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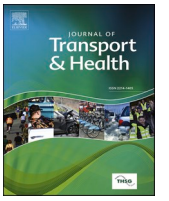

Safe streets for some: A review of local active transportation responses across the U.S. during the COVID-19 pandemic

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ABSTRACT

Introduction & research objectives: The COVID-19 pandemic significantly disrupted daily travel. This paper contrasts 51 US cities' responses, namely street reallocation criteria and messaging related to physical activity (PA) and active transportation (AT) during the early months of the pandemic. This study can be utilized by cities for aiding in the creation of locally responsive policies that acknowledge and remedy a lack of safe active transportation.

Methods: A content analysis review was conducted of city orders and documents related to PA or AT for the largest city by population in all 50 US states and the District of Columbia. Authoritative documents issued from each city's public health declaration (ca. March 2020) to September 2020 were reviewed. The study obtained documents from two crowdsourced datasets and municipal websites. Descriptive statistics were used to compare policies and strategies, with a focus on reallocation of street space.

Results: A total of 631 documents were coded. Considerable variation existed in city responses to COVID-19 that impacted PA and AT. Most cities' stay-at-home orders explicitly permitted outdoor PA (63%) and many encouraged PA (47%). As the pandemic continued, 23 cities (45%) had pilot programs that reallocated street space for non-motorized road users to recreate and travel. Most cities explicitly mentioned a rationale for the programs (e.g., to provide space for exercise (96%) and to alleviate crowding or provide safe AT routes (57%)). Cities used public feedback to guide placement decisions (35%) and several welcomed public input to adjust initial actions. Geographic equity was a criterion in 35% of programs and 57% considered inadequately sized infrastructure in decision-making.

Conclusions: If cities want to emphasize AT and the health of their citizens, safe access to dedicated infrastructure needs to be prioritized. More than half of study cities did not instate new programs within the first 6 months of the pandemic. Cities should study peer responses and

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innovations to inform and create locally responsive policies that can acknowledge and remedy a lack of safe AT.

1. Introduction

Beginning in March 2020, state and local governments in the US enacted coronavirus disease 2019 (COVID-19)-related restrictions designed to limit the transmission of the virus (Gostin and Wiley, 2020). Early COVID-19 shelter-in-place orders and subsequent advisories altered access to recreational spaces, limited travel to essential trips, and promoted physical distancing. As mobility (Bureau of Transportation Statistics, 2022a) and, particularly, utilitarian walking behaviors in US Cities (Hunter et al., 2021) declined, adults reported increases in adverse mental health conditions (Czeisler et al., 2020). Being physically active can improve sleep, reduce feelings of anxiety and blood pressure, and regular activity prevents chronic disease (U.S. Department of Health and Human Services, 2019). Conversely, physical inactivity is associated with increased morbidity risk (Kohl et al., 2021; Lee et al., 2012), including elevated risk for severe COVID-19 outcomes (Sallis et al., 2021), all with steep health-care costs (Santos et al., 2023).

During the pandemic shut-down of 2020, utilitarian walking decreased but overall recreational walking levels across the US surpassed pre-pandemic levels (Hunter et al., 2021). However, COVID-19 widened existing inequalities in walking behavior. Those reporting increased physical activity (PA) were more likely to be White, while Black or Hispanic adults were more likely to report being less active during the pandemic (Chen et al., 2021; Watson et al., 2021). Low-income groups were more likely to have a decrease in the number of PA minutes, fewer bouts, and were more likely to report decreased PA levels compared to high-income groups (Courtney et al., 2021; Watson et al., 2021). Providing opportunities to support outdoor recreation, including active transportation (AT), may help support post-pandemic economic recovery (e.g., through the provision of safe routes to business destinations) and improve health outcomes (Hunter et al., 2021).

Considering the inactivity and social isolation concerns, some municipalities used emergency powers to reallocate public streets for residents to use for socially distanced exercise and travel to and from essential businesses. Since city regulations often restricted access to indoor PA facilities (e.g., fitness centers, aquatic facilities), streets became new spaces for PA opportunities (Combs and Pardo, 2021). Measures included new street closures to provide safe, socially distant spaces for people to walk, bike, roll, or stroll. Referred to as Slow Streets, Healthy Streets, Pandemic Streets, Active Streets, or Safe Streets, they all include some form of temporary barrier to slow or prohibit vehicle access to protect pedestrians and bicyclists (NACTO, 2020). In addition to the reallocation of physical road infrastructure for PA and AT modes (including walking, cycling, and public transit) (Besser and Dannenberg, 2005; Tribby et al., 2020), cities altered public transit services or reallocated streets for non-transportation purposes (for outdoor dining or public health resource hubs). On the other hand, some cities initially closed places of outdoor PA to limit close contact with non-household members, even though multi-use paths and bikeways are some of the few low-risk spaces people could access outside of their homes relative to indoor essential businesses (Slater et al., 2020).

Several studies document the myriad of government responses that expanded or shuttered AT and PA infrastructure (Combs and Pardo, 2021; Glaser and Krizek, 2021; Mayo, 2021; Pishue, 2020; Shirgaokar et al., 2021). Combs and Pardo (2021) reviewed the spread of transportation responses (n = 841) from 394 communities around the world. The most common response was a partial reallocation of traffic lanes for bikes or pedestrians (13%), followed by full or partial street closures (each with 11%). Many of these traffic lane or street reallocation efforts were associated with a Safe Streets program. The study by Glaser and Krizek (2021) found that of the 55 most populated US cities, 30 of these cities' emergency responses affecting streets were safe street applications. However, these studies do not review official orders, guidance documents, and other primary documents to capture the rationale behind these actions.

