How Equitable is Bikesharing? Exploring Population Characteristics and Access to Employment

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ABSTRACT
Public bikesharing systems have grown considerably over the last several years, but face criticism for serving primarily a White, affluent residential population. But almost no study has explored whether bikesharing systems similar serve disproportionately high-status employment. This study explores the equity implications of residential and employment characteristics in the service areas of 29 bikesharing systems in the United States. I find that consistent with prior research, block groups within a five-minute walk of bicycle stations have a significantly higher proportion of White residents compared to those within a 3200-m radius. There are more mixed results when examining rates of poverty and English proficiency, but systems serve a higher proportion of zero-vehicle households. I find consistent results that almost all bikesharing systems serve significantly more higher-income, higher-skilled jobs. The findings suggest that equitable access to employment will be hard to achieve even with targeted inclusion efforts to lower-income person-of-color communities. System planners should rely on integration with public transit to achieve access equity goals.

INTRODUCTION

Public bikesharing systems have taken off at a rapid pace over the past few years. In the middle of 2013, there were 25 systems in operation in the United States (*1*); just four years later, there were 153 (*2*). While shared bicycles can serve multiple purposes and often aim for aspirational goals of mode shift or reduction in car use, they can provide an important first-mile and last-mile link to public transit. Critically, increasing the ease of transit access and egress can substantially increase accessibility to low-wage jobs for transit-dependent populations (*3*).

But bikesharing systems have come under considerable criticism from media and transportation advocates for serving an affluent, largely White population (*4*, *5*). This criticism supported by several studies that have examined both demographic characteristics of users and station areas and found considerable inequities in both (*2*, *6*). And while station access is not the only barrier to an equitable bikesharing system, it plays a large role in who will be able to get to a bicycle when needed and the destinations they can reach. The research to date, however, has looked primarily at the *residential* characteristics of where stations are located. Given the potential for bikesharing to fill gaps in commute travel both on its own and as a feeder mode to public transit, it is important to examine access to employment as well. This study asks whether bikesharing systems provide equitable access to jobs categorized by employment sector, income level, education needed. I hypothesize that they do not.

I begin this paper with a brief review of the literature on equity in bikesharing, including user demographics and trip characteristics. I also review the literature on barriers to cycling and bikesharing for low-income people and people of color. I then describe the methods and data sources of the study and review results from the analysis of both residential and employment characteristics of bikesharing service areas. My findings on equity of residential characteristics are consistent with previous literature, in that station areas for most systems I studied serve primarily White residents, though results are more mixed for indicators of poverty, English language proficiency, and vehicle access. However, I also found that station areas almost universally serve higher-prestige, higher-income employment.

LITERATURE REVIEW

Researchers and other observers have highlighted several inequities in bikesharing systems. Users tend to be White, higher-income, and more highly educated than the general population (*6–9*). In some cases, their characteristics also differ from other bicycle users. In Washington, DC, researchers found that users of the Capital Bikeshare system were less likely to be African American, but more likely to be from lower income groups compared to other bicyclists. However, the mean household income of bikeshare users was over $80,000, significantly higher than the median income for the district (*10*). Often, the differences result from a lack of access. A study of six large bikeshare systems found that stations were more likely to be located in census block groups with higher proportions of White residents compared to the rest of the city, and were often in higher-income neighborhoods (*11*). Another study developed an index of hardship, combining several socioeconomic characteristics, to find that three-quarters of all bikesharing stations in 42 systems examined were located in areas of the lowest hardship (*12*).

Commuting is at or near the top of trip purposes for bikesharing trips. In Washington, DC in 2011, work trips made up about 43 percent of all bikesharing trips, while social trips made up about 44 percent (*10*). For annual members of bikesharing systems, as opposed to causal or infrequent users, a review of more recent studies suggests that commuting is the top trip purpose (*6*). Annual members in Washington, DC, were more likely to travel in mixed-use neighborhoods compared to casual users who tended to travel in parks and near the national monuments,

suggesting more utilitarian travel for longer-term bikesharing users (*13*). In some places, bikesharing contributes to more multimodal travel, replacing trips previously made by other sustainable transportation modes (*7*). But in other cities, such as Montreal, Minneapolis, Washington, and Toronto, bikesharing has replaced car trips (*1*, *14*). Using results from user surveys, one study found that in Washington, DC, and Minneapolis, each shared bicycle replaced 247 km and 135 km of personal vehicle travel, respectively (*14*). Research on bikesharing patterns in New York City found that stations adjacent to subway stops generated the most trips in the system (*15*).

