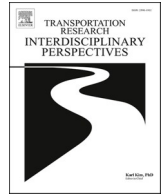


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## Micromobility, Macro Goals: Aligning scooter parking policy with broader city objectives

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### ABSTRACT

Dockless electric scooters challenge cities seeking to regulate them amidst broader goals such as universal access. Cities are particularly concerned with improper scooter parking, which can impede access by other travelers. Despite an important role that scooter parking plays in both regulations and public discourse, no comprehensive view of current scooter parking regulations exists, nor is it clear how regulations align with broader city objectives. This research asks: how have U.S. cities regulated scooter parking to date and what issues do parking regulations aim to address? Data from 37 U.S. cities show that while areas of widespread agreement exist—nearly all (95%) cities allow scooters to park in the furniture zone—a wide range in scooter parking requirements exists. About three quarters of cities allow scooters to park at bike racks (78%) and against buildings (70%), while fewer than two-thirds allow scooters to park either on landscaping (62%) or against signs (60%). Even among cities with similar regulations, however, considerable nuance exists. Interviews with staff from six U.S. cities and existing research highlight motivations for scooter parking regulations. The regulations employed—and the high degree of variability across cities—yield implications for scooter parking policies, as well as scooters' role in advancing broader city objectives. Scooter parking regulations play an important role in access, but cities should approach regulations as just one piece within a broader agenda of reclaiming streets for people and promoting mobility, sustainability, and access for all.

### 1. Introduction

Dockless electric scooters (“scooters”) are on sidewalks and streets in cities worldwide. As scooters have grown in popularity, cities have struggled to understand and regulate this new mode. Focused on ensuring that sidewalks remain clear for other travelers, cities are particularly concerned with scooter parking behaviors. Media outlets commonly decry improper parking (e.g., [Bendix \(2018\)](#)), and scooter mis-parking is a frequent source of public complaint ([Portland Bureau of Transportation, 2018](#)). Yet as communities grapple with how to best plan for and manage scooters, both city staff and researchers lack a comprehensive view of existing scooter regulations. Additionally, while scooter parking regulations typically aim to address program-specific goals, they have yet to be considered within the context of broader city objectives. To fill these gaps, this paper asks: how have U.S. cities regulated scooter parking to date and what issues do parking regulations aim to address? To answer these questions, I collected scooter parking regulations for 37 U.S. cities, interviewed staff from six U.S. cities, and reviewed existing literature on rates of scooter misparking. Findings

show an enormous degree of variation in scooter parking requirements across cities; variation itself, and the regulations employed, yield implications for how planners and policymakers seeking to regulate scooter parking can leverage them in combination with other policies to realize broader goals such as supporting car-alternative travel, access, and mobility for all.

Following this introduction, I briefly review the rise of shared scooter services, who uses them, and how. Next, I present the data and methods employed in this research. Third, I present the varied ways that U.S. cities currently regulate scooter parking and the prevalence of scooter misparking. I conclude with a discussion of how scooter policies can be used to support broader city goals.

### 2. Scooter (mis)parking

#### 2.1. The growth of shared scooters

Scooters first arrived on city streets in Santa Monica, CA in Fall 2017; in the subsequent years, their explosive growth has been a source of

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delight and consternation for travelers and cities alike. Scooters offer a potential new mode to lure people out of their cars and lower emissions (e.g. PBOT (2020)). And scooters are clearly meeting a mobility demand among some travelers, who in 2019 took over 86 million scooter trips in the U.S. alone—more than dockless (10 million) and docked (40 million) bikeshare trips combined (NACTO, 2020). But despite their popularity among some travelers, vehement opposition to scooters also exists. Opposition is reflected in media reports (see for example Gössling (2020)) and publicly-logged complaints. No scooter issue has garnered more opposition than parking, and complaints that parked scooters “clutter” public space and pose tripping hazards or block access for others abound. At the most extreme, cities have shuttered pilot programs citing scooter “clutter” (Livingston, 2020). With scooter (mis)parking at the forefront of micromobility public debates, parking regulation and enforcement have become a cornerstone of many U.S. scooter regulations.

## 2.2. Public perceptions of scooter (mis)parking

Public perceptions and complaints about scooter parking largely echo the media narrative that scooters frequently mis-park. Up to 75% of public complaints of micromobility (both scooters and bikeshare) cite improperly parked vehicles (NACTO, 2020; Portland Bureau of Transportation, 2018). City citations reflect public complaints, and the majority of scooter violations cite improper parking, including scooters that are tipped over, locked to impermissible objects, and block pedestrian access (City of Santa Monica, 2019b; PBOT, 2020; SFMTA, 2019a). Responses from a 2019 public survey in Santa Monica, CA showed that non-riders believe, on average, that scooter riders “never” to “sometimes” park responsibly. Even regular scooter riders viewed scooter parking had middling views on scooter parking, saying that scooters were “sometimes” to “mostly” parked responsibly (City of Santa Monica, 2019a). Although about 70% of scooter users believe that riders overall park and ride more responsibly today compared to a year ago, just 26% of non-riders share this view (City of Atlanta, 2020; City of Santa Monica, 2019a).

Research from five international cities suggests that scooter riders intuit that scooters should not block access for other travelers: the large majority of surveyed riders agreed that scooters should park upright, not block curb cuts or doors, and not park in the middle of sidewalks. Correspondingly, caring “how my parking might affect other travelers” motivated the largest share of riders’ parking behaviors (61%) (Brown et al., 2021).

