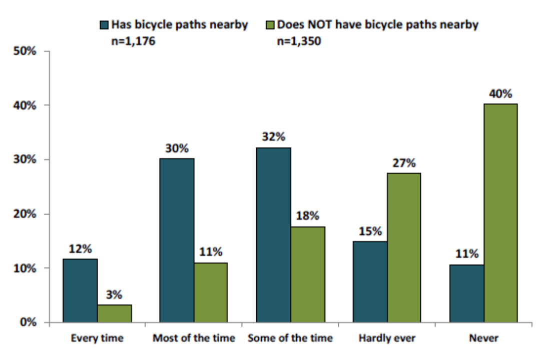
Respondents who had ridden a bicycle within the past year:

Reasons for Bicycling	Percent
Recreation	33
Exercise or health	28
Personal errands	17
Visit a friend or relative	8
Commuting to/from work	7
Commuting to/from school	4

61% of respondents rode their bike for recreation and 36% rode to make a utilitarian trip.

Answers from respondents who have bicycle paths or bicycle lanes available within a quarter mile of where they live:

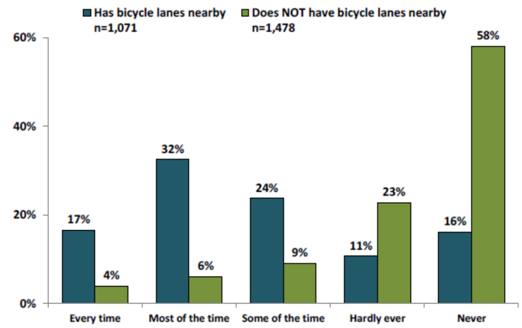
Figure 3.7
Frequency of Using Bicycle Paths
By Availability of Bicycle Paths in Neighborhood



Q32. Do you ride on bike paths…?
Base: Rode a bicycle within the past year
Unweighted N=See Chart

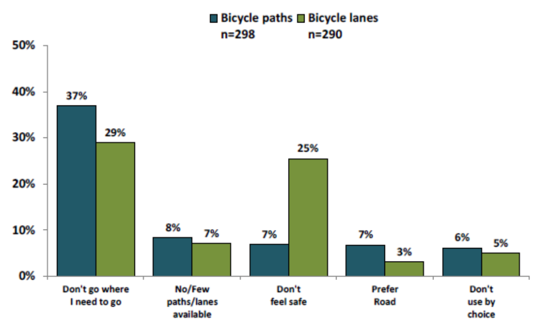
Source: NHTSA 2013

Figure 3.8
Frequency of Using Bicycle Lanes
By Availability of Bicycle Lanes in Neighborhood



Q35. Do you ride in bike lanes…?
Base: Rode a bicycle within the past year
Unweighted N=See Chart

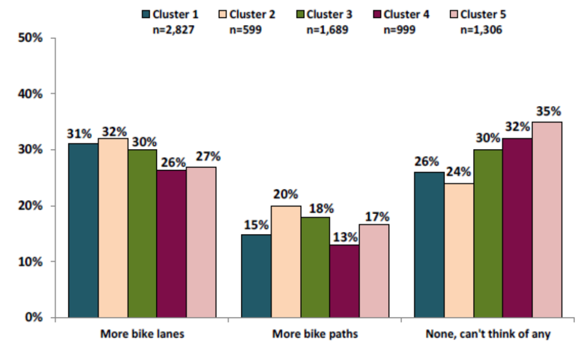
Figure 3.10
Reported Reasons for not Using
Bicycle Paths/Bicycle Lanes



Q33/Q36. What is the main reason that you choose not to use the bike paths/bike lanes…?
Base: Rode a bicycle within the past year, and has bicycle paths/bicycle lanes available within a quarter mile of where they live but hardly ever or never use them
Unweighted N=See Chart

Source: NHTSA 2013

Figure 4.4
Three Most Frequently Reported Changes Desired in Community
By Urbanicity

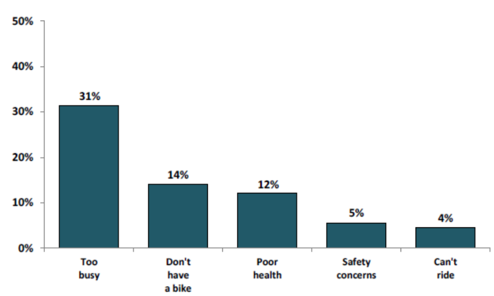


Q46. What changes, if any, would you like to see your local government make in your community for bicyclists?
Base: All respondents except those who said in response to Q1 that they have a disability that prevents them from riding a bicycle.
Unweighted N=See Chart

Source: NHTSA 2013

For those who expressed a desire to bicycle more, the survey asked them to indicate the main reason they do not bicycle as much as they would like. Close to one-third reported that they were too busy. The second most common reason mentioned was not having access to a bicycle.