The lack of diversity in bikesharing users does not necessarily reflect a lack of interest in use. For example, when the London bikesharing system extended to outlying, higher deprived areas, proportion of users increased from 6 percent to 12 percent between 2010 and 2013 (*16*). Often, barriers to bikesharing use specifically and bicycle use in general stem from issues other than physical proximity. For example, when the London system increased prices, infrequent system users from the higher deprived areas decreased their bikesharing use (*16*). When the Minneapolis bikesharing system extended to a low-income area of the city, the program conducted extensive community outreach to determine station placement and barriers to use. The focus groups conducted as part of the outreach found that requiring credit card payments excluded members who did not have or did not want to use them for recurring subscriptions. They also found that residents saw cycling as an activity for professionals, or, conversely, as a signifier of lack of success. Other concerns included lack of safe infrastructure for cycling and few attractions to draw visitors to the neighborhood (*17*). Focus groups of potential users conducted with predominately African American residents in Philadelphia came to similar conclusions about a new bikesharing system. While people were curious about the system, people were hesitant to cycle because of poor infrastructure, and concerns about traffic safety and personal security (*18*).

Other surveys of low-income people and people of color echo these findings. In surveys conducted with residents of Philadelphia, Chicago, and Brooklyn, the biggest barrier to cycling and bikesharing use is traffic safety, regardless of race and income. But for people of color, personal security and fear of bicycle theft are also significant barriers to cycling (*2*). Black and Latino residents of New Jersey faced similar barriers to cycling, while additionally noting a fear of racial profiling by police (*19*). Inability to ride socially with family would discourage some people of color from cycling. Philadelphia focus group respondents described how the bikesharing system's age restrictions would prevent families from riding together (*18*). Other studies with low-income, Black, and Latino people found that riding with family was an important motivation for cycling, and lack of supportive infrastructure would prevent them from doing so (*2*, *20*, *21*). Nevertheless, findings suggest that both access and personal considerations need to be addressed for an equitable bikesharing system.

METHODS

There are at least 119 IT-enabled bikesharing systems in the US as of January 2017 (*22*) (and 153 by another count (*2*)), but many have only a handful of docking stations and thus do not serve a large proportion of their city's population. I selected the largest 29 bikesharing systems in the United States as measured by docking points for bicycles (see figure 1). This number represents systems that had at least the median number of docking stations of all systems available with open data sources. The Citybikes application programming interface (API) aggregates bikesharing data feeds into a common technical platform (*23*). I used this API as the source of docking station location data.