Riders’ intuitions about where to park may not, however, align with city regulations. For example, a city may prohibit parking next to a signpost even though the scooter may not impede access by other travelers; correspondingly, many may view the scooter as appropriately parked. Indeed, research suggests that scooter riders often believe scooters are improperly parked only when they impede others’ access; riders are less likely to agree that a scooter that does not clearly block access is mis-parked compared to non-riders (Brown et al., 2021).

## 2.3. Observed scooter parking behaviors and citation rates

While the public narrative often focuses on scooter *mis*-parking, observational research suggests that scooters impede others’ access relatively infrequently. Fig. 1 shows that, on average across eight U.S. cities, 2.8% (between 0 and 8.1%) of scooters impeded other travelers’ access, meaning that they reduced passable sidewalk below about 32 in. as required by the American with Disabilities Act (Brown et al., 2020). While a single mis-parked vehicle—of any mode—can impede access by others, fewer than three out of 100 parked scooters is a far cry from the cluttered narrative presented by the media and feared by cities.

Cities are justly motivated to ensure that all people can travel unimpeded along city rights-of-way. Yet as Fig. 1 shows, scooters are only part of the story about access on city sidewalks and streets; motor vehicles mis-park at far higher rates than scooters across five observed cities; Washington, D.C. offered the largest contrast between scooter and car parking, with 0% of observed scooters parked improperly compared to more than one-third (39%) of motor vehicles (Brown et al., 2020). In addition to scooter and motor vehicles, quotidian objects like telephone poles, restaurant sandwich boards, and construction equipment can also block sidewalk access (Brown et al., 2020). In other words, while scooters *can* impede access, focusing *only* on scooters may miss a larger opportunity to reevaluate impedances and challenges faced by active travelers.

Despite the intense focus that scooter parking has garnered in the media and in the public dialogue around shared scooter services, no clear understanding exists about exactly how U.S. cities regulate scooter parking and if or how they may support broader city goals related to access by all.

## 3. Data and methods

Scooter parking regulations are often discussed, but no two cities regulate scooters the same way. To better understand how U.S. cities

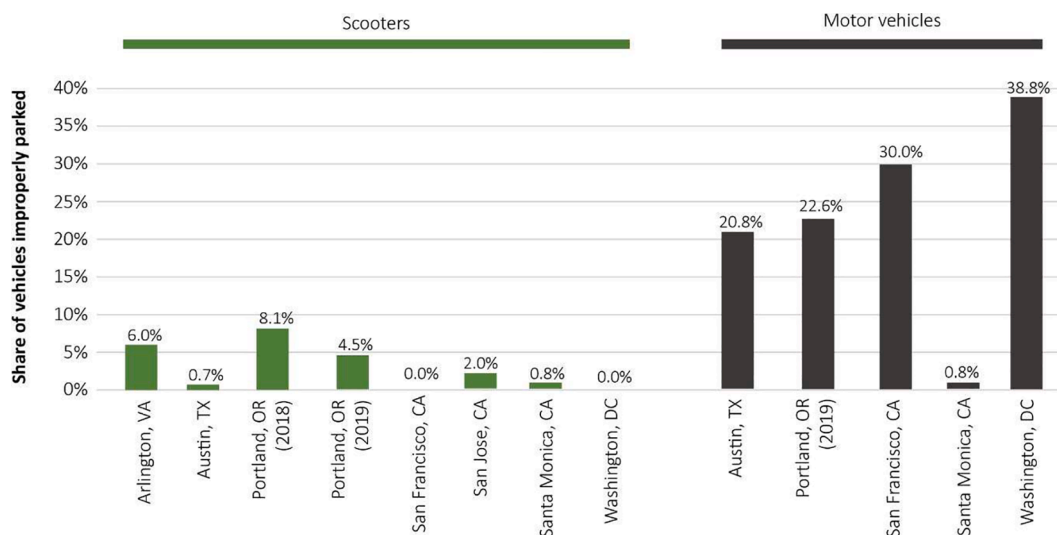


Fig. 1. Share of scooters blocking access across eight US cities. Sources: Brown et al. (2020), Fang et al. (2018), James et al. (2019), Portland Bureau of Transportation (2018).

regulate scooter parking, and how much these regulations vary, I catalogued scooter parking regulations across 37 U.S. cities (Fig. 2). While cities regulate many different aspects of scooter programs—such as vehicle design, fees, data sharing requirements, and equity plans—the regulations collected in this research focus specifically on scooter parking regulations and fleet size/operator regulations, two areas that may be shaped by city views about parking oversight and enforcement. Parking regulations also reflect tangible ways for cities to realize broad goals they often set for scooter programs. Portland, OR, for example, says that “e-scooters have the potential to help advance City goals for mobility, climate, equity, and safety” (PBOT, 2021). Pittsburgh, PA’s scooter program—which is part of a “shared mobility collective”—states that the program connects “residents, workers, and visitors to jobs, goods, and services in ways that maximize access while minimizing cost, congestion, and carbon emissions” while promoting transportation options that are inclusive, sustainable, affordable, and give residents the “freedom to choose” from a suite of modal options (Move, 2021). One way to promote modal options is to dedicate scarce city right-of-way to other modes, such as bike and scooter travel lanes or designated parking spaces.