Figure 4.7
Five Most Frequently Reported Reasons for Not Bicycling as Much as Desired



Q88. What would you say is the most important reason why you do not bicycle as much as you would like?
Base: Respondents who would like to bicycle more than they currently are
Unweighted N=3,989

Source: NHTSA 2013

HEALTH ESTIMATES

There is no definitive methodology for measuring or estimating health benefits due to bicycling or increases in active transportation. The field is open wide for innovative, performance-based approaches. Practitioners in both the transportation and public health fields are researching and developing methodologies, but it remains both resource-intensive and challenging to collect and analyze data for good, solid results.

A simplified approach is to, again, use existing demographic data to infer uses. That is, to apply national averages to your local population to estimate "broad stroke" bicycle use. For example, this data could broadly estimate trends for physical activity from a network or corridor of Class I multi-use trails. On a typical summer day in, people who took a bicycle trip, on average, rode for over an hour (65 minutes). The majority of trips were recreational or for exercise.

Trip Duration, by percent	Percent
0-30 minutes	42
31-60 minutes	36
61-120 minutes	15
121 minutes or longer	7
Average Trip *(during the summer)*	65.2 minutes

Source: NHTSA 2012

The City of Vista (San Diego County) applied for an Active Transportation Program grant for a pedestrian project at Maryland Elementary School. To answer how the project would increase walking and bicycling, the City combined travel counts with the Health Economic Assessment Tool (HEAT) developed by the World Health Organization. Maryland Elementary collected trip data at the school, the project site. Based on the walking trips data, the HEAT generated an estimate of "Reduced mortality as a result of changes in walking behavior," with the following results:

> The walking data you have entered corresponds to an average of **22.72** minutes per person per day. This level of walking provides **an estimated** protective benefit of: **18 %** (compared to persons not walking regularly). From the data you have entered, the number of individuals who benefit from this level of walking is: **372**.
>
> Out of this many individuals, the number who would be expected to die if they were not walking regularly would be: **2.97** The number of deaths per year that are prevented by this level of walking is: 0.53 (City of Vista, 2014)

The City of Vista then used the HEAT's "estimated protective benefit" (18%) in the following formula:

Calculations for Percentage of Trips Shifted to Walking/Biking:

Shift = (Enrolled Students)(% Don't Walk)(% Could Who Don't)*(% Benefit)*
Shift = (589)(73.5%)(46.9%)*(18%)* = 37
% Shift = Shift/(589 Enrolled Students) = 37/589
% Shift = 6.28% ≈ 5% to be conservative

TRIP COUNTS

In addition to automated counters or an ongoing counting program, short-term strategies that can help you collect data are:

- Student-travel tallies (collaborate with schools in project area. classroom tallies)
- One-time manual bike/ped counts
- Mobile automatic counters (less expensive than permanent, installed counters)
- Manual surveys

Comparison of Data Collection Methods

	Data Collection Method	Type of Data
Low-Cost	Web-based Surveys	Bicyclists, Pedestrians (Separate)
	Classroom Surveys	Bicyclists, Pedestrians (Separate)
	Manual Counts	Bicyclists, Pedestrians (Separate)
	Intercept Surveys (along trail or sidewalk)	Bicyclists, Pedestrians (Separate)
	Mobile Automatic Counters	Bicyclists, Pedestrians (Separate)
	Pneumatic Tubes	Bicyclists Only
Higher Cost	Permanent Automatic Counters	Bicyclists, Pedestrians (Some Can Distinguish)

Source: LGC 2015

FORECASTING FUTURE BICYCLE TRAVEL

Data used to forecast travel demand can range from readily available U.S. Census data to large sets of cell phone data, to site-specific counts or surveys. Many forecasting tools are also publicly available. The more sophisticated tools, such as multi-variate travel demand modeling applications, commonly require a relatively high level of training or experience and ample amounts of time. The more sophisticated software can be costly.

