Evaluating Demand for Bicycle Facilities in Community-based Bicycle Planning

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ABSTRACT

This paper considers methods and data sources to support demand-based bicycle facility planning. Taking the perspective of community-based local planning efforts, the paper evaluates data sources for understanding journey-to-work bicycle trips. By using better methods and data sources, cities can implement bicycle facilities that most benefit the community. This paper uses Pomona, California as a case study, using data collection through the American Community Survey, the U.S. Census Local Employment Dynamics data set, South Coast Air Quality Management District's employee commuting surveys, and field work. These data sources reveal significant variation in bicycle use across the census tract geographies, suggesting that facilities should be targeted to areas of greatest need and potential. Bicycle use is found to be higher in areas with household income less than $30,000 and higher shares of journey-to-work commutes of less than fifteen minutes. In addition, work trip origin-destination data from the Local Employment Dynamics data set allow particular corridors to be examined for bicycle facility potential. Finally, field work and special purpose surveys can provide further insight of demand patterns. This paper recommends using these free and public sources to create bicycle facility plans that target areas of high demand or potential. These data sources can provide good analytical information to support bicycle facility planning.

INTRODUCTION

High levels of automobile use in the United States increase air pollution, and greenhouse gas emissions, contribute to high congestion levels, and degrade public health. In response, many states and cities are promoting bicycle use as an alternative to the use of automobiles. Increasing bicycle use can address many current transportation problems, such as traffic congestion and accessibility for low income populations, and it will reduce impacts of the transportation system such as air pollution, energy use, and climate change. For example, California's SB375 was adopted in order to reduce greenhouse gas emissions (GHG) through reduction in vehicle miles traveled (VMT). One of the ways that cities seek to reduce VMT is by implementing bicycle plans and facilities that increase bicycle usage. Bicycles are ideal for short trips within a 5 mile radius such as local shopping plazas, workplaces, and schools. Bicycle usage is becoming more popular and many cities in the country are advocating for this mode of transportation by promoting its health benefits and psychosocial effects.

Bicycle usage reduces traffic congestion, air, water, and noise pollution, crowded parking, and road and highway costs *(1)*. Traffic congestion wastes 3 billion gallons of gas per year in the U.S. and bicycle use reduces 1 pound of CO2 for every 1 mile pedaled *(2)*. Because the U.S. is trying to reduce the GHG emissions from vehicles, bicycling is a great method to accomplish this goal. According to statistics, 49% of the trips are less than 3 miles, 39% are less than 2 miles and 24% are less than 1 mile *(2)*.

Bicycling offers health benefits by providing people the chance to be more physically active. According to peopleforbikes.org, 3 hours of bicycling per week reduces the risk of heart diseases and stroke by 50%. Women who cycle 30 minutes or more have a lower risk of breast cancer and adolescents who cycle are 48% less likely to be overweight as adults *(2)*.

Furthermore, bicycling offers economic rewards. The usage of a bicycle is less expensive than a car as it saves an average of $8,000 a year that would normally be spent on car usage (gas, maintenance). "On a round-trip commute of 10 miles, bicyclists save around $10 daily" *(2)*. Bicycling can also encourage more community involvement such as organizing events to bring the community together, and enjoy outdoor activities and time spent with family. This not only creates a stronger family bond, but it also provides an opportunity to create a relationship with one's community.

In addition, bicycling also reduces negative psychosocial effects. Adults and children suffer the effects of vehicle usage. Traffic congestion causes aggressive behaviors and stress in adults. Bicycling is a way for these behaviors to decrease *(1)*. Traffic accidents cause post-traumatic psychological effects, increasing depression, aggressiveness, and fear *(1)*. Children who are not active in physical activities tend to suffer more from obesity, social anxiety, and depression *(1)*. All these benefits make bicycle use an ideal transportation mode.

The demand for alternative transportation methods has increased with the recent jump in gasoline prices. In many cities, however, the physical infrastructure does not support safe and convenient bicycle use. When considering locations for bicycle facilities such as bicycle paths or lanes and bicycle parking, a city must consider the existing and future bicycle demand. Barnes and Krizek argue that cities must consider how many people will use a facility, how much the total demand will increase in the facility, and how bicycling will realize public objectives concerning congestion and air quality *(3)*. Also, land use and demographic characteristics are important because they help identify the areas where bicycle facilities are most needed. Such characteristics include population, households, and employment of residents in a community.