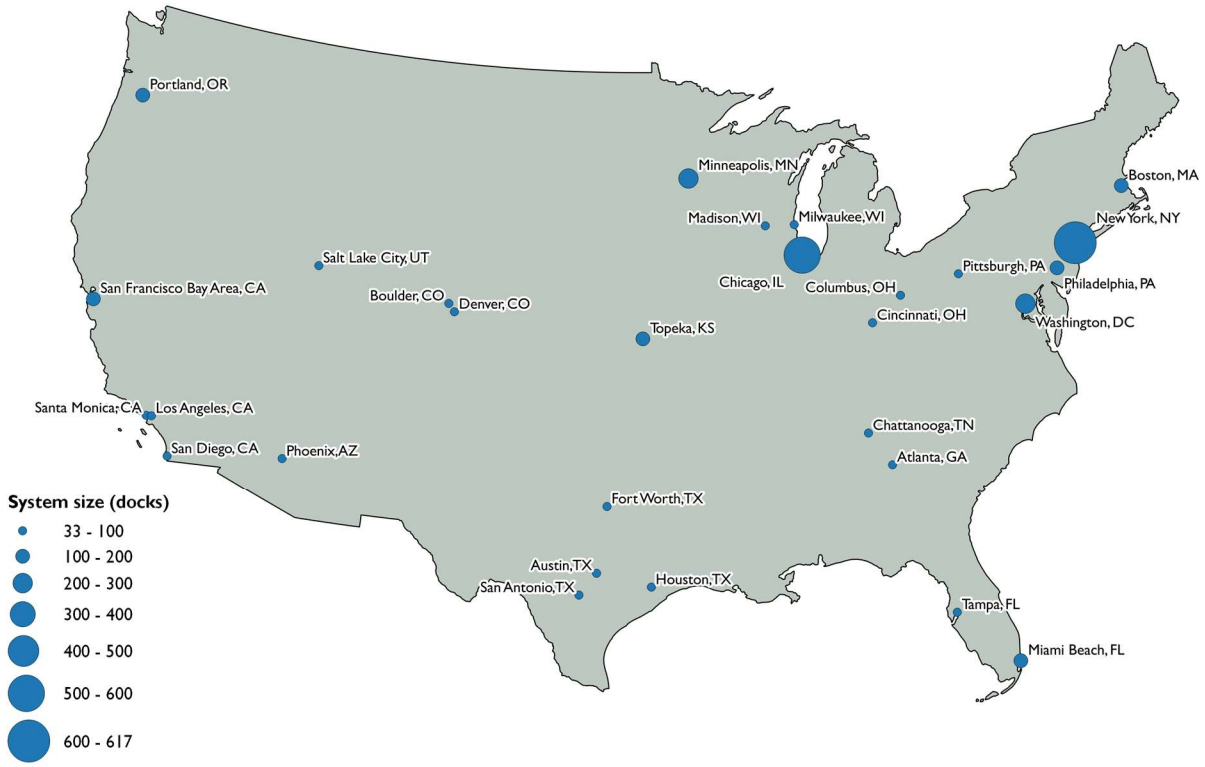

FIGURE 1 Size and location of largest bikesharing systems.

I computed the service area of each bikeshare system as the census block groups located within a 400 m (1/4 mi) radius of all the docking stations, or those within about a five-minute walking distance from a bicycle. I divided the CitiBike (New York City), Coast Bike Share (Tampa/St Petersburg, Florida), and the Ford GoBike (San Francisco Bay Area) systems into multiple groups for analysis. CitiBike is spread between Manhattan and Brooklyn/Queens; Manhattan has unique spatial and economic characteristics that are worth exploring separately from the rest of the system. Both the Tampa/St Petersburg and the San Francisco Bay Area systems have clusters of docking stations separated by long distances that would be infeasible to bicycle between. In the end, 33 different bikesharing system groups were available for analysis. Comparison block groups were those in the same county within 800 m (1/2 mi), 1600 m (1 mi) and 3200 m (2 mi) of the docking stations. I assumed that the 800 m distance might represent plausible, alternative locations for docking stations in the system. Other equity analyses have compared bikesharing service areas to the entire city (*11*); however, this may not be an appropriate comparison given the infeasibility of bikeshare in lower-density areas (*24*). The 1600 m distance represents an intermediate point of analysis.

I compared sociodemographic and employment variables for the census block groups in each service area with the three other distance groups. Sociodemographic variables analyzed come from five-year 2011–2015 American Community Survey estimates and include population proportions by race/ethnicity, poverty, English-language proficiency, and zero-vehicle households, which often represent criteria for communities of concern or other vulnerable

populations in equity analyses. Employment data comes from the 2014 Longitudinal Employer–Household Dynamics (LODES) dataset. I categorized the number of jobs by into low-income, blue collar (i.e. manual and service labor), professional employment, low-educational attainment, and those requiring a college degree. Note that employment category is based on the North American Industry Classification System (NAICS), which classifies business establishments, not individual jobs within each firm. Because LODES aggregates multiple data sources and includes perturbed data to protect confidentiality, it is not an exact representation of job locations. However, it is the most comprehensive national data source on employment that is available at a small-area level. Variables and definitions are shown in table 1. Statistical tests of comparison form the basis for analysis.

TABLE 1 Population and employment variables

Population characteristics	% White population	
	% Black population	
	% Latino population	
	% In poverty	
	% Limited-English proficiency	
	% Zero-vehicle household	
Employment characteristics	% Low-income jobs	Earning $1250/month or less
	% "Blue-collar" jobs	NAICS industries: Manufacturing, trade, transportation/warehousing, accommodation/food service
	% "White-collar" jobs	NAICS industries: Information, finance, real estate, professional, management
	% No-college jobs	
	% College jobs	High school or less Bachelor's/advanced degree

