

Who is Biking for? Urban Bikeshare Networks' Responses to the COVID-19 Pandemic, Disparities in Bikeshare Access, and a Way Forward

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Black, Latinx, and Indigenous people have contracted the SARS-CoV-2 virus and died of COVID-19 at higher rates than White people. Individuals rated public transit, taxis, and ride-hailing as the modes of transportation putting them at greatest risk of COVID-19 infection. Cycling may thus be an attractive alternative for commuting. Amid the increase in bikeshare usage during the early months of the pandemic, bikeshare companies made changes to membership requirements to increase accessibility, targeting especially essential workers. Essential workers in the United States are disproportionately Black and Latinx, underpaid, and reliant on public transit to commute to work. We document changes made by bikeshare companies, including benefits to various groups of essential workers, and we discuss such changes in the context of longstanding racial disparities in bikeshare access. While well intended, the arbitrary delineation in eligibility for such benefits by class of essential workers unwittingly curtailed access for many who may have benefited most. Given that equity in bikeshare is an important tool to improve access to safe transportation, critical changes in the distribution, accessibility, and usability of bikeshare networks is essential. Bikeshare companies, city planners, and policy makers should collaborate with community-based bike advocates to implement changes, as vocalized by those most in need of alternative forms of transportation.

INTRODUCTION

Black, Latinx, and Indigenous people have contracted the SARS-CoV-2 virus and died of COVID-19 at higher rates than White people [1]. One of the early highlighted behavioral changes during the pandemic was in the transportation realm: On March 14, 2020, one day after COVID-19 was declared a national emergency, *The New York Times* reported a 67% surge in biking in New York

City (NYC) between March 1 and March 11 compared to the same period the year before, signaling citizens efforts to avoid crowded trains [2].

The pandemic has since highlighted inequities in access to transportation, contributing to an increased burden of risk among primarily Black and Latinx people in urban settings. The most socially protected form of transportation is driving, but in 2015, nearly 1 in 5 Black families did not have a car, compared to only 1 in

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15 White families. The number of car-free households is much higher in densely populated cities with wide-reaching public transit systems. In NYC, for instance, 55.2% of households did not have a car in 2015 (51.0% of White, 57.1% of Black, and 63.0% of Latinx) [3]. In US cities, Black people and Latinx people are not only less likely to have access to a car, but also less likely to live close to work and essential services, and more likely to rely on public transit [3]. Black and Latinx people are over-represented among professions considered “essential” in the COVID-19 pandemic, such as hospitality, food retail, and transit, placing them and their families at greater risk of infection [4].

Several cities’ transit authorities slowed operations down, but in high public transit usage cities, demand remained high among essential workers. In NYC, public transit riders and employees alike raised concerns about safety, due to not being able to remain physically distant from one another, thus increasing their risk of contracting the SARS-CoV-2 virus. Thousands of Metro Transit Authority (MTA) workers, disproportionately Black, fell ill or were required to self-isolate due to exposure to COVID-19. Bus drivers reported unsafe working conditions, using their own masks and homemade disinfectant at work, only to be reprimanded by supervisors [5]. Soon, images of crowded trains and subway platforms surfaced, raising concerns regarding this high-risk environment [6]. In Philadelphia, a Black man was dragged off of a bus by several police officers for not wearing a mask, per the bus driver’s instructions [7]. Such incidents demonstrate that low-income Black and Latinx people are at greater risk not only of contracting the SARS-CoV-2 virus due to a greater reliance on reduced public transit services, but also of being subject to the disproportionate wielding of police as a state-sanctioned mechanism of enforcing social distancing, despite reportedly taking stronger precautions [8].

Access to alternative forms of transportation, including bicycles, has become critical, but remains unequal. A 2020 study showed that individuals rated public transit, taxis, and ride-hailing as the riskiest modes of transportation regarding COVID-19 [9]. A 2021 study found that the number of COVID-19 cases and deaths at the county level were associated not only with proximity to an airport, but also the number of train stations, and the proportion of adults using public transit [10]. Bicycles may thus be an attractive alternative to public transit as single-user vehicles. Still, a 2021 study of transportation research themes related to COVID-19 highlighted that less has been covered on sustainable modes of transportation such as bikeshares [11]. In this perspective, we discuss select large urban bikeshare networks’ programmatic changes in response to the COVID-19 pandemic, review disparities in access to bikeshares in urban settings, and proposed

solutions for bikeshare equity beyond the pandemic that can contribute to improving community and individual health.