To date, no study has documented the criteria for placing COVID-era Safe Streets, the prioritization of these investments, and justification used in public documents. The purpose of this study is to describe how cities addressed PA and AT in public documents in the early months of the pandemic to explore access, response, and the criteria used to inform placement decisions for providing additional spaces (Safe Streets) for outdoor activity. We contextualize the outcomes (i.e., type of response) with information on decision-making, evidence of physical activity/active transportation promotion, and existing public planning processes/goals/plans. The results indicate areas of improvement (cross-sector physical activity messaging), encouraging active travel (while acknowledging barriers or issues), and developing implementation-ready masterplans that prioritize investments with geographic equity in mind.

2. Methods

To determine how cities' responses addressed access to transportation-related infrastructure and PA locations early into the pandemic, researchers conducted a qualitative content analysis of issuances by executives and relevant departments in the largest cities in 50 US states and the District of Columbia between March and September 2020. A two-part process – document identification and content analysis – created a dataset that is used for comparative analysis. A document-level and city-level analysis explored the variation in collected documents by issuing agency, document type, and the variables of interest, namely: mention, encouragement, restriction, and barriers to PA or AT (see the Appendix for city-level data).

2.1. Document identification

Trained research assistants reviewed documents and supplemented state and city government sources using two crowdsourced datasets. The two existing crowdsourced datasets were from the National Association of City Transportation Officials (NACTO) and the Pedestrian & Bicycle Information Center (PBIC). These entities collected municipal active and public transportation interventions that were aligned with this paper's analysis period (Combs 2020; NACTO 2020). Additionally, researchers reviewed municipal websites under the respective COVID-19 webpage for orders and other documents that were within the analysis period. If there was not a standalone site, research assistants identified documents relevant to "COVID-19," "active transportation," and "physical activity" on the municipal websites.

2.2. Inclusion criteria

Documents that included a reference to COVID-19 and PA or AT that were updated before September 1, 2020, were included in this analysis. Documents could originate from an agency of the municipality or higher government agency, or a non-profit funded by the municipality (e.g., bikeshare programs). Items included in this review were: 1) executive declarations, including stay-at-home orders, mayoral proclamations, and ordinances; 2) public information documents, like reopening plans, guidance documents, and press releases; and 3) informational documents, like infographics/posters, websites, and FAQ/information sheets. Documents from the PBIC database that referenced transit, reallocation of space (for transportation purposes), and bicycles were included (Combs, 2020). Documents from the NACTO database included those in the categories of (a) maintaining transportation systems, (b) maintaining transit systems, (c) relieving crowded areas, and (d) creating clear messaging and outreach (NACTO, 2020). Researchers excluded documents focused on indoor recreational facilities (like gyms and aquatic parks) and general facility or schedule updates about organized park activities (like leagues). News sources were excluded, except for press releases.

2.3. Content analysis coding tool and procedure

Researchers developed a coding protocol and adopted definitions for key variables to obtain consistent results between independent coders. Each document was independently reviewed and coded by two trained researchers. Consensus coding was reached for all variables in a final dataset via Qualtrics Survey and then summarized using descriptive statistics. After consensus coding, the short answer responses were categorized, when appropriate, to reveal themes.

Coding questions centered on transportation options include types of physical infrastructure, criteria for justification, location, or prioritization of Safe Streets, and modifications to public transportation. Variables were coded as binary (yes or no), categorical (i.e., transportation options, provision language strength), and short response. The tool included short answer responses to capture items not anticipated by researchers. Importantly, the tool used provision language strength responses to capture whether the document promoted AT for trips and PA for exercise. These variables had three responses – "encouraged" was used for language recommending, promoting, or encouraging this activity, "addressed" was used for language mentioning this activity, and "n/a" for not mentioning this activity.

Researchers adopted CDC definitions for AT, complete streets, public transportation, social distancing, and PA. The term "Safe Streets" describes new street closures in the era of COVID-19 that provide safe, socially distant spaces for people to walk, bike, roll, or stroll. This term is synonymous with Slow Streets, Healthy Streets, Pandemic Streets, and Active Streets (NACTO, 2020). The term "essential" was used to clarify whether cities permitted or encouraged AT for essential trips and whether AT or PA was an essential activity.

Since cities varied in communication and document types, the coders relied on a guidance document to provide clarity and improve consistency. The guide included definitions for variables (see the Appendix) and Table 1 provides an example of how coders used the guide to correctly code key response outcomes. In this example, the document links physical activity to health benefits and the correct coding response for this variable of interest is "yes."

Table 1
Coding tool and guide for consistent coding on link between physical activity and health benefits (emphasis added).

Source	Definition or Quote
Document	"*Staying physically active* is one of the best ways to *keep your mind and body healthy*."
Coding tool	Does the document consider or refer to *physical activity through a lens of mental health* (such as depression, anxiety, or stress) *or physical well-being* (including chronic diseases such as hypertension, diabetes, and heart disease)?
Coding guide	Any "yes" must be due to *health promoting reasons*, like improved fitness or mental health. However, it must *tie physical activity to health benefits* (and not just say a place can be where one has these benefits).

3. Results

The first two sections summarize the document-level and city-level analysis. The third section of the results summarizes the infrastructure reallocation programs, namely Safe Streets, and the presence of placement criteria that governed where pilots were located or prioritized. Additional outcomes include the use of justification criteria, connections to existing AT programs, goals, or plans, and reasons for changes to the program.