Although advocacy for bicycle facility planning is growing, some cities fail to recognize the importance of good analytic information to support their plans. For example, some cities' plans call for facilities where there are few attractions or entertainment. Although many people

ride their bicycles for recreation uses only, nowadays people want to also ride their bicycles as a method of transportation to various destinations.

A good way to advance local bicycle planning is to encourage its community members and/or leaders to implement some or all of the parts in the bicycle planning process. The community strengthens the success of a plan because they bring up concerns, solutions, ideas, or different perspectives and they have a sense of ownership. The community can take the initiative to conduct the analysis while the planning or public works department can oversee the program. Public involvement helps gain support for the implementation of a plan. Public involvement techniques generally consist of an advisory committee that can oversee the public meetings, site tours, discussions, news release and brochures *(1)*. This paper analyzes four types of accessible, free data sources that communities can use to support better location of bicycle facilities. Using the city of Pomona, California as a case study, this paper focuses on the demand and high usage areas using the four data sources.

The demand for bicycle facilities is defined as the areas that demonstrate high levels of existing use, or high potential use by virtue of community characteristics. This paper reports on pilot tests of these data source in portion of Pomona with low income. Households with low income have a higher probability of using public transportation such as bus, train, or the use of bicycle. In addition, this paper examines the factors that reveal the demand for bicycle trips to work. The viability of different types of transportation, such as biking, increases if the commute is less than 5 miles.

Good bicycle planning should consider all trip types, but this paper focuses on journey-to-work trips. Improving facilities for current bicycle commuters is important because these individuals are promoting bicycle usage in the surrounding areas. In addition, understanding demand for bicycling can help planners assess the current conditions of the area and correct poor or dangerous road conditions.

Although there are design guidelines for bicycle facilities that detail the measurements for lanes, paths, trails, and what to consider when implementing a plan, there is a lack of information to understand existing and potential demand.

The four sources used are free and accessible to the community. First, the American Community Survey provides three important variables that highlight the demand for bicycle facilities, including the means of transportation, travel time to work, and household income. By using these three criteria, we will be able to identify high potential census tracts in Pomona. Secondly, the Census Local Employment Dynamics data set provides data on work trip origins and destinations for work trips, reported without travel mode. This is relevant because shorter trips are better suited to bicycling. Thirdly, employer surveys from the South Coast Air Quality Management District (SCAQMD) are used to analyze the modes of transportation to work for reporting employers in Pomona. Finally, field work study in the downtown Pomona area provides an estimate counts of bicycle users.

LITERATURE REVIEW

Better information on bicycle demand can support case-by-case decisions on bicycle facility improvement and the development and adoption of bicycle master plans. According to the California Bicycle Transportation Act (1994) all cities and counties must include the following in their bicycle master plan: 1). Estimated number of existing and future bicycle users; 2). Land use and population density; 3). Existing and proposed bike-ways; 4). Existing and proposed bicycle parking facilities; 5). Existing and proposed connections; 6). Facilities for changing and storing clothes and equipment; 7). Safety and educational programs for bicycle users; 8). Community participation; 9). Plan must be consistent with transportation, air quality and energy

plans; 10) Project descriptions and priority listings; 11). Past expenditures and future financial needs *(4)*. The act states that projects must be designed and developed to achieve the functional commuting needs and physical safety of all bicyclists. The data sources described here focus on step 1, understanding existing and future bicycle users. This data can help develop priorities for bicycle parking, basic safety improvements in roadways and bicycle lanes such as Class I, a bicycle path that is separated from any street or highway; Class II, a bicycle lane that consists of a striped lane for one-way travel on a street or highway; or Class III, a bicycle route that is shared with vehicles.

Many cities construct their bicycle master plan (BMP) based on their goals and objectives and by gathering information from and about their residents. Information is usually gathered through surveys such as travel diaries, traffic counts, or observations. This method usually contains questions about the demographics of an area such as age, gender, residence location, employment and income; the origin and destination of trips on modes such as transit or other forms of transportation; time of trip such as day of the week, time, year, weather, road and traffic conditions; and the purpose of the trip that affects the travel choice for users such as road conditions. Although this method gathers high quality disaggregate information, it is expensive to collect and may lack information on walking trips, bicycle trips, short trips, non-work trips, travel by children or recreational trips *(1)*.

Bicycle guidelines usually focus on standard policies that must be followed when implementing bicycle facilities. These guidelines include details of where Class I, Class II, or Class III bicycle facilities should be installed. These guidelines also provide requirements for signage which help create a better knowledge of an environment amongst bicycle users and a safer atmosphere. Bicycle guidelines also provide recommendations for the installation of bicycle parking, lockers, or bicycle stations.