Forecasting methodologies will predict travel demand based on aggregate or disaggregate data. "Aggregate forecasting tools analyze a collective or 'aggregated' set of data on existing travel choices to predict travel choices. As an example, this may include using Census Journey-to-Work data for an area to determine what the mode split would be for a new school" (PBIC 2015). Disaggregate forecasting, in contrast, analyzes a set of individuals' the travel choices and their individual characteristics (e.g. age, gender, income level, employment, etc.), then estimates how individuals with the same characteristics across the population can be assumed to make the same travel choices. An example of disaggregate forecasting is using travel surveys to determining what demographic bicycles the most (e.g. male, full-time student, aged 18 to 24), then forecasting bicycling rates based on how many people in the population fit that demographic.

A previous funding source required bike plans to estimate how many more people would commute by bike after the plan was implemented (i.e., presumed to be a result of implementing the plan). Therefore, the 2004 *Humboldt County Regional Bicycle Transportation Plan Update* included data on the existing and projected levels of bicycle commuters. The consultants used aggregated population data to estimate the total number of existing bicycle commuters. Then they used those estimates to forecast the future number of bicycle commuters. HCAOG updated the data for the 2012 update; the regional data is reproduced below as an example.

Bicycle commuter estimates from the *Humboldt Regional Bicycle Plan–Update 2012*:

Humboldt County Region (incorporated and unincorporated areas)		
Demographic Detail	**Data**	**Source**
Population Estimates		
– DOF, with 2000 benchmark	71,567	California Department of Finance
– ACS, 5-Year Estimate	69,018	2005-2009 American Community Survey
Population 5-14 years old	8,338	2005-2009 ACS
Population 16 years or older	61,698	2005-2009 ACS
Population in labor force	34,653	2005-2009 ACS
Workers (16 years and older) who commute to work	30,601	2005-2009 ACS
Bicycle-to-work commuters	428	2005-2009 ACS
Bicycle-to-work mode share	1.4%	Calculated from above
Students enrolled in grades 1 thru 12	10,362	2005-2009 ACS
Total # of bicycle commuters	1,1231,526	Assumes 5% of school students and 10% of college students commute by bicycle - from national studies and estimates*
Miles ridden by bicycle commuters per weekday	7,574	(Work commuters + college commuters x 7 miles) + (1st- to 12th-grade student commuters x 1 mile) (round trips)*
Forecasts: Estimated for fully implementing Bike Plan (20-year horizon)*		
Projected # of future daily bicycle commuters	9,548	Estimated using increase to 279% of baseline from 2000 LACMTA[1] study by Alta
Future # miles ridden by bicycle commuters per weekday	47,389	Based on average miles per weekday by existing bicycle commuters
Reduced motor vehicle miles per weekday	30,329	(assumes 0.64 motor miles per bicycle commuter mile)
Reduced PM10 (lbs/weekday)	558	(0.0184 tons per reduced mile)
Reduced NOX (lbs/weekday)	8 1513	(0.0499 tons per reduced mile)
Reduced ROG (lbs/weekday)	1 2,201	(0.0726 tons per reduced mile)
Reduced motor vehicle miles per year	5,459,220 to 7,582,250	Range based on 180 days for students to 250 days for employed persons
Reduced PM10 (lbs/year)	100,450	180 days (0.0184 tons per reduced mile)
Reduced NOX (lbs/year)	272,415	180 days (0.0499 tons per reduced mile)
Reduced ROG (lbs/year)	396,340	180 days (0.0726 tons per reduced mile)

*Calculations based on Alta Planning + Design formulas. [1]Los Angeles County Metropolitan Transportation Authority

Source: Humboldt Regional Bicycle Plan: Update 2012

There are situations where there simply is no existing trip activity to count, for example where a new trail is proposed. In such cases travel demand is estimated based on other available data, applying any number of metrics or techniques. Planners and engineers typically rely on bike data that can be collected from a similar facility type, such as ridership volumes on adjacent streets, and extrapolate a forecast from there. Obviously, the more alike the "proxy" facility is to the proposed one, the better. It might be a nearby trail, street or intersection, a similar facility located in a like location (e.g. in another similar sized downtown, near another transit station, adjacent to park or school, an equivalent connection to the California Coast Trail, etc.).