BIKESHARE COMPANIES’ RESPONSE TO COVID-19

Bikeshare companies across the country changed their policies during the pandemic, many offering essential workers free or low-cost memberships. This approach increased some workers’ transit options, while decreasing their risk of contracting COVID-19 while in transit. We searched the US Department of Transportation’s Bureau of Transportation Statistics’ data and identified large metro areas with active bikeshare programs. We then searched individual city bikeshare program websites to identify their response to the COVID-19 pandemic, specifically changes in membership costs and target populations, presented in Table 1.

In NYC, Citi Bike[®] launched a critical workforce membership program for transit workers, emergency responders, and healthcare workers, offering them a free 30-day membership and unlimited 45-minute trips. Similarly, Washington DC’s Capital Bikeshare[™] offered essential workers, including those in food services and food retail industries, a free 30-day membership and unlimited 30-minute trips. Philadelphia’s Indego employed a different approach, reducing the cost of a 1-month membership by 50%, down to \$5 for all riders, and \$2.50 specifically for low-income riders. In Boston and Chicago, 30 days of free rides were allotted to hospital workers. So far, only one study has examined trends in bikeshare utilization in the US, specifically in Chicago; it was found that despite a substantial decline in the proportion of commuting trips during the pandemic, bikesharing presents a more resilient option compared to public transit. Notably, they also found that regions with fewer Black residents and more White and Asian residents were found to be less dependent on bikesharing [12].

THE LIMITED REACH OF BIKESHARE COMPANIES’ RESPONSE ON HEALTH EQUITY

These efforts to support essential workers during the pandemic contribute to reducing risk of exposure to COVID-19, however, due to the pre-existing landscape of bikeshare access in these cities, they were likely to have a limited reach. First, in some cities, the changes documented were limited to certain types of essential workers. For instance, NYC, San Francisco, and Boston’s policy changes did not include food workers, food retail workers, or hospitality workers. Such arbitrary delineation unwittingly devalue some, and prop up other classes of

Table 1. Large bikeshare networks’ policy changes in response to the Covid-19 pandemic and access to bikeshare by select demographic groups.

City	Membership Change	Target population	% Residents without College Degree with Access to Bikeshare	% Black Residents with Access to Bikeshare	% White Residents with Access to Bikeshare
New York, NY	free 30-day membership	Healthcare providers, transit employees, and first responders (eg, NYPD, FDNY, EMS)	4.1%	1.4%	7.1%
Washington, DC	free 30-day membership	Essential workers, including healthcare, food service, and food retailer industries workers	41.5%	42.6%	41.5%
Philadelphia, PA	\$5 membership for all, \$2.5 for low-income people, 30 days	All members	-	-	-
Boston, MA	free 30-day memberships	Hospital workers	22.3%	7.1%	42.6%
Chicago, IL	30 days of free rides	Healthcare workers	11.4%	5.2%	18.7%
San Francisco, CA	Unlimited 45-minute rides	Healthcare workers	-	-	-

Data on policy changes was obtained from cities’ bikeshare company websites; Data on access to bikeshare by select demographic group is from 2015 study quantifying bikeshare equity [14], (-) = no publicly available data

workers, and in this case, potentially contributes to the problematic healthcare hero narrative [13], leaving unacknowledged the critical role food and service workers have played in sustaining life during the pandemic.

Second, bikeshare inequity has been a longstanding issue. For instance, in NYC, all Citi Bike docking stations are located in the Manhattan and Brooklyn boroughs, with none in Queens and the Bronx [14]. The latter are disproportionately populated with low-income, Black, and Latinx residents and had much higher rates of COVID-19 morbidity and mortality [15]. A national survey of 33 urban bikeshare networks showed that overall, they serve residential areas with more White, less poor, and more English-proficient residents [16]. In terms of occupation, bikeshare networks disproportionately serve higher-earning, college-educated, white-collar workers in nearly every city [16]. One survey-based study by the Better Bikeshare Partnership found that only 2% of lower-income residents in Philadelphia, Chicago, and Brooklyn were bikeshare members, compared to 5% of “higher-income people of color” and 10% of “higher-income White residents” [17]. Prior evidence thus suggests that despite the intent in making bikeshares more accessible to essential workers (the majority of whom are blue-collar and low-income workers), the temporary changes in membership policies during the height of the pandemic are unlikely to have reached those most in need

of alternatives to public transit. Still, there remains a great opportunity for bikeshare companies, city planners and transit authorities to invest in greater bikeshare and biking equity. Improving bikeshare access may confer benefits in terms of greater access to jobs and essential services among underserved communities.