The 37 cities were selected from among the 50 most populous U.S. cities that both (1) permit scooters and (2) have publicly-available municipal code or documentation about scooter parking requirements. Scooter permits and municipal code typically include either a concrete parking requirement (e.g. scooters must be locked-to a fixed object; scooters must be parked in the furniture zone) or prohibition (e.g. scooters must not be tipped over; scooters cannot be parked on landscaping). When a requirements or prohibitions was *not* referenced, however, I assumed that component was not required or prohibited. For example, I assumed that a city does not impose a scooter lock-to requirement if it was not mentioned in the municipal code or permit. I likewise assumed that scooters were allowed to park at bicycle racks if doing so was not expressly prohibited in city documents. Appendix A details regulations by city.

Given the varied parking regulations across cities, this research also examines motivations for different parking requirements. Motivations help elucidate why, for example, some cities allow scooter parking

against buildings while others do not. To better understand city motivations behind scooter regulations, I interviewed staff from the six cities shown in black in Fig. 2 (Los Angeles, CA; Omaha, NE; Portland, OR; San Francisco, CA; Santa Monica, CA; Washington, DC). Interviews were conducted via Zoom or phone and lasted between 30 and 45 min. Interviewed staff were familiar with scooter parking regulations, often working to enforce parking and/or draft scooter parking regulations. City staff were asked about scooter parking enforcement practices, if or how other scooter program requirements such as fleet caps related to parking concerns, and how scooter parking requirements related to city goals.

## 4. Findings

### 4.1. How do US cities regulate scooter parking?

Parking regulations vary greatly across U.S. cities, although Fig. 3 shows that areas of widespread agreement also exist. Most scooter parking regulations focus on cities’ goals to keep sidewalks accessible and clear for all travelers; however, nuances across cities—or even within the same city—create labyrinthine regulations that may pose challenges for cities to enforce or communicate to the public. Often, scooters legally parked in one city would violate another city’s parking regulations. The numerous, and often subtle, differences across and within city scooter regulations may in part explain why many riders express confusion over scooter parking requirements, particularly requirements with a more tenuous connection to impeded access (Brown et al., 2021).

Nearly all (95%) cities permit scooters to park in the space adjacent to the curb, often called the curb or street furniture zone (see NACTO (2013) for examples and definitions). The two cities that do not permit scooters to park in the furniture zone are Phoenix, AZ and Sacramento, CA. Both cities instead require scooters to park only in corrals, drop zones, or at bike racks. In other words, scooter cannot be parked free-standing elsewhere on the sidewalk. While most residents can accurately identify the furniture zone (PBOT, 2020), some cities have introduced information campaigns to help communicate proper scooter

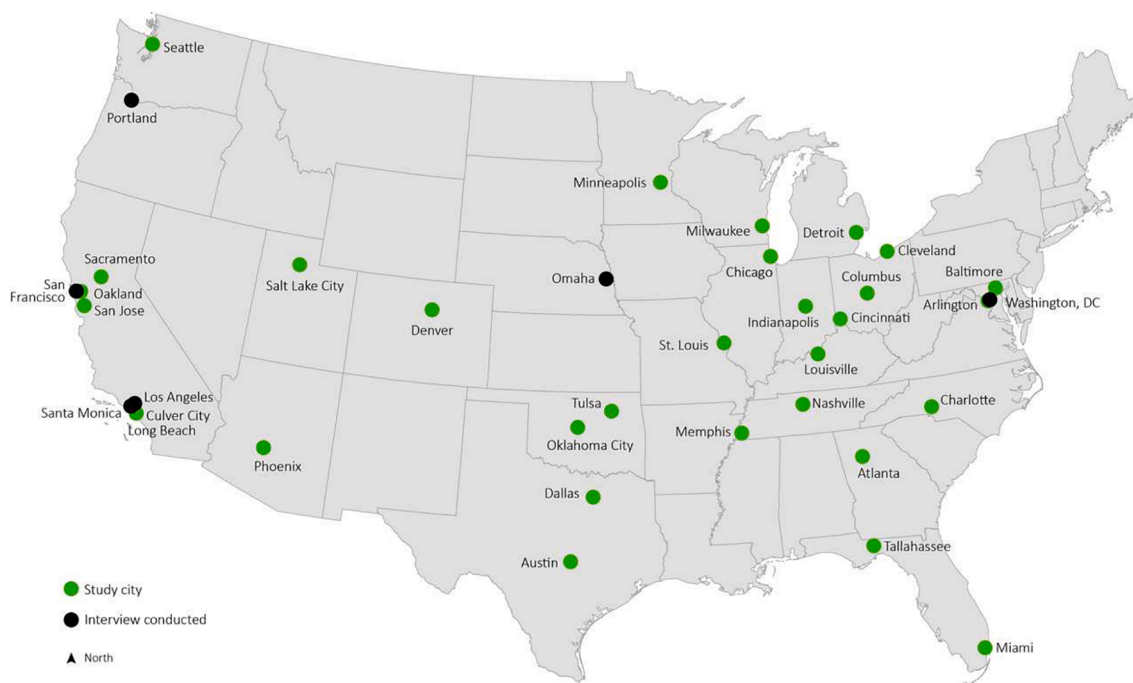


Fig. 2. Scooter regulations across 37 U.S. cities. City staff were interviewed in the following six cities: Los Angeles, CA; Omaha, NE; Portland, OR; San Francisco, CA; Santa Monica, CA; and Washington, DC.