Another approach is to conduct a survey(s) to estimate the percentage of potential users. Or, if the Level of Traffic Stress (LTS) has been designated, that, too, can be used to predict demand. For example, if a jurisdiction proposes a roadway project that would result in a lower LTS, they could forecast the increase in bicycle ridership for the new LTS classification. Again, if data cannot be collected, projected trips might be extrapolated from other statistical sources, as discussed above.

Online Modeling Tools

The following are just a few of the many travel modeling tools available to forecast future bicycle travel. The following are available to the public for free.

SEAMLESS TRAVEL MODEL

Caltrans developed the Seamless Travel Model; it includes bicycle and pedestrian models. It is available for use by anyone; however, it is a technical approach which requires technical expertise, such as GIS.

Key inputs:

- AM peak bicycle/pedestrian count
- Employment and population density
- Presence of retail
- Length of nearby Class I bikeway

Methodology available at:
http://www.path.berkeley.edu/sites/default/files/publications/PRR-2010-12.pdf

BENEFIT-COST ANALYSIS OF BICYCLE FACILITIES ON-LINE TOOL

This tool is based on research completed for National Highway Cooperative Research Program (HCHRP) Report 552, and provides outputs for:

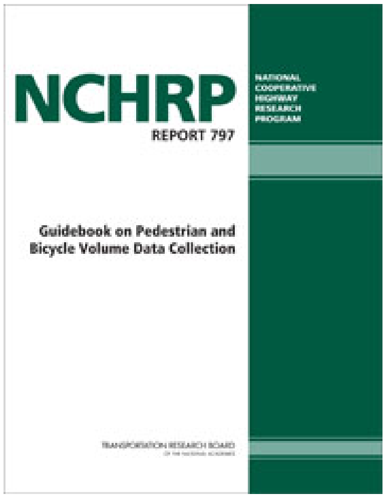
- Total new bicyclists
- New adult bicyclists
- New bicycle commuters
- New child bicyclists

It also estimates mobility, health, and economic benefits. It is available from the Pedestrian Bicycle Information Center's website at www.pedbikeinfo.org/bikecost/index.cfm.

MAPPING RESOURCES

www.healthycity.org
www.communitycommons.org

GUIDES FOR DATA COLLECTION



Transportation Research Board's (TRB's) "National Cooperative Highway Research Program (NCHRP) Report 797: **Guidebook on Pedestrian and Bicycle Volume Data Collection**" (2014) describes methods and technologies for counting pedestrians and bicyclists, offers guidance on developing a non-motorized count program, gives suggestions on selecting appropriate counting methods and technologies.

The TRB has also released the Web-Only Document 205: **Methods and Technologies for Pedestrian and Bicycle Volume Data Collection.** It documents the research that led to the NCHRP Report 797 guidebook, such as testing and evaluating a range of automated count technologies that capture pedestrian and bicycle volume data. Available at http://www.trb.org/Main/Blurbs/171974.aspx

The NCHRP Study 08-78 interim report, "Estimating Bicycling and Walking for Planning and Project Development" is another resource for forecasting. The authors have categorized available forecasting tools by the geographic scope they cover (NCHRP Report 770 and a technical background document, March 2011).

PEDESTRIAN AND BICYCLE INFORMATION CENTER

PEDBIKEINFO.ORG

The pedbikeinfo.org website has several resources for planning and design. The "Planning & Data Collection Tools" menu includes: crash data, counts, surveys, inventories, audits, secondary data sources, and the ActiveTrans Priority Tool.

The website is funded by the U.S. DOT FHWA and maintained by the Pedestrian and Bicycle Information Center (PBIC) within the University of North Carolina Highway Safety Research Center.

NATIONAL BIKE & PEDESTRIAN DOCUMENTATION PROJECT

This national count project is being carried out in an effort to develop a standardized method for conducting manual counts, and to obtain pedestrian and bike count data nationwide. The counts happen every year and are ongoing. Communities participate by conducting counts during the second week in September. During that week, they count bicyclists and/or pedestrians—at the location(s) of their choice—from 5pm to 7pm on at least one weekday (Tuesday, Wednesday, or Thursday), and from noon to 2pm on Saturday.

Agencies may want to participate in annual nation count, and can also use this methodology for other data collection. The methodology includes factors to use to extrapolate annual usage estimates, e.g. factors for seasonal weather changes. The National Project provides information to download (data collection sheets, data spreadsheet, methodology, etc.) from the official website www.bikepeddocumentation.org.