3.1. Document-level summary

A total of 631 documents were coded. The mean number of documents coded per city was 12, with a standard deviation of 7. The city with the smallest number of documents was Des Moines, whereas Los Angeles had the most documents. Overall percent agreement across the variables in this paper was 0.59, taking an arithmetic average across simple (Cohen) and weighted (Fleiss-Cohen) kappa values (Zapf et al., 2016). For the safe street variables, the average kappa value was 0.70. The kappa statistic is commonly used to report interrater reliability (or the measure of agreement/disagreement) between independently coded responses for the same variable. As a correlation coefficient, the value can range from −1 to +1. The closer the value is to +1, the more confidence can be placed in the study results. The kappa value of 0.70 is considered a *substantial* value of agreement (McHugh, 2012). Issuances came from mayors or governors, depending on the state's governance structure, as well as local/state agencies and departments. Documents were issued by transportation (38%) and executive agencies, including state and local organizational types (36%), public health (13%), and parks and recreation departments (9%). Coded documents included websites (36%), executive/mayoral orders and proclamations (25%), press releases/other (19%), guidance documents (9%), FAQ/info sheets (6%), with the remainder from reopening plans, ordinances, and infographics/posters (5%).

Overall, 46% of documents included language mentioning PA or exercise compared to 60% for either active or public transportation. A subset of documents mentioning PA or exercise (31%) described it as "essential" – either as essential in travel (to/from essential business) or essential to one's health. When mentioning AT or PA, most documents (83%–86%) did not encourage the public to take AT modes for essential trips or exercise (see Appendix for provision strength definitions). Although mentioning or encouraging PA could be considered a preventative public health measure, none of the documents referenced quantitative recommendations on PA (e.g., recommended duration or times per week).

3.2. City-level summary

Of the 51 cities in this study, 96% had documents mentioning PA or exercise, while 98% had documents mentioning AT or public transportation. More than half of cities (61%) connected PA or exercise to mental health or physical well-being outcomes or benefits. One example of this connection is from a Los Angeles County Department of Public Health guidance document: "Staying physically active is one of the best ways to keep your mind and body healthy." A smaller share of cities, 47%, produced documents that encouraged PA for exercise. About 1 in 3 cities that encouraged PA for exercise did not use language that referred to PA through a lens of mental health and physical well-being. No cities had documents that addressed recommended PA guidelines (U.S. Department of Health and Human Services, 2019).

Despite the risk of COVID-19 transmission being lower in non-confined outdoor spaces (Centers for Disease Control and Prevention,

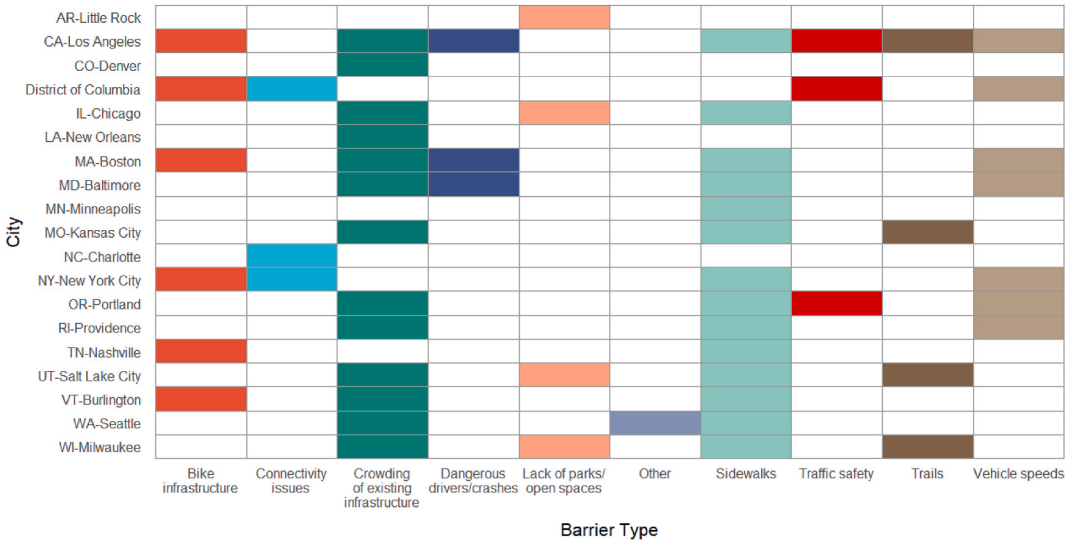

Fig. 1. Safety issues or barriers to PA and AT.

2020; Gartland et al., 2022), there were a few documents that mentioned residents could walk or bike instead of taking public transit. While 86% of cities mention that public transport should be taken only for "essential" trips or that it provides an "essential" service, less than 24% of cities encouraged walking or biking for trips (or the shift to these modes for essential trips). Cities promoting active travel for trips were geographically distributed across the country.

Of the cities studied, 37% mentioned a perceived barrier of lack of physical infrastructure for PA, including AT. Fig. 1 shows the cited barriers (including lack of infrastructure) by city. These barriers include crowding of existing infrastructure, which may be due to increased use during the pandemic of space that was already inadequately sized. The other most prevalent issues are sidewalks (sizing or lack thereof), vehicle speeds, and bike infrastructure (lanes, paths, protected/separated). Of the cities that encouraged residents to take AT for essential trips, 60% acknowledged infrastructure barriers to PA.

Cities placed restrictions on places of PA or AT where people might congregate. This included full closures to all visitors to partial restrictions, such as prohibitions on organized sports and closing playground facilities at parks. Most cities placed, at a minimum, a partial restriction on park infrastructure or activities (80%), including two cities that addressed a former restriction at the time of the document reviewed. About one in five cities fully closed park facilities at some point during the early stages of the pandemic. Nearly half of the documents mentioning a full closure were dated March 2020 (three-quarters before June).