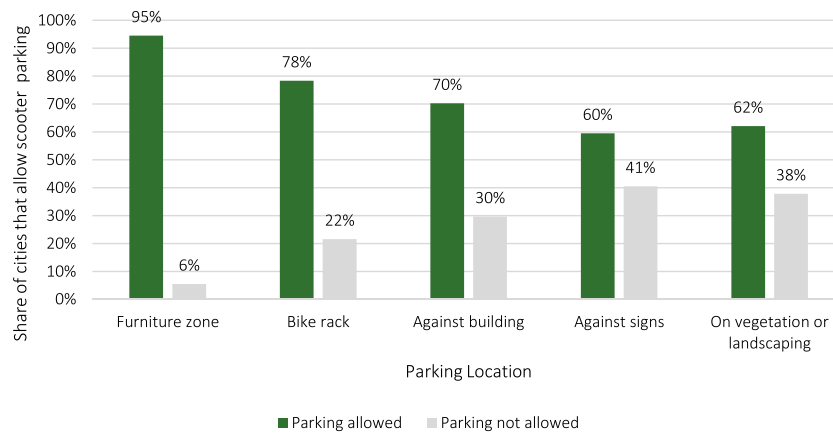


Fig. 3. Share of U.S. cities allowing scooter parking in five locations. Note: Includes data for 37 US cities. Appendix A details city-specific regulations and sources.

parking locations.

Many cities introduce scooters via short-term (often one-year) pilot programs. City staff state that best practices observed from other cities, plus prior experiences with bikeshare station or bike rack siting guidelines, typically inform initial scooter pilot regulations. Los Angeles, for example, does not build bikeshare stations within 15 feet of a street corner in order to maintain clear sightlines for travelers; the city applied this same rule to scooters, and prohibits scooter parking within 15 feet of a street corner (LADOT, 2020). Multiple city staff stated that, while bikeshare policies offered a helpful starting point for scooter regulations, scooter pilot programs proved particularly valuable. City staff universally described how lessons and observations from initial scooter pilots informed subsequent revisions of scooter parking requirements.

On some parking regulations, cities agree. Cities universally prohibit scooters to park nearby safety features such as fire hydrants; in bus stops or loading zones; or to block crosswalks, curb cuts, driveways, doorways, street furniture, public drinking fountains, or wheelchair access ramps. Such parking behaviors would undermine city objectives to ensure access by a wide range of travelers. All cities also require that scooters park upright and in ways that do not impede pedestrian travel or violate the access guaranteed under the Americans with Disabilities Act (ADA); ADA Accessible Design Guidelines stipulate that an accessible sidewalk have at least 32 in. of passable space (Department of Justice, 2010).

Most cities (95%) allow scooters to park in the furniture zone, but considerable variation exists as to where specifically scooters may park within this space. While no cities allow scooters to block pedestrian travel, regulations range in how much passable space scooters must leave (typically ranging from 3 to 6 feet). Similarly, some cities mandate minimum sidewalk widths for scooter parking and forbid scooters to park on sidewalks narrower than the required minimum. Los Angeles, CA, for example, requires scooters park on sidewalks that are at least three feet wide; San Francisco, CA, by contrast, requires that scooters park on sidewalks at least nine feet wide (LADOT, 2021; SFMTA, 2020). The contrasting minimum sidewalk widths highlight both how variable regulations are—San Francisco requires scooters park on sidewalks three times wider than Los Angeles—and how scooter parking permitted in one city may not be allowed in another. Some cities note that minimum sidewalk widths can eliminate permissible scooter parking from large swaths of a city, particularly in historically underinvested and underserved areas that have narrower (or missing) sidewalks (PBOT, 2020). Narrow sidewalks present a particular challenge when alternatives to sidewalk parking—such as in-street drop zones or corrals—may either be limited or be outright opposed by a public who does not want on-street car parking converted to other uses. Such tensions likewise exist in ongoing city conversations about how to prioritize space on city rights-of-way, such as encouraging modal shift by creating protected

infrastructure for active travelers (Buehler & Dill, 2016). Limited reprogramming of city streets means that scooters and pedestrians often share the sidewalk—both when scooters are parked and moving—which may generate conflict. Cities often attempt to mitigate conflict between pedestrians and parked scooters by limiting where scooters may park on sidewalks. Conflict also can arise when scooters ride on sidewalks; PBOT (2020) finds that fewer scooter users ride on sidewalks when protected bicycle infrastructure is available, yet political challenges exist in wresting space from cars to use for scooters and bikes.

More than two-thirds (70%) of sampled cities permit scooters to park against buildings. Two cities (Memphis, TN; Miami, FL) allow scooters to park against buildings, but not in front of window displays or commercial windows. Some cities that prohibit building-adjacent parking cite a desire to keep scooters off private property; others say regulations were informed by discussions with disability rights groups. Disability rights advocates often argue that scooters should be contained within the furniture zone, noting that some low-vision and vision-impaired travelers use the sides of buildings to help navigate sidewalks (Brown et al., 2020). Scooters, therefore, can pose a tripping or safety hazard when parked outside of the furniture zone. Previous research suggests that scooters are one of many sidewalk objects that may impede access for travelers with disabilities: other objects such as construction equipment and restaurant sandwich boards can also pose obstacles and hazards for travelers with disabilities (Brown et al., 2020).