RESULTS

Population characteristics

Results from the population analysis indicate that, for most cities, bikesharing systems serve residential areas that are Whiter, less poor, and more proficient in English (Table 2). Although the absolute values of the proportions vary by small amounts in each of the three buffer distances measured, the signs are consistent in almost every case. By far, the biggest differences between the service areas and comparison areas are in the proportion of the population who is White. The service area for 26 of the 33 system groups analyzed had a share of the White population larger than 3200-m comparison area, and half of those were 10 percentage points greater. The largest difference was in Manhattan, NY, where 75 percent of its census block groups are within the

service area, but those outside are in Harlem and Upper Manhattan, which has the highest concentration of Black residents in the borough. Service areas for Milwaukee, Forth Worth, Philadelphia, Miami, and Cincinnati all have a White population at least 20 percentage points higher than the comparison area. In Topeka,[1] San Francisco, Oakland/Berkeley, Minneapolis, and Boulder, however, the bikeshare service areas had more non-White residents at each comparison area; values ranged from 4 to 14 percent. It is clear that distinguishing between services areas was necessary for the San Francisco Bay Area. The East Bay and San Francisco locations have a greater proportion of non-White residents within the service area, while the opposite is true for the San Jose service areas.

The differences for the other equity metrics in the population are less disparate and statistically significant, though many still are. For six of the 33 system groups, concentrations of poverty are lower within the service area compared to the largest comparison area, while poverty is higher in 14 service areas. Generally, but not always, the higher poverty within the service area is associated with higher proportions of non-White residents. But for Madison, San Jose, Pittsburgh, and Columbus, the bikesharing systems served areas with more White residents and more people in poverty. Madison also had the highest difference in poverty between block groups inside and outside the service area. Seven systems served areas with higher proportions of limited English speakers, while ten systems served areas with lower proportions. The most equitable metric was the proportion of zero-vehicle households served. Bikesharing systems in only two cities (Miami and Cincinnati) served more households with vehicles compared to outside the service area, and only two percentage points less in those instances.

[1] Topeka's system is unusual in that most docks have space for only a few bicycles, while riders can also lock up shared bicycles to any city-owned bike rack. This enables the system to cover 80 percent of the block groups in the county. The other systems operate more common fixed docking locations.

TABLE 2 Comparison of bikesharing service areas, population characteristics

		White		Black		Latino		Poverty		Limited English proficiency		Zero vehicle households	
Bike Share System	Location	400 m	3200 m	400 m	3200 m	400 m	3200 m	400 m	3200 m	400 m	3200 m	400 m	3200 m
Citi Bike - Brooklyn/Queens	New York, NY	46%	**+19%**	23%	**-6%**	21%	**-7%**	22%	**-2%**	8%	**-9%**	65%	**+4%**
Citi Bike - Manhattan	New York, NY	60%	**+30%**	7%	**-20%**	15%	**-16%**	14%	**-11%**	8%	**-5%**	78%	**+7%**
Divvy	Chicago, IL	39%	**+16%**	30%	**+1%**	21%	**-22%**	23%	**+2%**	8%	**-4%**	31%	**+13%**
Capital BikeShare	Washington, DC	39%	**+17%**	44%	**-24%**	11%	**+4%**	17%	**-5%**	3%	**+1%**	37%	**+5%**
Nice Ride	Minneapolis, MN	61%	**-5%**	18%	**+6%**	9%	+1%	25%	**+10%**	7%	**+3%**	20%	**+10%**
Hubway	Boston, MA	56%	**-2%**	12%	**-2%**	16%	0%	21%	**+7%**	10%	0%	37%	**+17%**
Ford GoBike - East Bay	San Francisco Bay Area, CA	38%	**-6%**	20%	**+8%**	14%	**-4%**	24%	**+9%**	12%	**+3%**	26%	**+14%**
Ford GoBike - San Francisco	San Francisco Bay Area, CA	42%	**-12%**	5%	0%	18%	**+4%**	20%	**+9%**	17%	**+10%**	53%	**+26%**
Ford GoBike - San Jose	San Francisco Bay Area, CA	33%	**+8%**	5%	**+2%**	37%	**-8%**	21%	**+4%**	13%	**-3%**	14%	**+8%**
Citi Bike Miami	Miami Beach, FL	36%	**+23%**	8%	**-16%**	53%	**-8%**	19%	**-10%**	22%	**-9%**	20%	**-2%**
Topeka Metro Bikes	Topeka, KS	70%	**-14%**	10%	**+7%**	13%	**+4%**	18%	**+9%**	2%	0%	9%	**+5%**
BIKETOWN	Portland, OR	77%	+1%	6%	**+1%**	7%	-1%	18%	**+4%**	2%	-1%	24%	**+14%**
Indego	Philadelphia, PA	46%	**+24%**	33%	**-23%**	8%	**-9%**	26%	**-9%**	5%	**-1%**	42%	**+2%**
Grid Bike Share	Phoenix, AZ	47%	**+5%**	6%	**-1%**	35%	**-7%**	30%	**+3%**	8%	0%	18%	**+6%**
Decobike San Diego	San Diego, CA	60%	**+11%**	5%	**-1%**	25%	**-9%**	18%	-1%	6%	-1%	14%	**+7%**
Metro Bike Share	Los Angeles, CA	24%	**+10%**	11%	**+4%**	42%	**-20%**	30%	+1%	20%	**-6%**	27%	**+6%**
Breeze Bike Share	Santa Monica, CA	66%	**+9%**	4%	0%	16%	-1%	11%	**-2%**	5%	**-1%**	9%	**+3%**
Denver B-cycle	Denver, CO	70%	**+15%**	6%	-1%	18%	**-14%**	19%	+2%	3%	**-2%**	17%	**+8%**
Relay Bike Share	Atlanta, GA	48%	**+3%**	36%	**-7%**	5%	**-1%**	23%	+2%	2%	0%	16%	**+2%**