IMPROVING BIKESHARE EQUITY

Solutions to improve bike equity both during public health crises and in times of relative normalcy must begin with engagement of key local stakeholders. These include residents in communities with low bikeshare access and usage, bikeshare users, bikeshare operators, and local transit authorities and policy makers. The unequal distribution of bikeshares, favoring neighborhoods with lower rates of poverty and lower proportions of Black and Latinx residents, is the most visible barrier; but even within a given neighborhood, usage remains unequal by race and income level [14,17]. Some of the most frequently cited barriers to bikeshare use by lower-income people of color include issues of safety, cost, and lack of information [14,17,18]. For instance, even when bikeshare programs included cash payment options or discounted plans for low-income families, these programs remained more widely known among wealthier, Whiter communities [17]. In order to promote equitable access

and use among essential workers in health crises, barriers regarding bikeshare access, bikeshare use, and bikeshare safety must be recognized and addressed. The National Association of City Transportation Officials' (NACTO) equity recommendations are centered around addressing membership barriers, addressing safety concerns, and bikeshare station walkability [19-21].

Bikeshare Access

Beyond increasing the number of docking stations, they must be distributed equitably. Additionally, dockless bikes, or free-floating bikes, which do not require stations, have been proposed as an approach to addressing inequities in bikeshare access and are associated with greater bike use [22]. These bikes offer the advantage of being more easily redistributed to meet demand during public health crises and other times of social vulnerability. However, one study of Seattle residents found that in a 6-month pilot program of dockless bikeshare, users were disproportionately young, male, White, closer to the city center, and already bicycle owners or users [23]. These results reflect the reality that many bikeshare companies do not recognize equity as a goal; fewer than one quarter had equity policies in 2017 [24]. While novel distribution models may, in theory, help achieve equity, they have not been utilized towards this goal. One approach to solving this issue would be a state-sanctioned mandate, requiring bikeshare companies to distribute docking stations or dockless bikes as well as promotion materials equitably at all stages of program development and operations, including marketing campaigns specifically targeted towards racial minorities and low-income residents.

Bikeshare Use

Beyond improving access, additional barriers to engagement and use of bikeshare by people of color and low-income people must be recognized and addressed. Registration requirements, including credit cards, smartphones, and reliable internet, are not equitably available to all people. Even where solutions to these issues have been implemented, such as cash payment options, these solutions are more frequently known by those targeted the least [17]. Solutions must therefore be threefold: understanding barriers to use, addressing those barriers, and broadcasting changes. A study of bikeshare users in "Better Bikeshare Partnership" areas – areas traditionally underserved by bikeshares – found that people who used bikeshares less often were less likely to be exposed to bikeshare through friends and family and more dependent on community outreach campaigns [18]. Possible solutions to the registration barrier include cash payment without registration, registration via dock-based kiosks, registration through employers, and integration with

public transportation payment cards. Bikeshare companies and city-planners should collaborate with community-based bike advocates in order to gauge interest in these and other options, and to disseminate information when such options are enacted.

BIKESHARE SAFETY

Bikeshare equity and safety depends on bike infrastructure, which often requires longer-term, structural intervention. Bicycle lanes are unequally distributed in most major US cities, with one recent study showing that the cycling network disproportionately serves wealthier neighborhoods with higher educational attainment and lower proportions of Latinx residents, after controlling for demand factors [25]. Evidence shows that more bike lanes, particularly protected bike lanes, lead to more biking [26,27]. A critical mass of cyclists on the road also leads to greater cyclist safety. In fact, the effect of "strength in numbers" is considerably more protective than the use of helmets, and mandating helmet use can dissuade bike use and therefore increase risk to those who do choose to ride [28]. Making helmets accessible by choice, however, can encourage greater bikeshare usage: in one analysis, 72% of residents in majority-minority, lower income communities agreed that free or low-cost helmets would make bikeshare more appealing [18]. Some bikeshares provide helmets with registration, while others provide discounts for purchasing helmets in bike stores. The former approach may lead to greater helmet adoption, while the latter supports local business. Another alternative could be for employers to include monthly bikeshare memberships in their transportation benefits, as some already provide ridesharing credits to their employees, in line with NACTO's recommendations [20]. In that case, employers and/or employer-based health insurers may provide helmets to those employees who choose to use bikeshares. Additionally, eliminating mandatory adult helmet laws would alleviate the burden of punishment from enforcement such laws disproportionately have on people of color [19].