Most cities (78%) allow scooters to park at bike racks, although again variation exists across cities in how exactly these allowances are enacted. San Francisco, CA, for example, allows scooters to park at bike racks, but requires that 50% of rack space be left available for personal bikes; other cities, such as Atlanta, GA, allow scooters to park at public bike racks, but not within five feet of bikeshare stations. Staff in cities that allow scooters to park at bike racks cited a desire for consistent parking regulations across micromobility modes (scooters and bikes) to limit traveler confusion. Staff from cities that do *not* permit scooters to park at bike racks cited concerns about scooters and bikes competing for limited rack space, and insufficient rack space for all micromobility vehicles. Such decisions reflect broad city objectives to support multi-modal travel and reduce conflict between modes, yet reveal an inherent tension in these objectives. One option (parking at bike racks), seeks to minimize potential conflict between pedestrians and scooters, while the other (no parking at bike racks) aims to minimize conflict between bikes and scooters.

Sixty percent of cities allow parked scooters to lean against or locked-to signs or poles. Again, considerable nuance exists across cities. Austin, TX and Minneapolis, MN, for example, allow parked scooters to lean against some poles (such as light posts), but not informational or regulatory signs. Nuanced regulations that allow parked scooter to lean against some poles but not others may contribute to users' uncertainties



over parking regulations (Brown et al., 2021). The nuances also represent the challenges of creating space for new modes while also supporting broader city goals and communication efforts. Yet it is also not clear if all regulatory nuances are necessary to address city concerns. If, for example, cities' objective is to ensure that regulatory signs remain unobstructed and easy to read, it is unclear if a three-foot tall scooter is any more likely to block sign information than it is to block light from a light post. Nor does it seem likely that parking a scooter against one type of pole would block sidewalk access while parking against another would not.

Most cities (62%) allow scooters to park on landscaped or vegetated portions of the right-of-way, although a number of cities clarified that scooters may park on grassy plots but *not* landscaped areas with flowers or plantings (Charlotte, NC; Indianapolis, IN; Washington, DC). Some cities that do not allow scooters to park on *any* vegetated surface including grass (for example, Dallas, TX requires scooters to park on "solid" surfaces); interviewed staff stated this regulation addressed concerns of scooters tipping over if parked on soft or uneven surfaces. Interestingly, the divergent approaches to scooter parking on vegetated plots both stem from similar city goals: keeping sidewalks clear and accessible by all travelers. Some cities aim to meet this goal by allowing scooters to park on vegetated/grassy areas (which removes them from the sidewalk entirely), while other cities meet this goal by prohibiting them from parking on uneven surfaces (which could result in more scooters being tipped over and thus exacerbate impedance).

While cities have restricted where scooters can park, many have also designated parking spaces on streets and sidewalks specifically for dockless scooters and bikes. Designated parking ranges from painted sidewalk corrals to on-street drop zones. Cities have also iterated their dockless parking infrastructure over time. Los Angeles, for example, experimented with sidewalk decals to direct users to dockless parking zones; interviewed staff stated that decals proved fast and easy to deploy, but also less durable compared to paint. To attract riders to designated parking spaces, city staff often work with scooter companies to digitally geofence corrals and drop zones; geofencing allows travelers to see parking spaces in apps in addition to on the street.

Parking regulations imposed less commonly include requiring riders to take a photo of their parked scooter at the end of a trip (Indianapolis, IN; Omaha, NE) and not allowing scooters to park within set distances of bridges, lakes, or rivers (e.g., Austin, TX; Portland, OR).

Just four (11%) US cities currently require riders to lock parked scooters to stationary objects: Chicago, Minneapolis, San Francisco, and Washington, DC. Other cities, including Portland, OR, are considering lock-to requirements as well. Cities cite ADA accessibility concerns and broad city goals to keep sidewalks clear and accessible as primary motivators for lock-to requirements. Chicago, for example, states that the lock-to requirement "aimed to reduce dangerous sidewalk clutter and maintain clear pathways for all Chicagoans who depend on unobstructed sidewalks, especially residents with disabilities" (City of Chicago, 2021). In some cities, lock-to requirements are pursued by transportation staff; in others, they are mandated by city council. City staff note that lock-to requirements create consistent parking expectations across micromobility vehicles (scooters and bikes); others see lock-to requirements as a policy mechanism to fund additional bike racks and support city mode shift goals beyond scooters. San Francisco, CA views the lock-to requirement as a "key" program feature and credits lock-to with a decline in both parking violations and public complaints (NACTO, 2020; SFMTA, 2019a, p. 2). Lock-to requirements cannot, however, prevent all parking violations. Scooters can be locked to unpermitted infrastructure (e.g., light posts, parking meters). They can also be "free locked" and parked unattached to a fixed object despite their locking capability. Research also suggests that lock-to requirements are not a precondition for keeping sidewalks clear; Brown et al. (2020) find similarly low rates of scooters blocking sidewalk access in cities both with and without lock-to requirements.