Although there is some guidance for planning bicycle facilities, there is a lack of literature that shows how bicycle facilities should be implemented based on demand or necessity. Most traffic models are at too high a level of aggregation to capture the short trips by bicycle use so they are not as accurate when predicting work trips. Other techniques, such as tracking bicycle trips with GPS devices, are beyond the capacity of many community-based bicycle planning efforts. The demand for non-motorized travel can be assessed by using free and public data sources that can shed light on attractions, demographics, trip distance, land use patterns, travel conditions, topography, and community attitudes *(1)*.

CASE STUDY

The city of Pomona is a moderately large city with a grid street historical core, located in a suburban land use context 27 miles east of downtown Los Angeles in Southern California. According to the 2009 Census, Pomona has a population of 151, 552 *(5)* and is ranked 5th largest city in Los Angeles County *(6)*. Pomona takes great pride in creating new visions and lifestyle for the future of its residents.

FIGURE 1 Location of study area in Pomona
Source: Local Employment Dynamics

Pomona was selected as the case study because it is developing a bicycle master plan to implement a range of bicycle facilities, making it ideal to explore methods of determining bicycle demand. According to the 2009 Census (American Community Survey), 0.9% of the population in Pomona uses bicycle as their mode of transportation for the journey-to-work trips *(7),* only slightly higher than the level for Los Angeles County (0.7%) *(7)*. Pomona was also a good site to incorporate a community-based bicycle planning because it has lower income neighborhoods that might have higher bicycle demand and lack resources for bicycle planning.

Pomona currently has two areas with assigned bicycle lanes. The first is a Class II bicycle lane that is less than a mile long on Hamilton Avenue between Phillips Avenue and Mission Boulevard. Although this bicycle lane is a good first step, it does not appear to be based on the analytic information documenting the use and benefit to the public. It does not lead to any type of entertainment/attractions or to another form of public transportation (such as a bus).

The second area is a bicycle lane on Kellogg Drive and University Drive, near the American Red Cross building at Cal Poly Pomona. Again, this bicycle lane does not appear to be based on analytic information because it is not well-used by bicycle riders. Although this lane is in the vicinity of the Cal Poly Pomona campus, it is underutilized by bicycle users.

These two areas lack inter-connectivity, attractions, demand, necessity, and safety. Current bicycle users in Pomona ride their bicycles on sidewalks and sometimes on the street which raises safety issues for the city.

If a city improves the inter-connectivity between local entertainment, shopping, and

dining, bicycle users will have a stronger desire to take advantage of the facilities. In addition, if the city creates inter-connectivity with surrounding cities that also promote bicycle ridership and attraction the city will have a more populated, well-used, and successful facilities.

METHODOLOGY

This study uses selected areas in Pomona to examine the usefulness of different analytic approaches to planning bicycle facilities. By using the recommended four types of analysis, a community can have a better understanding of the potential for bicycle trips to work. The four types of sources include the U.S. Census (American Community Survey-5-Year average), the U.S. Census Local Employment Dynamics data set, South Coast Air Quality Management District (SCAQMD) employer surveys, and direct field work and observations.

Source #1: American Community Survey (5-Year)

The American Community Survey provides five year averages for census tracts for the city of Pomona. Tract level analysis can highlight differences in bicycle use that is lost in city-wide averages. The data collected focuses on three criteria to help map the areas with the highest demand. The first is a direct measure, the "Means of Transportation" (code "B08301"); the second and third are indirect measures, including "Travel time to Work" (code "B08303"); and "Household Income" (code "B19001"). The results are compared at the county level, city level, and census tract level. Figure 2 provides the census tract map; the tracts that are analyzed are represented in a pink circle as shown in Figure 2.

The census tract analysis is tested in four areas in the City. "High Bicycle Usage" is tract 4017.03 which has the highest percentage of bicycle users in the city. "Current Bicycle Lane" is based on tract 4025.01, and selected to understand bicycle use in a tract that has a bicycle lane. "Downtown Pomona" is based on tracts 4023.02 and 4025.02 which reflect the core area, and tracts with a high percentage of bicycle users. Finally, "Single Use Suburban area" is selected to be representative of bicycle users in a suburban area (tracts 4033.17 and 4024.02). The caution in using the American Community Survey is that the margin of error with the five year tract level data may affect the usefulness of the data.