Closing AT infrastructure (e.g., bike paths or multi-use paths) was less common. Only 13 cities implemented at least a partial restriction, such as asking people to 'keep moving' when using facilities. Just four cities (Los Angeles, Portland, Chicago, and Providence) mentioned a full closure of any AT infrastructure, mostly coinciding with periods of high community spread or holiday weekends. Mayoral orders or reopening plans often announced closures, followed by public-facing documents (e.g., info sheets, press releases, and websites).

3.3. Safe street programs

Of the 19 cities mentioning safety issues or barriers, all expressed a need to dedicate or reallocate infrastructure in the interim for either more PA and AT or safe social distancing due to COVID-19. The review found that 47% of cities (n = 24) mentioned a reallocation of physical infrastructure, and 96% of these cities (n = 23) stated a need for a safe street. These twenty-three cities (which varied widely by population size – 45,000 to 8.8 million) are mapped in Fig. 2. Of these cities, 65% encouraged PA for exercise, but only 39% encouraged AT for trips or the shift to AT for essential trips/workers.

Seventy-three documents that mentioned a city reallocation program like Safe Streets, and over half (51%) came from a transportation agency. An executive (mayor or city council) was the next most frequent agency type to release these documents (32%), followed by public works (8%), parks & recreation (4%), and public health (4%). Cities used websites, press releases, and FAQ/info sheets to share information about these street programs with the public (45%, 32%, and 12%, respectively).

Executive agencies relied heavily on press releases while transportation agencies used websites. Seven of the 23 cities only had one document that mentioned a Safe Streets program (with a median of 2 documents on this program). The type of PA and AT infrastructure mentioned in these documents include streets, sidewalks, parks, and other non-motorized mode infrastructure (e.g., bike lanes). Fig. 3 shows the breakdown of infrastructure mentioned in these documents. The wide range of infrastructure mentioned came from cities listing the need for this program (e.g., inadequately sized sidewalks, a lack of parks or open spaces, or crowding on existing trails) to explain the street closures.

3.3.1. Safe street location criteria

Street reallocation programs varied based on community resources, needs, and ease of implementation. Some documents used location criteria to explain where the city would place street reallocation pilots. Location criteria included specific street locations to generalizable conditions, such as nearby parks, traffic conditions, and public input (Fig. 4). Most cities placed Safe Streets in residential neighborhoods (65%), in locations where existing infrastructure was inadequately sized (57%) or mentioned another criterion (57%). The other category included low car ownership areas (Seattle), proximity to parks (Charlotte), and a bicycle or pedestrian master plan (Milwaukee, Boston, & Nashville), among others. The cities with the most variety of location criteria are Salt Lake City, Baltimore, New York City, and Seattle (see Appendix).

Only two of ten cities mentioning a specific location did not provide any other location criteria.[1] Even though many programs were quickly implemented without traditional public comment periods, most cities shared criteria in their public documents that indicated where Safe Streets would be or are located. About one in three cities considered geographic equity (i.e., coverage) when deciding where to locate safe street programs. For example, Seattle used a city-specific race and social equity index to select neighborhoods for this program (City of Seattle Office of Planning and Community Development, 2022). Baltimore's ordinance required at least one mile of reallocated street space in each district and set a cap that no district can have more than 15% of the reallocated street lane-miles.

3.3.2. Safe street prioritization criteria

The most common prioritization criteria were neighborhoods without accessible open spaces (i.e., 'Safe Streets *provide* this'), in proximity to open spaces (i.e., 'Safe Streets *connect* people to them'), and in high-density neighborhoods (i.e., 'Safe Streets *serve* the most people'). Some cities prioritized serving areas where residents are predominantly Black Indigenous People of Color (BIPOC),

[1] We chose to still include these specific location mentions as a criterion to juxtapose it with cities that *explicitly* documented location criteria (with or without specific locations).

Fig. 2. Map of cities with a Safe Streets program.
Note: The following cities provided mileage data or street locations to estimate mileage: Baltimore (65 mi), Minneapolis (36.4 mi), New York City (100 mi), Providence (13 mi), Nashville (4.5 mi), Houston (1.3 mi), Burlington (23.5 mi), Seattle (20 mi), Milwaukee (9.7 mi).

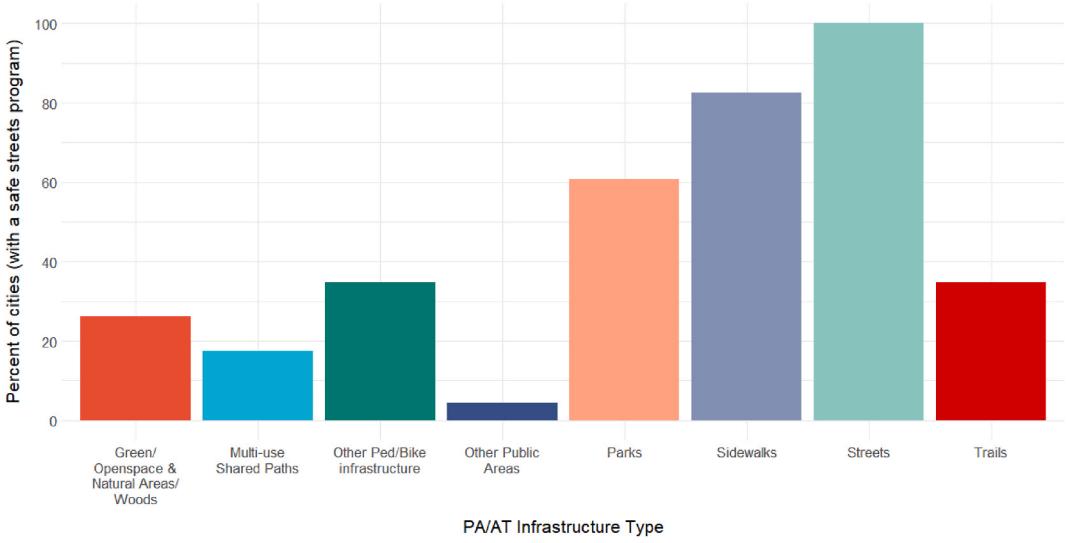

Fig. 3. Safe Streets program documents and mention of PA/AT infrastructure (n = 23).

older adults (aged ≥ 65 years), people with disabilities, or low-income. In contrast to location criteria (Fig. 4), fewer cities mentioned priority criteria in their documents (Fig. 5). "Other" criteria included roads with the most pressing safety needs, the most heat burdened communities, and areas hardest hit by the pandemic.