QUANTITATIVE SAFETY DATA

Quantitative safety data is data that will help identify roads, intersections, or other facilities that have a high incidence of collision, hazards, or injuries and may therefore be priorities for implementing projects to improve safety. Analyzing the data should help you understand primary collision factors and what countermeasure or series of countermeasures can address the infrastructure deficiency or other problem.

The FHWA **Crash Modification Factors Clearinghouse** website is an online repository of resources "to help transportation engineers identify the most appropriate countermeasure for their safety needs" (https://safety.fhwa.dot.gov/tools/crf/resources).

Collision data can be obtained from the **Statewide Integrated Traffic Records System (SWITRS)** and the Transportation Injury Mapping System (discussed below). The California Highway Patrol (CHP) maintains the SWITRS database of collision records, including bicycle crashes, reported to and recorded by local police and the CHP. The records are compiled into an annual statewide report. Local police, sheriff, and CHP departments will generally have more up-to-date collision reports than SWITRS.

For the years 2011 through 2015, the California Highway Patrol SWITRS report collision data indicates that the Humboldt region had a total of 302 reported bicycle collisions, with 263 bicyclists injured, and four bicyclists killed (see Table 5.6).

Table ~~3.2~~5.6 Reported Collisions in Humboldt County, 2011-2015

	Total Collisions	Collisions Involving a Bicycle	Bicyclist Killed	Bicyclists Injured	Property Damage
2011	2,004	71	2	58	12
2012	2,118	65	1	59	7
2013	2,040	68	1	53	16
2014	1,996	52	0	48	5
2015	2,008	46	0	45	4
Total	10,166	302	4	263	44

*Reported collisions for calendar year. Source: California Highway Patrol, SWITRS Reports.

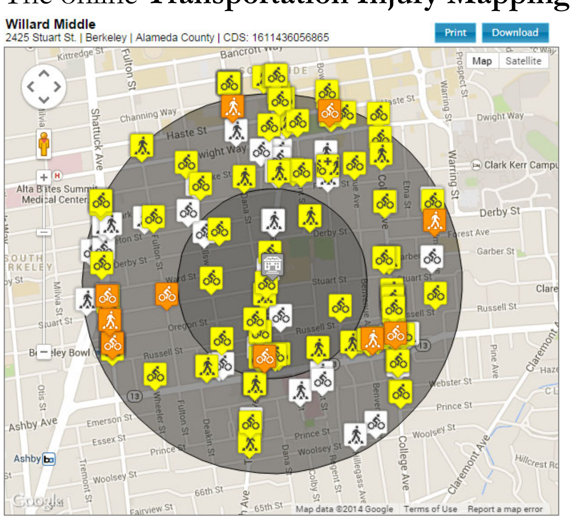
Table 5.7 shows accidents reported by jurisdiction. Eureka had the highest percentage of collisions; the unincorporated County had the second highest. Arcata had the third highest percentage; however, because the City of Arcata covers a smaller area than the unincorporated County, the City may have a higher accident rate per square mile.

Table ~~3.3~~5.7 Collisions Involving Bicycle by Jurisdiction, Humboldt County, 2011-2015*

	2011		2012		2013		2014		2015		Total for jurisdiction	
Jurisdiction	#	%	#	%	#	%	#	%	#	%		
Arcata	19	26.7	11	16.9	11	16.1	13	25.0	13	28.2	67	22.3%
Eureka	30	42.2	34	52.3	33	48.5	18	34.6	19	41.3	134	44.6%
Fortuna	1	1.4	3	4.6	3	4.4	5	9.6	2	4.3	12	4.0%
Unincorporated County	21	29.5	17	26.1	21	30.8	16	30.7	12	26.0	87	29.0%
Regionwide Total	71	100%	65	100%	68	100%	52	100%	46	100%	300	100%

*Reported for calendar year. There are no reported collisions in 2011-2015 for Ferndale, Rio Dell, or Trinidad.
Source: California Highway Patrol, SWITRS Reports.

The online **Transportation Injury Mapping System (TIMS)** provides data tools and mapping analysis tools for traffic safety-related planning. It includes the **Safe Routes to School Collision Map Viewer** which will map pedestrian and bicycle collisions near schools, based on data accessed from the California Department of Public Schools Database. (https://tims.berkeley.edu/help/SRTS_Colsn_Map_Viewer.php)



This site also performs SWITRS queries and maps. (www.tims.berkeley.edu)

TIMS is by the Safe Transportation Research and Education Center (SafeTREC) at the University of California, Berkeley.

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