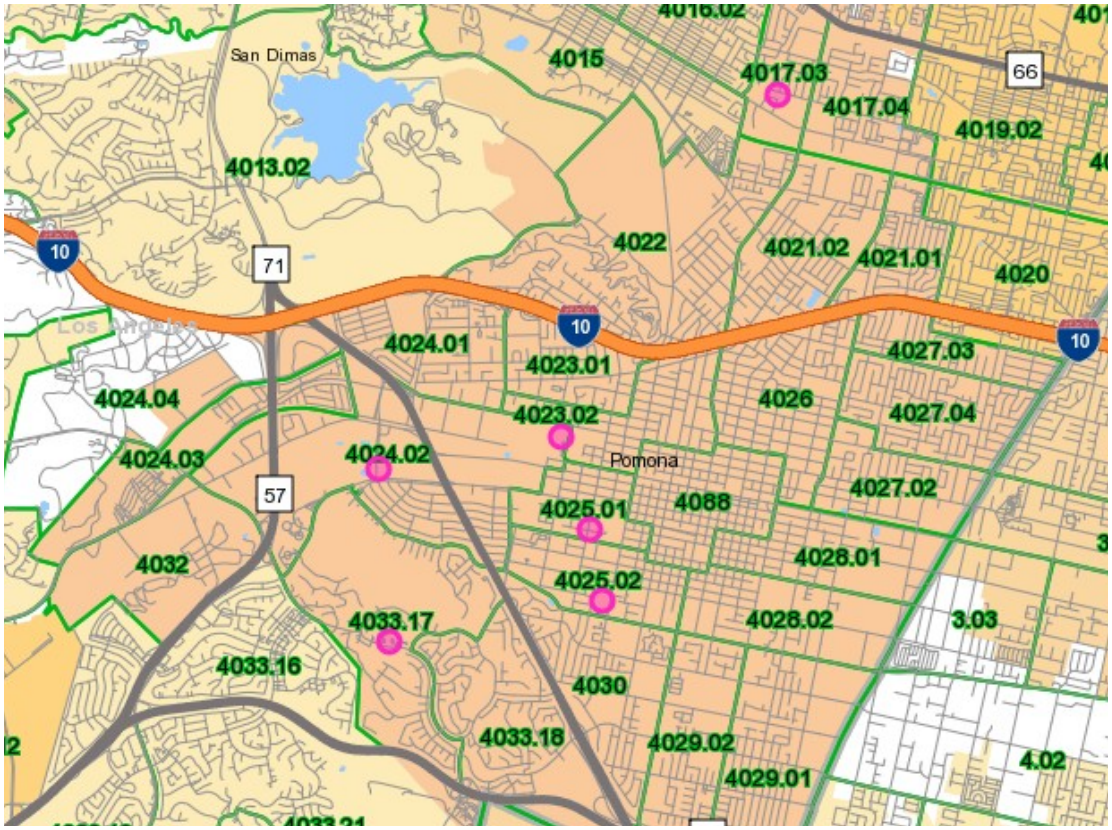

FIGURE 2 Location of census tracts in Pomona
Source: Local Employment Dynamics

Source #2: Local Employment Dynamics

The Local Employment Dynamics data set is an analytical and mapping program that provides information about the location of workers, jobs, local economies, and communities (8). It is based on employer reports of workers' home address. The mapping option is useful in that it creates a spatial analysis of work trip origins and destinations for work trips of all travel modes. It is tested in the tract with the highest bicycle use (tract 4017.03) to help understand the spatial dispersion of work trips and assess the potential for better serving bicycle trips to nearby destinations.

Source #3: South Coast Air Quality Management District (SCAQMD)

The South Coast Air Quality Management District (SCAQMD) is the agency that regulates air pollution in the Southern California air basin *(9)*. Information was obtained from SCAQMD's Rule 2202 commute mode surveys that are completed by certain employers having more than 500 employees. The information collected includes bicycle use for the work trips. SCAQMD provided a data file that contained the commute mode information and descriptive information for employers in the City of Pomona. While SCAQMD is unique to Southern California, there are similar air quality agencies in many other regions, as well as other agencies that regularly collect travel behavior data.