Coast Bike Share - St Pete	Tampa, FL	59%	**+5%**	29%	**-5%**	8%	+2%	27%	**+6%**	2%	0%	25%	**+15%**
Coast Bike Share - Tampa	Tampa, FL	60%	**+21%**	17%	**-14%**	19%	**-8%**	21%	-3%	6%	-2%	14%	+1%
San Antonio B-cycle	San Antonio, TX	22%	**+9%**	5%	**+1%**	68%	**-12%**	28%	0%	10%	-2%	19%	**+5%**
Bublr Bikes	Milwaukee, WI	66%	**+27%**	13%	**-19%**	15%	**-8%**	27%	-2%	4%	**-2%**	20%	+1%
Austin B-cycle	Austin, TX	61%	**+12%**	5%	**-3%**	23%	**-14%**	23%	**-6%**	3%	**-3%**	11%	0%
Healthy Ride	Pittsburgh, PA	66%	**+4%**	19%	**-10%**	3%	0%	30%	**+10%**	4%	**+2%**	31%	**+9%**
CoGo	Columbus, OH	71%	**+9%**	17%	**-11%**	3%	0%	36%	**+8%**	2%	0%	18%	**+3%**
Fort Worth Bike Sharing	Fort Worth, TX	54%	**+24%**	12%	+2%	29%	**-27%**	26%	-1%	5%	**-9%**	10%	**+2%**
Houston B-cycle	Houston, TX	49%	**+9%**	16%	0%	26%	**-10%**	17%	**-2%**	6%	**-3%**	9%	-1%
Cincy Red Bike	Cincinnati, OH	56%	**+22%**	33%	**-27%**	3%	+1%	39%	-2%	3%	**+2%**	26%	**-2%**
B-cycle	Madison, WI	78%	**+6%**	4%	**-5%**	5%	**-4%**	30%	**+17%**	4%	0%	20%	**+12%**
Boulder B-cycle	Boulder, CO	82%	**-4%**	1%	**+1%**	8%	+1%	27%	**+19%**	3%	**+1%**	11%	**+8%**
Bike Chattanooga	Chattanooga, TN	63%	**+10%**	32%	**-6%**	2%	**-4%**	30%	0%	2%	0%	22%	**+9%**
GREENbike	Salt Lake City, UT	68%	**+7%**	3%	+1%	18%	**-5%**	25%	+3%	5%	-1%	24%	**+13%**

Note: 400 m indicates service area, percentages are the population proportion inside service area. 3200 m indicates larger buffer area, percentages are the percentage point difference from the service area. Bold values indicate statistically significant differences ($p < 0.05$). Only larger buffer is shown.