Many cities without lock-to requirements considered, but ultimately

rejected, requiring scooters to lock-to stationary objects when parked. Motivations for this decision vary and could change over time. Some city staff say that providing scooter parking (e.g., corrals) and incentives (e.g., discounted trip for parking inside of a geofenced drop zone) sufficiently addresses parking issues and achieves city goals of keeping sidewalks clear for all travelers. Other cities cite insufficient infrastructure—namely bike racks—as a primary barrier to imposing lock-to requirements. Some bicycle advocates also oppose scooter lock-to requirements out of concern over scooter competition for bike racks. To both address cyclist concerns and to provide additional parking spaces for scooters, cities with lock-to requirements have installed additional bike racks. San Francisco, for example, has installed more than 1,225 new bike racks in the past several years, paid largely by charging operators \$75 per deployed scooter.

#### 4.2. Fleet requirements as parking management

Fleet requirements are regulatory tools that some cities see as related to parking management and enforcement, and typically stipulate the number of operators and the number of scooters each operator is allowed to deploy. Fleet requirements bridge two city goals that exist at times in tension with one another: increasing access to transportation options while also ensuring that an overabundance of scooters do not obstruct sidewalks (City of Chicago, 2021; Move, 2021). Most city regulatory codes (55%) do not presuppose how many operators a city will permit; instead, cities award operating permits and licenses based on the quality of applications received. Even in regulations that cap the number of allowable operators, cities may issue fewer permits. For example, a city whose regulations allow four companies to operate may only permit three; permitting fewer companies may occur during the contracting process, or because individual companies exited the market. Cities permit between one and eight mobility operators, with an average of 2.8. Some city staff believed that too many operators or scooters can compromise enforcement efforts or reduce city staff's ability to build high-quality relationships with each operator. Portland Bureau of Transportation echoed similar sentiments in its 2020 scooter evaluation report and recommended that the city permit between one and three operators for a longer-term program; the report argues that between one and three operators balances user choice with city management capacity (PBOT, 2020). Staff from multiple cities noted that fewer operators—between two to four—fostered more collaborative relationships between city staff and operators, which helped to align scooter operations with city goals and regulations. Some staff believed that permitting at least two operators was best from both a system redundancy perspective (in case one operator unexpectedly exits the market, as many did during the COVID-19 pandemic), as well as to promote competitive prices for travelers. More operators, however, do not guarantee that cities or travelers will reap additional public benefits when put into competition with one another; another possible outcome of multiple vendors is that services duplicate one another, and travelers must juggle multiple apps that deliver nearly identical services.

All cities limit fleet size, although fleet sizes ranged dramatically from 200 to 3,000 scooters per operator. Many cities stipulated minimum as well as maximum fleet sizes, and two-thirds (67%) operated performance-based fleet caps that increased or decreased maximum fleet sizes based on daily use.

Cities face competing needs when setting scooter fleet sizes including staff capacity, local conditions, and enforcement capabilities; research, however, shows no clear association between rates of improperly parked scooters and citywide fleet sizes (Brown et al., 2020).

### 5. Aligning scooter regulations with city goals

Scooter parking regulations from 37 U.S. cities demonstrate remarkable diversity. While areas of widespread agreement exist—nearly all (95%) of cities allow scooters to park in the furniture

zone—nuanced differences present a patchwork of regulations across cities. About three quarters of cities allow scooters at bike racks (78%) and to park against buildings (70%), while fewer than two-thirds allow scooters to park either on landscaping (62%) or against signs (60%). Even cities with superficially similar regulations often diverge on the details. The regulations employed—and the high degree of variability across cities—yield implications for scooter parking policies, as well as scooters' role within broader city objectives. Scooter parking regulations can be an important piece of a city's agenda, but they should also serve as just one piece in a broader mosaic needed to reclaim city streets for people and promote mobility and access by all.

### 5.1. Micromobility, macro goals

Many micromobility programs often self-promote their role in realizing broad city goals such as reducing emissions and promoting public health and safety (e.g. Santa Monica (2019b)). Scooter goals, however, are rarely issued in a vacuum. Instead, they often mirror ongoing city efforts to promote non-auto modes—including walking, transit, and micromobility—to achieve a less car dependent and more environmentally-conscious future. For years cities have tried to shift travel behaviors through policies including dynamically priced car parking (Millard-Ball et al., 2014), free transit (e.g. Kęblowski, 2020), and zoning reforms that lower parking requirements to encourage compact and mixed-use development. More recently, cities have turned their attentions to the public rights-of-way. Together, city streets and sidewalks represent powerful city assets that policymakers and planners can program to support car alternative modes and align public space with city priorities.

### 5.2. Prioritize street and sidewalk space

Under current scooter regulations, scooters and pedestrians in many ways compete for sidewalk space. Ninety-five percent of the 37 U.S. cities surveyed allow scooters to park in the furniture zone. With scooters parking adjacent to the sidewalk right-of-way, conflict can arise between scooters and sidewalk users if scooters are tipped over or otherwise block the right-of-way. Some cities attempt to mitigate conflict with other travelers by prohibiting (or permitting) scooters from parking at bike racks (22%) or imposing lock-to requirements in an attempt to “reduce dangerous sidewalk clutter and maintain clear pathways” (City of Chicago, 2021). The tension between scooters and pedestrians, however, distracts from the larger picture: in most U.S. cities, sidewalks make up a small share of the public right-of-way that policymakers and planners could leverage to meet city goals. In other words, pedestrians and scooters are fighting over crumbs when they should be demanding more cake. To advance broad goals of sustainability and mobility, cities should look beyond the sidewalk and consider how street space can be reclaimed for multimodal uses to promote sustainability, mobility, and safety for all travelers.