Source #4: Field work and observation of Pomona

Community-based bicycling groups are increasingly becoming involved in bicycle count field

work. Although government agencies are also involved in bicycle counts, the lack of funding creates an issue for broad coverage of existing use levels. The field work and observations done in the downtown Pomona area include data collected through fieldwork by a group of undergraduate Urban and Regional Planning students from Cal Poly Pomona in Fall 2010. The field work consisted of observations and bicycle counts on Garey Avenue between Holt Avenue and Phillips Boulevard. This area was selected because it is near the Pomona Metrolink station, near the current bicycle lane on Hamilton Avenue, and because it is in a downtown area that is increasing its entertainment options for current and potential visitors.

ANALYSIS

The data collected produced useful information and clearly shows the variation in bicycle use across Pomona. First, the American Community Survey indicates that there is a high variation in the bicycle usage in downtown area compared to the suburban area. Second, the highest bicycle use tract (4017.03) was analyzed with the Local Employment Dynamics and reveals that there is a high level of travel to nearby surrounding cities, a finding that suggests good potential for bicycle facilities. Third, the Southern Coast Air Quality Management District provided information on the modes of transportation that employees use in the city of Pomona. The results were not fully representative because not all employers are required to survey their employees. Lastly, the field work and observation in downtown Pomona analyzed the bicycle usage during different times and days of the week to estimate the demand for facilities. The results indicated that there is a high usage in the downtown area. Ultimately, the goal was to identify the areas with a high and low demand for bicycle facilities so that investments in facilities can be targeted to the best locations.

Source #1: American Community Survey (5-Year)

TABLE 1 Census Table

Source: American Community Survey 2005-2009

	L.A. County	City of Pomona	Pomona Census tracts			
			High Bicycle Usage	Current Bike Lane	Downtown Pomona	Single Use Suburban area
Tract number			4017.03	4025.01	(4023.02 & 4025.02)	(4033.17 & 4024.02)
% of Bike	0.7%	0.9%	5.4%	3.0%	2.6%	0.0%
% travel time < 15 min	34.3%	36.2%	34.0%	28.8%	26.1%	17.2%
Income < $30,000	27.9%	28.4%	35.5%	34.6%	41.6%	19.7%

Table 1 shows the comparison for the three criteria at the county level, city level, and census tract level. As shown, the city level has a somewhat higher percentage than the county level. The highest bicycle use tract has a rate of cycling that is seven times that of the county average, clearly indicating a localized bicycle facility need. Research has shown that 40% of automobile trips are less than five miles *(10)*. Considering these statistics, a large portion of the population makes trips that are less than fifteen minutes, which is an approximation for a five-mile drive. If more of the residents with a drive less than fifteen minutes would use cycling as their mode of transportation, the demand for bicycle facilities would increase and there would be less vehicle use. Conversely, the single-use suburban area shows a share of 15 minutes or less

trips that is much less than the county average, indicating a lower bicycle potential for the journey-to-work, unless that trip is linked with transit. Finally, the Downtown Pomona tracts studied show lower household income and likelihood to choose alternative modes of transportation such as public transport or bicycle usage. Within the L.A. County, 27.9% of the population has a household income less than $30,000, but the high bicycle use tract in Pomona has a 35.5% income below that level.

The census tract analysis provides essential data as it shows the variation in bicycle usage and predictive factors across the city. The highest percentages within the three criteria were found in the northern part of the city ("High Bicycle Usage") with 5.4% of the population using bicycle as a mode of transportation and lower incomes. This suggests that low income households would benefit more from bicycle facilities.

As the table shows, the data support the "Current Bicycle Lane" area on Hamilton Avenue. The statistics indicate that 3.0% of the area's workers use bicycles, which favors the location of the current bicycle lane. However, this lane remains underutilized. Planners can use this area to identify problems that contribute to the low usage of the lane and find ways to connect it to any entertainment or attractions as a way of increasing its use.

Downtown Pomona has a higher percentage of bicycle commuters than the city average with a 2.6% bicycle mode share. The lower household income indicates that there can be a high demand for new bicycle users if a plan is adopted in the downtown area. The downtown area is important to Pomona because as the city increases its redevelopment activities, a bicycle plan that can be incorporated around entertainment and destination points.

The suburban neighborhood of Phillips Ranch indicates 0.0% bicycle share for the journey-to-work in the area. This area has the least favorable statistics regarding income and short work trips. Investments in bicycle facilities in these neighborhoods are unlikely to have as great a benefit as the other tracts, although there may be bicycle use for recreational and school purposes not measured in this analysis.