3.3.3. Safe street justification criteria

Safe Streets programs either prohibit or restrict motor vehicles to local only traffic. During the pandemic, cities often conveyed the justification for the program since these programs reclaimed public space for people. Fig. 6 plots the types of justification responses mentioned in the document review. New York City, Boston, and Seattle had the most reasons for the program (see Appendix), though all cities provided at least one reason. The most common justifications were to provide adequate space for exercise or PA, alleviate crowding on existing infrastructure, provide safe AT routes, and increase personal safety via social distancing. When mentioning that the streets can bring residents together safely, cities balanced that with a statement on providing space for social distancing, which can

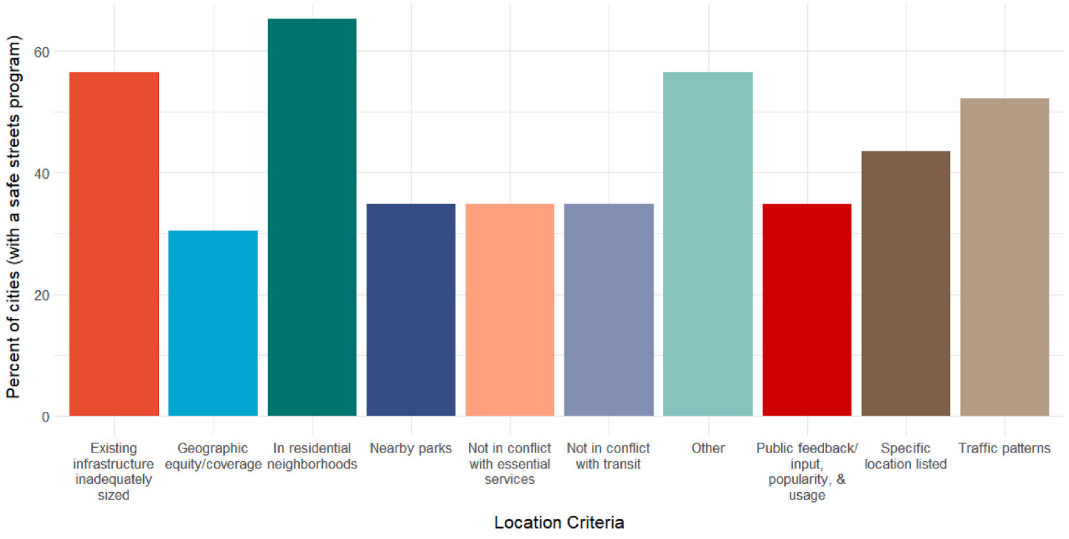

Fig. 4. Location criteria mentioned in Safe Streets programs (n = 23).

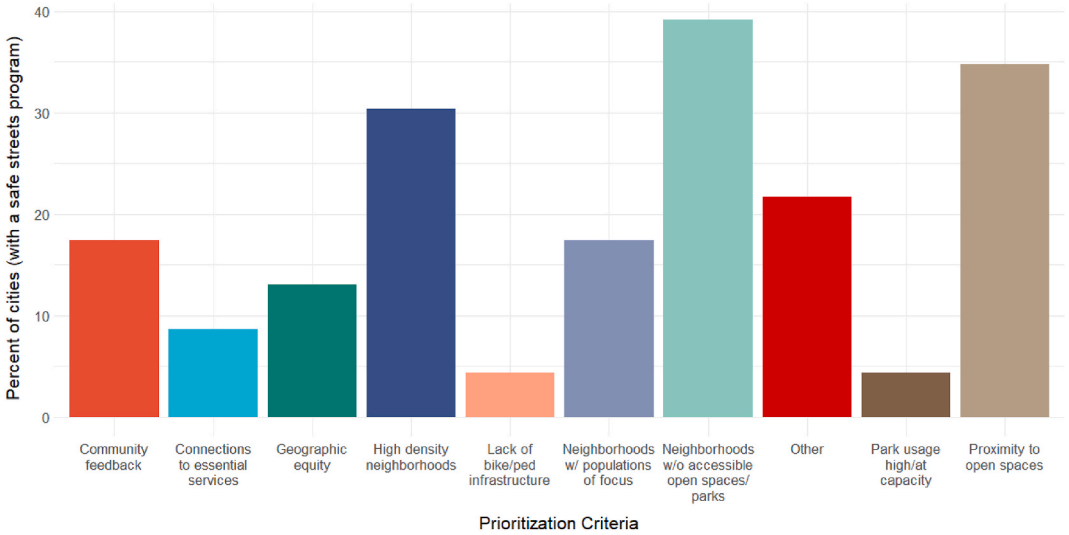

Fig. 5. Prioritization criteria mentioned in Safe Streets programs (n = 23).

increase personal safety when recreating or traveling. Traffic safety, a broad category that includes controlling speeding, maintaining traffic level reductions, reducing crashes, and providing Safe Streets for all, was observed in six cities. All but one of these cities (Atlanta) addressed a perceived barrier or lack of physical infrastructure for PA, including AT. Promoting Safe Streets as a remedy for existing problems may help advance the reordering of street use but was not a strategy employed by most cities during the study period.