TABLE 3 Comparison of bikesharing service areas, employment characteristics

		College educated jobs		Less than college educated jobs		Low-income jobs		"Blue-collar"		"White-collar"	
Bike Share System	Location	400 m	3200 m	400 m	3200 m	400 m	3200 m	400 m	3200 m	400 m	3200 m
Citi Bike - Brooklyn/Queens	New York, NY	29%	+5%	28%	-2%	16%	-3%	31%	-10%	9%	+2%
Citi Bike - Manhattan	New York, NY	35%	+7%	22%	-5%	16%	-8%	21%	-19%	41%	-9%
Divvy	Chicago, IL	29%	+5%	26%	-2%	21%	-4%	24%	-12%	29%	+17%
Capital BikeShare	Washington, DC	34%	+7%	27%	-6%	12%	-1%	15%	-25%	25%	+22%
Nice Ride	Minneapolis, MN	31%	-5%	23%	0%	18%	+2%	21%	+9%	29%	-11%
Hubway	Boston, MA	35%	-1%	21%	+1%	17%	-3%	20%	+7%	28%	+4%
Ford GoBike - East Bay	San Francisco Bay Area, CA	35%	+7%	23%	-4%	18%	-9%	23%	-15%	21%	+9%
Ford GoBike - San Francisco	San Francisco Bay Area, CA	36%	+12%	22%	-11%	16%	-6%	23%	-8%	40%	+12%
Ford GoBike - San Jose	San Francisco Bay Area, CA	35%	+1%	22%	-3%	18%	-1%	19%	-14%	25%	+5%
Citi Bike Miami	Miami Beach, FL	24%	+6%	33%	-5%	19%	-10%	30%	-5%	17%	-1%
Topeka Metro Bikes	Topeka, KS	21%	+12%	30%	-9%	25%	-11%	27%	-13%	15%	+29%
BIKETOWN	Portland, OR	31%	+1%	24%	-1%	17%	-1%	25%	+1%	31%	-5%
Indego	Philadelphia, PA	31%	+5%	25%	-4%	17%	-6%	18%	-18%	26%	+7%
Grid Bike Share	Phoenix, AZ	25%	+5%	29%	-3%	17%	-2%	18%	-23%	21%	-7%
Decobike San Diego	San Diego, CA	23%	+10%	30%	-7%	23%	-5%	39%	-20%	20%	+15%
Metro Bike Share	Los Angeles, CA	30%	-1%	27%	0%	15%	-5%	22%	+8%	22%	+3%
Breeze Bike Share	Santa Monica, CA	29%	+6%	26%	-5%	20%	-5%	32%	-15%	35%	+15%
Denver B-cycle	Denver, CO	30%	+8%	25%	-7%	17%	-8%	23%	-21%	29%	+20%
Relay Bike Share	Atlanta, GA	30%	+6%	26%	-4%	17%	-5%	22%	-13%	36%	+2%
Coast Bike Share - St Pete	Tampa, FL	27%	+4%	28%	-3%	21%	-6%	20%	-6%	22%	+28%
Coast Bike Share - Tampa	Tampa, FL	26%	+4%	28%	-5%	19%	+3%	15%	-23%	20%	+6%
San Antonio B-cycle	San Antonio, TX	16%	+7%	36%	-7%	23%	-5%	31%	-34%	16%	+3%

Bublr Bikes	Milwaukee, WI	26%	**+4%**	26%	**-4%**	24%	**+6%**	19%	**-15%**	25%	**+26%**
Austin B-cycle	Austin, TX	26%	**+4%**	28%	**-3%**	16%	**-3%**	17%	**-19%**	18%	**+2%**
Healthy Ride	Pittsburgh, PA	31%	**+8%**	25%	**-7%**	16%	**-7%**	14%	**-12%**	33%	**+14%**
CoGo	Columbus, OH	33%	**+1%**	22%	**-1%**	16%	**+1%**	13%	**-6%**	27%	**+8%**
Fort Worth Bike Sharing	Fort Worth, TX	23%	**+4%**	30%	**-3%**	17%	**-6%**	20%	**-8%**	17%	**+5%**
Houston B-cycle	Houston, TX	26%	**+8%**	29%	**-6%**	16%	**-9%**	22%	**-17%**	23%	**+16%**
Cincy Red Bike	Cincinnati, OH	30%	**+10%**	24%	**-8%**	17%	**-11%**	16%	**-23%**	37%	**+11%**
B-cycle	Madison, WI	29%	**+6%**	24%	**-3%**	18%	**-7%**	17%	**-17%**	14%	**+12%**
Boulder B-cycle	Boulder, CO	31%	**0%**	22%	**-2%**	20%	**-1%**	36%	**-11%**	25%	**-11%**
Bike Chattanooga	Chattanooga, TN	22%	**+4%**	32%	0%	17%	**-13%**	33%	**-11%**	23%	**-2%**
GREENbike	Salt Lake City, UT	30%	**+1%**	22%	**-3%**	24%	**-4%**	27%	**-12%**	38%	**+4%**

Note: 400 m indicates service area, percentages are the population proportion inside service area. 3200 m indicates larger buffer area, percentages are the percentage point difference from the service area. Bold values indicate statistically significant differences ($p < 0.05$). Only larger buffer is shown.