Source #2: Local Employment Dynamics

Figure 3 shows an output from the U.S. Census Local Employment Dynamics data set for Census tract 4017.03 for the year 2009. The map plots concentrations of jobs, showing clusters of destinations that could be served by bicycle facilities in high bicycle-use tracts.

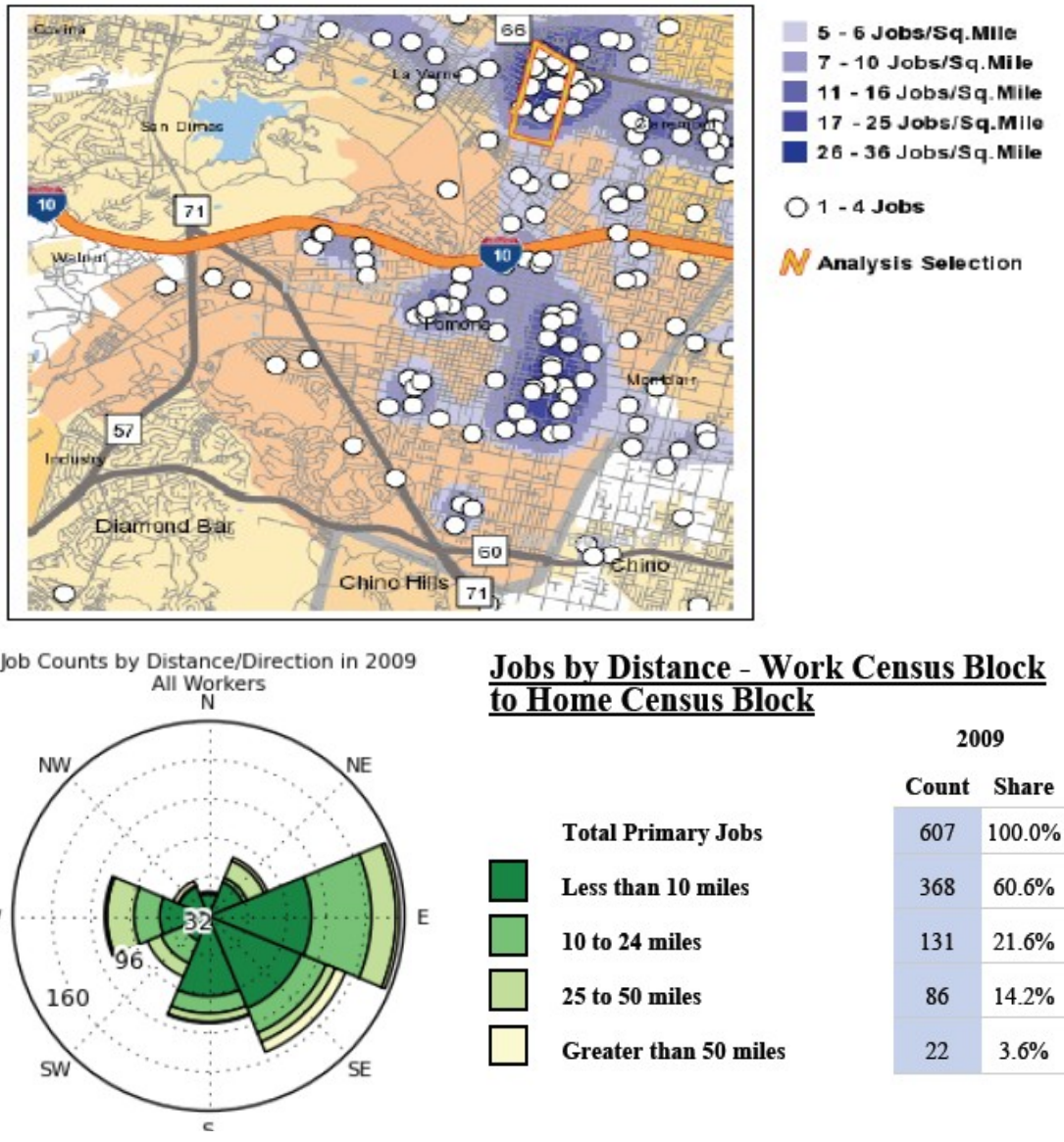

FIGURE 3 Jobs by distance in high bicycle usage area
Source: Local Employment Dynamics

Census information highlighted the area with the highest bicycle use in Pomona which is tract 4017.03. This area was analyzed in the Local Employment Dynamics data set to understand the destination trips from work to home for all work trips. The map on Figure 2 focuses on the people living in this area who also work in the nearby area in order to understand the clustering trips that are coming in and out of the neighborhood (shown in dots).