Scooters and other micromobility vehicles provide alternatives to driving. User surveys show that between one-third and one-half of scooter trips replace private cars or ride-hailing, with the exact share depending on local context and quality of other modes (City of Atlanta, 2020; City of Santa Monica, 2019b; PBOT, 2020). So how can cities encourage more people to get out of their cars and onto comparably space-efficient and lower-emission micromobility?

Cities can promote micromobility travel by investing in supportive infrastructure. Although scooters and bikes comprise a rising share of vehicles on the street, little formal space is dedicated to their parking or use; Brown et al. (2020) observe that across five U.S. cities, scooters and bikes accounted for about one-quarter (24.7%) of vehicles despite limited parking infrastructure. Using examples of existing curb management strategies (e.g. Seattle and San Francisco), cities can reallocate street space to micromobility travel lanes and parking. Currently just two cities (6%) do *not* allow scooters to park in the furniture zone.

Sacramento, CA requires scooters be parked at either bike racks or in marked parking corrals; Phoenix, AZ only permits scooters to park in designated parking corrals. While parking corrals can be on- or off-street, many cities have located parking corrals (and before that, bike-share stations) on-street either adjacent to or in lieu of car parking spaces. Strategically added micromobility parking spaces can advance broader city goals. While scooter parking requirements often aim to reduce conflict between scooters, bikes, and pedestrians, scooter parking can also be used to reduce conflict between other modes. For example, removing street corner car parking spaces and replacing them with scooter corrals or racks could improve travelers' sightlines and road safety even for non-scooter users (FHWA, 2018). Cities can also add sidewalk bulb-outs to build additional space for micromobility parking; bulb-outs have co-benefits slowing vehicle traffic and reducing crossing distances for pedestrians, making streets safer for those walking or rolling on city streets and sidewalks.

Scooter parking can reorient streets to help cities better meet goals of maximizing space for people to move and access destinations. Seattle, WA explicitly connects its curb management strategy, for example, to goals identified in the City Comprehensive Plan, including moving goods and people. The city highlights how curbs are essential to reducing single occupancy vehicles; across land uses, Seattle prioritizes access for people and goods over vehicle parking (Seattle Department of Transportation, 2021). Similarly, San Francisco recommends programming curbs under an overarching goal to maximize space for people to move and access destinations (SFMTA, 2019b). One way for cities to reorient their curb space is to consider how many people use each foot of the curb: the same 80 feet of curb can serve five people in four personal cars, 32 shared bikes, or 63 people riding a bus (SFMTA, 2019b). A single converted car parking space can also hold up to 12 micromobility vehicles (Litman, 2013). Cities should directly compare competing curb space uses to reinforce how policy affects broader city objectives to move people; comparisons also highlight the inequities of preserving curb space for few, while limiting curb use for more efficient modes, like buses, which are disproportionately used by lower-income travelers (NHTS, 2017).

Dedicated street and sidewalk scooter parking can also help cities manage scooter fleets. In interviews, city staff stated that it is important to communicate designated scooter parking through using both in-app geofencing and on-the-ground signage. In-app signaling can be particularly useful for travelers unfamiliar with the area, or who may be around the corner from—but unaware of—a dedicated parking area. Observations also suggest that, when dedicated spaces are provided, riders *do* park scooters and bikes in them; more than one-third of observed micromobility vehicles were parked in scooter corrals and at bike racks across five U.S. cities (Brown et al., 2020). Surveys of international scooter riders also suggest that some people mis-park because they cannot find designated parking, or parking is too far away from their final destination (Brown et al., 2021); cities should consider providing additional dedicated micromobility parking spaces to address both of these concerns. Finally, cities can designate micromobility parking alongside other policies to support tidy micromobility parking. Some cities require micromobility operators to deploy scooters directly to dedicated parking zones to address parking management and ensure more equal distribution across space. A number of micromobility companies also give riders small rebates if they park within designated zones. In Santa Monica, CA, Lyft encourages riders to “Earn \$ with Preferred Parking”, telling riders to “Please park your scooter in a painted box on the sidewalk”. The app also directs riders to geofenced parking areas highlighted in green on the Lyft app.

### 5.3. Towards access for all

City streets and sidewalks should be accessible to all travelers. Access implies being both able to travel safely—including using designated and separated infrastructure as discussed above—and freely without being