3.3.4. Changes in safe street programs

Many cities changed ongoing street reallocation programs to meet community needs. Changes listed in official documents include additional street closures in the same location, in a new location, removal of some or all reallocated streets, or transitioning the temporary program into a permanent fixture. Fig. 7 plots the most common rationale with a breakout plot for the "other" category responses. Changes to the Safe Streets program included the need for socially distanced PA or AT and public input (support and opposition). Only one city, Providence, RI documented that some safe street locations would close due to negative feedback. However, Providence also changed the program to make way for a permanent street reallocation in another location (see Appendix). Three cities mentioned limited resources as cause for the change (Minneapolis, Salt Lake City, and Seattle). Boston accelerated existing infrastructure projects. Finally, four programs had phases or would entail future expansions subject to input (Charlotte, New York City, Burlington, and Milwaukee).

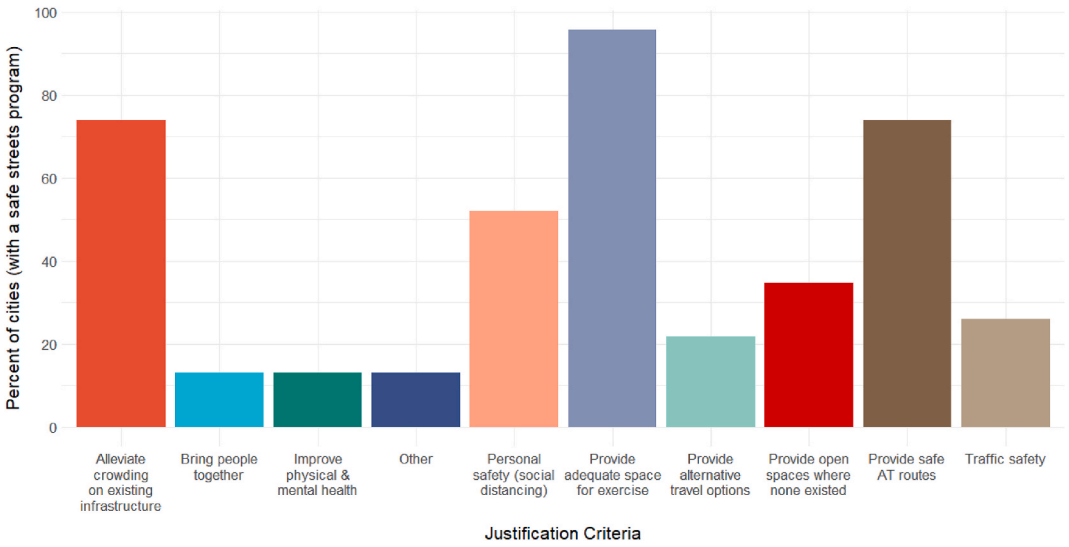

Fig. 6. Justification criteria mentioned in Safe Streets programs (n = 23).

Four cities besides Providence mentioned changes to AT or PA interventions, including but not limited to Safe Streets, were made permanent or regular features. New York City's Open Streets were temporary reallocations, but up to 10 miles of protected bike lanes were permanent additions to the existing bicycle network. Boston indicated it would fast-track protected bike lanes improvements. Boston also acknowledged ongoing projects like neighborhood slow street zones, the need for bus priority lanes, adjustments to curb use rules, and bikeshare stations. Seattle made at least 20 miles of their Stay Healthy Streets permanent and expedited the construction of bike lanes. Salt Lake City suggested the most used Stay Safe, Stay Active streets would become permanent before the first street reallocation. Following a six to eight-week period, the city extended the most utilized street closures and asked for public feedback to reintroduce more permanent Safe Streets.

3.3.5. Existing plans connection

Almost 30% of study cities mentioned a commitment or tie to a current planning document, goal, or program (besides Safe Streets) that includes AT or PA. In contrast, about 52% of cities mentioning a Safe Street program did so.

Vision Zero, the goal that "no one shall be killed or seriously injured as a consequence of [crashes] in road traffic" (Belin et al., 2012), was one of the most common goals mentioned (Fig. 8), which aligns with documents mentioning vehicle speeds and crashes as important traffic safety issues. Master plans for bike and walk networks or transit-oriented developments were also cited. Nashville and Milwaukee used existing bike plans when identifying street reallocation locations and Boston used a road diet study to fast-track improvements for residents. The other category included city-specific plans, like Portland's transportation justice framework, Boston's three-fold equity, economic opportunity, and climate responsiveness plan, and Wilmington's PlayStreets program that engages families with city officials, such as the police.

4. Discussion

This study assessed the content of 631 official documents from 51 US cities to understand and evaluate how cities mentioned PA, AT, and created pilots to expand safe outdoor recreation spaces during the early months of the pandemic. Nearly three-quarters of the documents analyzed were from transportation or executive agencies compared to 13% for public health. Still, almost all cities had documents mentioning PA (96%), but only 61% linked PA to mental health or physical well-being benefits. Even so, *no* city directly cited recommendations on PA or exercise (U.S. Department of Health and Human Services, 2019). This spawns several questions as to why cities did not cite these recommendations in the documents that changed travel behavior during the pandemic. Perhaps city officials did not understand or prioritize how important PA is to health outcomes, including mental health and physical well-being. Perhaps they were not aware of CDC guidelines, or the guidelines were not plain enough. It is unclear from this study how such a lapse occurred, but this question deserves further study.