The map indicates there are clusters to the west (towards La Verne), the east (toward Upland), and Pomona south of the 10 freeway. These areas indicate that there is a likely justification for bicycle facilities in those corridors, and it offers a promising outcome considering these directions have current bicycle facilities.

Some major arterial in these directions include a Class I bicycle path on Fairplex Avenue in La Verne and a Class III bicycle route on Puddingstone Avenue, which also provides

connectivity towards the city of San Dimas. The east side is towards Upland but also to one of the major leading local cities in cycling, Claremont *(11)*. Claremont has many Class II bicycle lane facilities and is also a great destination for entertainment.

In comparing the percentage of jobs within 10 miles of the residence, this tract has 60.6% whereas Pomona as a whole is 37.4%, indicating that this neighborhood has a more local employment pattern. This data helps explain the Census analysis finding that this area has a high bicycle share.

Source #3: South Coast Air Quality Management District (SCAQMD)

In many regions, other data collection and activities produce information useful to bicycle facility planning. For example, some large employers in Southern California survey their workers on an annual basis concerning their commuting patterns and mode choice, including bicycling. This survey is one of the options for compliance under Rule 2202, a regulation intended to reduce air pollution from mobile sources. This data must be requested from the South Coast Air Quality Management District, but it is public information that allows the identification of employers with high bicycling levels. Table 2 shows the results for employers in the City of Pomona, revealing a 0.16% bicycle share across the seven reporting employees, with the highest bicycle share being 0.39%.

TABLE 2 SCAQMD Commute Data

Location	Type of Business	Number of Employees	Bicycle share
100 W 2nd Street	*Chase*	255	0.00%
761 Corporate Center Drive	DeVry University Pomona Campus	303	0.09%
2040 W Holt Avenue	Los Angeles County Government Offices	366	0.00%
3179 W Temple Avenue	Blue Cross Building	480	0.00%
309 E Second Street	Western University of Health Sciences	741	0.39%
3530 W Pomona Boulevard	Business Complex	1,228	0.10%
1798 N Garey Avenue	Pomona Valley Hospital Medical Center	2,744	0.20%
Total		**6,117**	**0.16%**

The highest bicycle share was reported at Western University of Health Sciences that is located in Downtown Pomona. The bicycle share percentage coincides with the bicycle share reported in the American Community Survey. The 0.39% share makes a contribution to the total 2.6% reported in 2005-2009 year. This provides useful evidence that there is a high demand for bicycle facilities in the downtown area and a basis for creating partnerships with specific employers.

This source can be potentially useful as it would allow mapping of the commuting patterns and mode choice by employees; however the small sample size of employers make this source impractical as a sole information source.

Rule 2202 is potentially a good source of supplemental information for bicycle planning, particularly because it can track year to year trends and is based on high response rates. In larger cities, there may be a larger group of employers conducting surveys. In addition, there may be other survey data that can be identified for bicycle planning purposes, such as travel diaries completed by regional governments.

Source #4: Field work and observation of Pomona

An effective way of collecting data on the use of bicycles is by conducting field work observations and counts. Field work is a free source of information if volunteer fieldworkers can be recruited. In this case, data collection was conducted in downtown Pomona by a class of Cal Poly Pomona students to identify the current level of bicycle users. Observations were conducted through peak times on business days to identify the highest counts.

TABLE 3 Bicycle counts in Downtown Pomona

Bike counts on Garey Ave. and Phillips Ave.				Bike counts on Garey Ave. and Mission Blvd.			
	Time	11/15 /10 4:20pm-5:30pm	11/16/10 11:30 am-12:15pm		Time	11/16 /10 4:30pm-5:20pm	11/23/10 3:45p.m.-4:30p.m.
Total # of Cyclists		32	10	Total # of Cyclists		14	7
Gender	Male	29	10	Gender	Male	11	6
	Female	3	0		Female	3	1
Waiting for	Bus	0	0	Waiting for	Bus	1	0
	Train	0	0		Train	0	0
Bikes on Bus rack		0	1	Bikes on Bus rack		2	0

Table 3 supports the findings about bicycle use percentage collected from the Census. The downtown area is a qualified area that clearly shows demand for bicycle facilities. Because this area is also near the Metrolink commuter rail station and bus hub, it is ideal for inter-connectivity between bicycling and public transport, thereby extending the potential range of commuting.