impeded by other travelers or objects. Scooters are certainly part of this objective. Scooter parking regulations aim to ensure access and safe travel by all travelers, not just scooter riders, and all cities prohibit scooters from being tipped over or blocking sidewalks. Yet research also suggests that not all parking regulations are equally important to reaching a goal of access by all. Fleet sizes and the number of scooter operators—which in the 37 U.S. cities included in this research ranged from two to nine vendors each operating 200 to 3,300 vehicles—can greatly affect city staffing capacity and city-operator relationships. Neither, however, has a clear link to scooter mis-parking; in a study of five U.S. cities, the city with the largest scooter fleet, Austin, TX, had the second-lowest rate of scooter mis-parking (0.6%) (Brown et al., 2020). Similarly, while some cities perceive lock-to requirements as key to reducing rates of scooter misparking, they remain a relatively uncommon requirement: as of November 2021, just four US cities require scooters be locked to a stationary object when parked. Previous research also finds that cities that achieve low rates of misparking (and thereby achieve their goal of clear and accessible sidewalks) without lock-to requirements, which suggest that other policies such as incentives or providing designated micromobility parking can deliver similar results (Brown et al., 2020). Most scooter users accurately identify scooters that block access as improperly parked, and state that when they do mispark, it is because either they are confused about parking regulations or there is no available scooter parking (Brown et al., 2021). Cities can harness both the impulse to park properly and the rider-identified need for additional parking by providing more micromobility parking. Designating micromobility parking would also align with broader city goals related to supporting access and movement to people; while all cities allow scooters to park in designated corrals, regulations do not specify how many corrals will be made available. Certainly, cities that require parking in designated spaces (Phoenix, AZ; Sacramento, CA) have strong incentives to provide designated parking to ensure sufficient parking spaces for their scooter fleets. It also remains critical for cities to continue to enforce parking regulations to ensure unimpeded travel by others, such as requiring operators to quickly remove scooters that block crosswalks, curb ramps, and crosswalk push buttons. Cities should also extend regulations to encompass the range of needs for travelers with disabilities and vision impairments, such as prohibiting parking on tactile pavers. Discussions with disability groups also suggest that cities should prohibit parking next to buildings (currently prohibited by just 30% of cities), given buildings' role in helping low-vision travelers navigate sidewalks.

Cities have extended considerable efforts to limit where scooters can and cannot park. Ensuring that scooters do not block access for other travelers is critical. Yet with only 3% of scooters impeding access (Brown et al., 2020), scooters and scooter parking regulations should be part of broader city efforts to promote unimpeded access by all travelers. Scooters are not the only impediments that active travelers face: sidewalk users must routinely navigate restaurant menu boards, advertisements, construction equipment, and other objects; such objects impede access at nearly the same rate of scooters (2% vs 3%, respectively) (Brown et al., 2020). Cities should ensure that sidewalks remain free of obstructions—including but not limited to scooters—to provide more predictable and safe travel for sidewalk users.

In addition to objects impeding access, cities should consider how sidewalks themselves may inhibit access. Although U.S. courts have ruled that sidewalks must be well-maintained and kept clear to ensure accessibility under the ADA, both informal car parking and broken sidewalks can impede access (Shoup, 2010, 2015). Sidewalk quality and curb cuts (or lack thereof) can preclude access for travelers, particularly those with mobility devices like walkers or wheelchairs for whom a six-inch curb or broken sidewalk cannot be circumvented or may divert travelers into the street (Peterson, 2015). Because U.S. cities must only construct curb cuts and ramps when streets are resurfaced, some sidewalks remain inaccessible to travelers with mobility devices (USDOT, 2013). In other places, sidewalk networks may be incomplete or

patchwork. Targeted city efforts to invest in accessible and high-quality sidewalks is an important step to promote universal access and active travel (Gharebaghi et al., 2018; Thornton et al., 2016).

Scooters can also play a role in achieving city goals related to reducing driving, vehicle miles traveled, and its associated congestion and emissions. If cities want to promote scooters as car-alternatives, however, they should evaluate how to make scooter travel safe and comfortable. Part of this effort should consider how cars can impede access for both scooters and bikes. Research finds that nearly one-quarter (23%) of cars mis-park in studied commercial districts; most of these violations (68%) last less than five minutes, but any misparked car can divert scooters and bikes from the relative safety of bike lanes into general traffic lanes (Brown et al., 2020). Studies of other commercial areas find similarly high rates of mis- and double-parking for ride-hail vehicles, which often lack designated loading spaces (Lu, 2018). Cities wishing to promote space-efficient modes like bikes and scooters should therefore enforce not only how micromobility vehicles can block pedestrian travel—the focus of most scooter parking requirements—but also how cars can obstruct bike, scooter, and pedestrian travel by obstructing bike lanes or parking across sidewalks. Cities could pilot short-term loading spaces for goods delivery and ride-hail vehicles to evaluate if additional loading spaces reduces bike lane obstructions. Because parking and travel behaviors may vary block-by-block or by time of day, cities should consider adopting dynamic parking practices that vary curb priorities by land use or time of day (Seattle Department of Transportation, 2021; SFMTA, 2019b). Cities could also allow delivery companies to reserve loading spaces in advance (Shaver, 2019).

Cities seeking to regulate scooters should begin by considering the broad goals they hope to achieve through a shared micromobility program, such as universal access to city sidewalks and streets. Policy-makers and planners should tailor scooter parking regulations to meet those goals, as well as leverage scooter parking to further existing city objectives, such as using scooter parking to daylight intersections and improve pedestrian safety. Yet goal setting should not be limited to just scooters. Instead, scooter regulations should represent just one effort within a broader city agenda of reclaiming city streets for people and promoting mobility, sustainability, and access for all.

#### *CRedit authorship contribution statement*

**Anne Brown:** Conceptualization, Data curation, Formal analysis, Funding acquisition, Investigation, Methodology, Visualization, Writing – original draft, Writing – review & editing.

#### **Declaration of Competing Interest**

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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#### **Appendix A. Supplementary data**

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.trip.2021.100508>.

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