LIMITATIONS

Bikeshares will not benefit all people equally, even with equitable distribution and access. Barriers such as inability to ride a bike, whether due to physical disability or lack of bicycle access early in life, cannot easily be surmounted. Neighborhood safety may also be a deterrent for some. Distance from one's home to essential destinations, including work and supermarkets, is also dependent on socioeconomic status [20,21]. Still, the Better Bikeshare Partnership report notes that while disparities in bikeshare usage exist, these same disparities

are not observed in bikeshare interest [17]. A study by PeopleForBikes of National Household Travel Survey data found that bike riding among Black people increased from 2001 to 2009 by 90%, more than any other racial or ethnic group [29]. Maximizing the number of individuals interested in bikeshare who are able to use it would lead to fewer people relying on cars and public transportation. This would in turn contribute to lower greenhouse gas emissions and less crowded public transit. Furthermore, increasing bikeshare access for a significant number of people who show interest would contribute to increased physical activity, a net positive in terms of mental and physical health.

CONCLUSION

While urban bikeshare companies' policy changes targeting essential workers likely alleviated COVID-19 risk for some, it is possible they fell short of reaching those most in need of a low-risk mode of transportation, given the longstanding inequities in bikeshare access and the arbitrary occupational and class delineation in eligibility for this benefit. While the impact of these changes warrants further study, building bike equity through increasing bikeshare access and use is a necessary step to address transportation inequities which exacerbate disparities in health outcomes both at baseline and during public health crises, especially for socially vulnerable communities.