This work also showed that non-health agencies, like transportation and executives, shared public health messaging (e.g., social distancing, mask-wearing, and personal hygiene guidelines) to prevent further community spread of COVID-19. This is an encouraging example of collaboration among public health professionals, transportation professionals, and city leaders. Adopting simple messages, such as "six feet apart," is a simple but powerful example of how cross-sector collaboration can penetrate the consciousness of the general public and even change behavior. Such a finding solicits the question: How could further collaboration among public health professionals, transportation planners/engineers, and executives positively change health outcomes? Collaborative efforts between public health and other "built environment agencies," like transportation, public works, parks and recreation, and planning, may

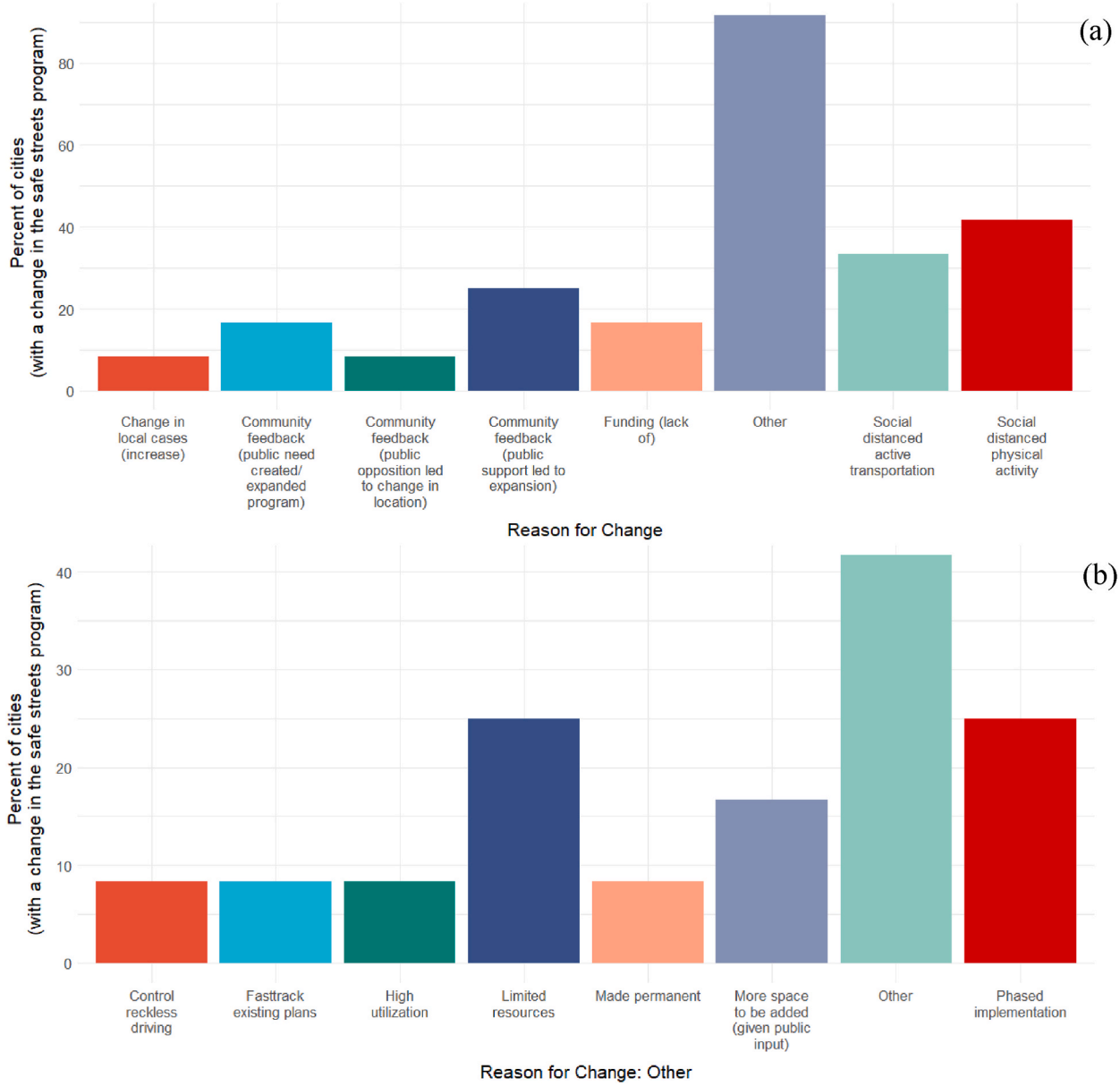

Fig. 7. (a) Change in Safe Streets programs, and the (b) breakdown of "other" category (n = 12).

support local efforts to address physical inactivity, address safety problems, or promote other healthy choices (Ederer et al., 2023; Kohl et al., 2021; Meyer et al., 2021).

Recommendations that encouraged AT for essential trips or discouraged shared modes like public transit were observed in less than 24% of cities. With more than half of all daily trips less than three miles (Bureau of Transportation Statistics, 2022b), transport agencies can encourage and provide safe routes for pedestrians and bicyclists. Still, the success of investing in non-motorized infrastructure is complicated. US cities have historically built bike paths and urban trails through parks and meandering waterways rather than direct paths that promote utilitarian trips –which is reflected in the fact that most walk or bike trips by Americans are recreational (Sadauskas, 2022; Schoner and Levinson, 2014). Despite the fact that much infrastructure is *designed* for recreational travelers, the absence of more walking and cycling commuters may influence cities to see non-motorized infrastructure as a poor investment – but this mindset may be changing after the pandemic. Of the cities in this study that encouraged residents to use AT for trips, 60% acknowledged gaps and barriers in safe PA/AT infrastructure. A safe and complete network of AT infrastructure is needed to encourage many people to bike, walk, and use transit for trips (Dill and McNeil, 2016), so the fact that some of the cities in our study see this gap in their communities could indicate an interest in addressing these gaps to create more AT-oriented cities.