Although conducting observations and counts is time consuming, it does provide an accurate data collection that is helpful to determine areas with the most bicycle use. The person conducting the observations needs to determine the data objectives and create a spreadsheet data collection template and training materials that will help guide the counts.

Comparison of Results

The four different sources show significant variation in the demand for bicycle facilities in different areas of Pomona. The Census data provides tract-level information on bicycle use and corresponding demographic, income, and travel time data. This source is easily accessible by going to the Census website and selecting the criteria for analysis.

The Local Employment Dynamics (LED) also supports the Census information by

identifying work trip origin-destination patterns in tracts identified in the census tract analysis as having higher levels of bicycle transportation. This information source is part of the Census web site. Although the web site is not hard to manipulate, it does take time to understand the options because of the large data analysis options available.

The SCAQMD source also supports the Census information regarding Pomona's bicycle usage. Furthermore, it supports the idea that colleges tend to have a more frequent bicycle use because they tend to promote climate awareness amongst the staff and students. This data can be requested from the South Coast Air Quality Management District by stating the county and city information needed.

The field observations conducted in downtown Pomona support the conclusions based on the Census. Although conducting field work is free and accessible, it is also time consuming. The analyst must identify the goals for the data collection process in order to gain accurate and useful information for the implementation of bicycle facilities. In addition, field observations offer accurate and current information regarding the bicycle users. By first identifying the areas with high bicycle usage in the census tract analysis, the analyst can further build a strong profile by conducting bicycle counts and observations in areas with the most bicycle use.

	Pros	Cons
Census	● Provides work trip bicycle shares for the tract level.	● The high margin of error at the tract level. ● Does not deal with non-work trips. ● Survey asks about the main trip travel mode. If respondent uses a bicycle to a bus, the respondent will only answer to the majority of the mode used, so the bicycle portion will be lost. ● There is a large amount of variables to select. Analyst must know exact variable interested in obtaining data.
Local Employment Dynamics	● Provides options to select a study area. ● It creates a map and chart based on the data collected.	● Survey is based on all trips and not specifically to bicycle trips. ● The website is time consuming and is initially confusing due to the many options available to map the area analyzed.
SCAQMD	● Identifies areas with high bike usage	● Few employers conducting survey so it produces insufficient data.
Field Work	● Accurate and current.	● Field work does not indicate the trip purpose or origin of destination. ● Trips counted may be less than the number of people who want to use bicycle if the route seems unsafe. ● Time consuming

TABLE 4 Strengths and Weaknesses from Sources

Table 4 summarizes the main strengths and weaknesses from each data source. The best source reviewed is using census tract information because it provides essential information on

bicycle use. Field work is also a strong source because it offers accurate and current information about the area being analyzed, but it does not tell the analyst the purpose of the trip, origin or destination information (unless cyclists are stopped and asked those questions). Conducting field work is also essential for determining the current conditions of roads or sidewalks that might help explain a low bicycle percentage. If roads are in need of improvements, bicycle users might ride their bicycle less as it poses safety issues. This information helps planners assess the conditions of an area and improve them as well.

CONCLUSIONS

This study focuses on the factors that reveal the demand for bicycle trips to work and the locations where people demonstrate the most need. All sources reveal that areas with low income have a higher demand for bicycle facilities because their bicycle usage rate is higher than areas with a higher household income. The sources recommended provide useful information and can reduce costs to the city for hiring consultants to develop a plan. However, the city (and local community and advocacy groups) must demonstrate interest and commitment to initiate a community-based plan. The suggested data sources serve as an important starting point for community-based planning efforts, but are not definite indicators of demand. Further research could be considered to identify a correlation between high demand and supply.

The Pomona case study reveals a variety of bicycle usage throughout the city. While downtown Pomona and the northern side of the city reveal high bicycle usage, the suburban area of the city has less usage. By comparing the data, it is clear that the location of bicycle facilities must be targeted.

While the city is responsible for adopting and implementing a bicycle plan, the engagement of the community further strengthens the success of a plan. Cities already conduct public hearings to get the community involved in a plan. However, if the city promotes the idea of a community-based plan, residents might take the initiative to conduct analysis with the tools reviewed here along with the planning or public works department overseeing the program.

Future research concerning innovative data sources for bicycle planning could address other types of bicycle trips (shopping, recreational, social, school, etc.). Planners need to conduct a thorough demand analysis for all trip purposes to determine total bicycle demand, priority for bicycle facility improvements, and connectivity across bicycle, pedestrian in general, and transit transportation modes.

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