Employment characteristics

In contrast to the population comparisons, the employment comparisons were more consistent: bikesharing serves higher-status, higher-earning jobs for nearly every city (table 3). Of the 33 system groups, 29 served areas with more jobs for college educated workers and 25 served more white-collar jobs. Similarly, 27 served fewer jobs requiring less than a college degree, 26 served fewer jobs for low-income workers, and 26 served fewer blue-collar jobs. The largest differences between the service area and comparison groups were among the blue-collar jobs. Nearly three-quarters of systems served at least 10 percentage-point fewer blue-collar jobs compared to the largest comparison area.

In some cases, the radius in which non-service-area census block groups were analyzed made a difference when interpreting the equity characteristics. For example, Salt Lake City's system serves 18 percentage points fewer low-income jobs than the area immediately adjacent to the service area (800 m), but 6 percentage points more than the 3200 m radius (not shown). This suggests that a slight reconfiguration of the system would serve a more equitable distribution of jobs, but the current service area is still accessible to low-wage employment. San Diego's system appears to the be the most equitable from the perspective of employment, serving slightly fewer college educated jobs and 8 percentage points more unskilled employment compared to outside the service area.

DISCUSSION AND CONCLUSION

By most metrics in this study, the largest bikesharing systems in the United States tend to serve more socially and economically advantaged neighborhoods—those with higher proportions of white residents, lower poverty rates, and higher-paying skilled jobs. The record is slightly more mixed for residential characteristics, in that bikesharing systems are more likely to serve zero-vehicle households and in several cities serve more higher-poverty neighborhoods. But the patterns are clearer for the employment data; bikesharing is not likely to meet the needs of lower-income job holders. This is an important point to consider: commute trips, while not making up the majority of all bikeshare trips, are the most common type of trip in several of the systems analyzed (*25*). The findings corroborate this study's hypothesis that bikesharing systems do not provide equitable access to employment.

Partly in response to criticism that bikeshare tends to attract wealthier, more educated, white users, several system operators have made concerted efforts to incorporate program elements that would reduce the barriers to use for people who do not fit that profile. For example, a partnership between the regional bicycle coalition and transportation equity groups advocated for an expansion of the San Francisco Bay Area's bikesharing system into predominately low-income Black and Latino neighborhoods near two rail stations in Oakland. They also worked to secure discounts for low-income users and will conduct outreach in partnership with two bicycle organizations led by people of color (*26*). These efforts are reflected in the study results, which show the East Bay portion of the bikesharing system as serving more neighborhoods with higher proportions of Black residents, people in poverty, and limited-English speakers. Indeed, many large systems now have written plans or goals to meet equity considerations (*27*). But targeted outreach still remains a challenge for many operators and is critical for educating and engaging potential new users. The efforts require investment by cities and bikesharing operators; research suggests that simple online outreach is not adequate to reaching targeted populations (*28*).

Bikesharing requires density to work well. Because lower-income and lower-skilled jobs tend to be spatially dispersed in metropolitan areas, it is unlikely that bikesharing will be able to provide equitable access to employment without a robust public transit network. Where there are disparities, cities and bikesharing operators should consider robust integration in both transit-dense areas and transit-poorer areas, such as suburban locations to where lower-wage workers would be commuting. Integration could also mean linking fare policies and media so that access to transit by shared bicycle would be treated as if traveling the transit network itself. Finally, incorporating the business community as a partner in bikeshare station planning could help bring systems to areas where lower-skilled jobs are clustered. For these reasons, future work should analyze bikesharing systems in conjunction with public transit networks to understand whether they provide equitable access to employment. Additional research should also focus spatial analysis on other destination types paired with residential locations to understand individual levels of accessibility by bikesharing.

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