REFERENCES

1. African Americans struggle with disproportionate COVID death toll. <https://www.nationalgeographic.com/history/2020/04/coronavirus-disproportionately-impacts-african-americans/>. Accessed April 30, 2020.
2. A Surge in Biking to Avoid Crowded Trains in N.Y.C. - The New York Times. <https://www.nytimes.com/2020/03/14/nyregion/coronavirus-nyc-bike-commute.html>. Accessed June 27, 2020.
3. Percent of Households without a Vehicle by Race/Ethnicity: United States, 2015. https://nationalequityatlas.org/indicators/Car_access/By_race~ethnicity:49791/United_States/false/. Accessed June 25, 2020.
4. Mongey S, Weinberg A. Characteristics of Workers in Low Work-From-Home and High Personal-Proximity Occupations. 2020. <https://www.stlouisfed.org/on-the->
5. 41 Transit Workers Dead: Crisis Takes Staggering Toll on Subways - The New York Times. <https://www.nytimes.com/2020/04/08/nyregion/coronavirus-nyc-mta-subway.html>. Accessed June 20, 2020.
6. Coronavirus NYC. Social distancing is not happening on the subway - ABC7 New York. <https://abc7ny.com/overcrowded-subway-train-nyc-social-distancing-coronavirus/6068366/>. Accessed June 26, 2020.
7. Philly Police Drag Man From Bus for Not Wearing a Face Mask. NY Mag. <https://nymag.com/intelligencer/2020/04/philly-police-drag-man-from-bus-for-not-wearing-a-face-mask.html>. Accessed June 26, 2020.
8. American News Pathways. Explore the Data | Pew Research Center. https://www.pewresearch.org/pathways-2020/covid_restriction_b/race_ethnicity/us_adults/. Accessed June 26, 2020.
9. Shamshiripour A, Rahimi E, Shabanpour R, Mohammadian A. (Kouros). How is COVID-19 reshaping activity-travel behavior? Evidence from a comprehensive survey in Chicago. *Transp Res Interdiscip Perspect.* 2020;7:100216.
10. Gaskin DJ, Zare H, Delarmente BA. Geographic disparities in COVID-19 infections and deaths: the role of transportation. *Transp Policy (Oxf).* 2021 Mar;102:35–46.
11. Kutela B, Novat N, Langa N. Exploring geographical distribution of transportation research themes related to COVID-19 using text network approach. *Sustain Cities Soc.* 2021 Apr;67(January):102729.
12. Hu S, Xiong C, Liu Z, Zhang L. Examining spatiotemporal changing patterns of bike-sharing usage during COVID-19 pandemic. *J Transp Geogr.* 2021 Feb;91:102997.
13. Cox CL. 'Healthcare Heroes': problems with media focus on heroism from healthcare workers during the COVID-19 pandemic. *J Med Ethics.* 2020 Aug;46(8):510–3.
14. Ursaki J, Aultman-Hall L, Transportation V. Quantifying the Equity of Bikeshare Access in US Cities. *UVM TRC Rep.* 2015;15-011(June).
15. Wadhera RK, Wadhera P, Gaba P, Figueroa JF, Joynt Maddox KE, Yeh RW, et al. Variation in COVID-19 Hospitalizations and Deaths Across New York City Boroughs. *JAMA.* 2020 Jun;323(21):2192–5.
16. Barajas JM. How Equitable Is Bikesharing? Exploring Population Characteristics and Access to Employment; 2017.
17. McNeil N, Broach J, Dill J. Breaking barriers to bike share: Lessons on bike share equity. *ITE J (Institute Transp Eng.* 2018;88(2):31–35. www.ite.org. Accessed April 25, 2020.
18. McNeil N, Dill J, MacArthur J, Broach J, Howland S. Breaking Barriers to Bike Share: Insights from Residents of Traditionally Underserved Neighborhoods. Transportation Research and Education Center (TREC). 2017. <https://doi.org/10.15760/trec.176>.
19. National Association of City Transportation Officials. Equitable bike share means building better places for people to ride. *NACTO Bike Share Equity Pract Pap.* 2016;(Bike Share Equity Practitioners' Paper #3).
20. National Association of City Transportation Officials. Can monthly passes improve bike share equity? *NACTO Bike Share Equity Pract Pap.* 2015;(September):1–8. <https://nacto.org/can-monthly-passes-improve-bike-share-equity/>.
21. National Association of City Transportation Officials. Walkable Station Spacing is Key to Successful, Equitable Bike Share. *NACTO Bike Share Equity Pract Pap.* 2015;1(April):1–5. https://nacto.org/wp-content/uploads/2015/09/NACTO_Walkable-Station-Spacing-Is-Key-For-Bike-Share_Sc.pdfhttps://www.bicyclenetwork.com.au/media/vanilla_content/files/NACTO_Walkable-Station-Spacing-Is-Key-For-Bike-Share.pdf
22. Mooney SJ, Hosford K, Howe B, Yan A, Winters M, Bassok A, et al. Freedom from the station: spatial equity in access to dockless bike share. *J Transp Geogr.* 2019

- Jan;74:91–6.
23. Hirsch JA, Stewart I, Ziegler S, Richter B, Mooney SJ. Residents in seattle, wa report differential use of free-floating bikeshare by age, gender, race, and location. *Front Built Environ*. 2019;5:17.
 24. Howland S, McNeil N, Broach J, Rankins K, MacArthur J, Dill J. Breaking Barriers to Bike Share: Insights on Equity from a Survey of Bike Share System Owners and Operators. TREC Final Reports. 2017;(May): <https://doi.org/10.15760/trec.173>.
 25. Braun LM. Geographies of (dis)advantage in walking and cycling: Perspectives on equity and social justice in planning for active transportation in U.S. Cities. *Diss Abstr Int Sect A Humanit Soc Sci*. 2018;79(10-A(E)):No-Specified. <http://ovidsp.ovid.com/ovidweb.cgi?T=JS&PAGE=reference&D=psyc15&NEWS=N&AN=2018-34217-283>. Accessed April 25, 2020.
 26. Reilly KH, Noyes P, Crossa A. From non-cyclists to frequent cyclists: factors associated with frequent bike share use in New York City. *J Transp Health*. 2020;16:100790.
 27. Buehler R, Pucher J. Cycling to work in 90 large American cities: new evidence on the role of bike paths and lanes. *Transportation (Amst)*. 2012;39(2):409–32.
 28. Jacobsen PL. Safety in numbers: more walkers and bicyclists, safer walking and bicycling. *Inj Prev*. 2003 Sep;9(3):205–9.
 29. PeopleForBikes. U.S. Bicycling Participation Benchmarking Study Report.; 2015. <https://doi.org/10.1063/1.4989706>.