While 60% of cities that encouraged AT for trips also acknowledged gaps in infrastructure, only 37% of all cities considered in the

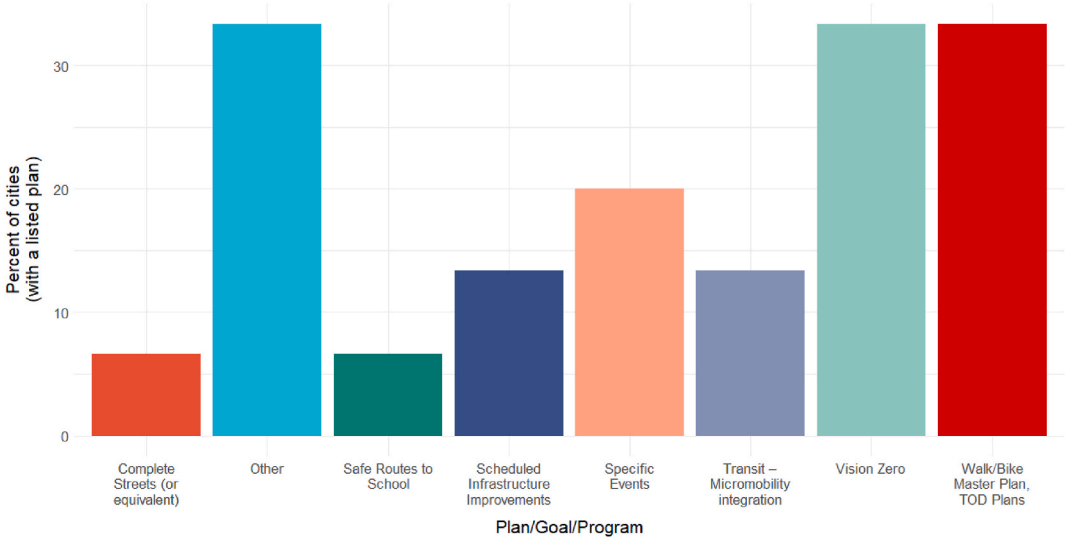

Fig. 8. Implemented infrastructure tied to existing plans (n = 15).

study mentioned these barriers. Perhaps there is a self-selection bias in those who recognize a lack of AT infrastructure; it makes sense that those that already understand the importance of AT (and perhaps also PA) would also understand gaps in their AT network. Still, at least some local governments are recognizing the importance of encouraging more active trips while acknowledging the issues that residents face.

Stay-at-home orders, the rise of teleworking, the closure of indoor fitness centers and some parks may have led many residents to recreate close to home on street infrastructure that may not be designed for them. About 45% of cities mentioned a need for a Safe Streets program, which reallocates roadway space from vehicles to pedestrians and cyclists. Also,*all* cities listing safety issues or barriers expressed a need for reallocated infrastructure for PA and safe social distancing during the pandemic. Repurposing infrastructure for non-motorized road users is not new; Complete Streets and Vision Zero are ongoing planning efforts to make roads safer for all users (Smart Growth America, 2022; Vision Zero Network, 2022). However, the reallocated streets were novel *because the need for these new PA spaces was due to social distancing* (i.e., Safe Streets programs *are* public health interventions). While the review of documents was limited to a narrow temporal period, early participation by cities of all population sizes, locations, and state political leanings suggest that cities may be willing to frame AT investments as public health tools.

Several cities' documents outlined the criteria used to place, prioritize, and justify these new spaces. While the available resources (e.g., funding, staffing, and traffic control devices) of a city may limit the scale and number of safe street programs, the characteristics of neighborhoods that received reallocated infrastructure reveal the priorities of cities. The top location criteria were population density, residential street classification, and inadequately sized AT infrastructure.

It is also interesting to consider what cities did *not* use as location criteria. Only one in three cities that initiated a Safe Streets program specifically mentioned geographic distribution (i.e., coverage) when deciding where to place these new spaces, and included two of the four cities that utilized community feedback. Including geographic distribution design criteria in programs may enhance the distribution of resources within a community. One web-based survey showed that 91% of US adults discovering new places of PA during the pandemic intended to use them (Webber et al., 2022). Although the intention to use new space was linearly associated with moderate-to-vigorous PA (MVPA) levels, no statistical difference was found between inactive and sufficiently active adults (i.e., no MVPA versus $\geq$ 150 min/week of MVPA). Those cities that did not use geographic equity as a prioritization criterion (and included at least one criterion) instead chose more specific combinations of criteria, including: high density neighborhoods, population-focused neighborhoods, areas without access to open spaces, and areas that are in close proximity to an open space (see Figure B7). This demonstrates that all Safe Streets initiatives with prioritization criteria, even without specifying geographic equity, were designed to move towards more equitable outcomes in providing adequate space for exercise (95%) and active transit routes (73%), and alleviate crowding on existing infrastructure (73%). The effect of this prioritization strategy, either explicitly declared or through design, is that the streets could combat the likelihood of decreased activity in lower-income neighborhoods (Courtney et al., 2021; Watson et al., 2021). Applied to this study, it is possible that cities prioritizing geographic distribution into their decision-making could have benefited more residents from new infrastructure added to their neighborhoods. Creating equal opportunities to access outdoor recreation spaces, including utilitarian walking and biking infrastructure, can support the post-pandemic economic recovery and improve health outcomes (Hunter et al., 2021).

Surprisingly, few (13%) of the cities with a Safe Streets program documented used existing master plans to place new Safe Streets. This is surprising; if cities expand AT/PA infrastructure, it would make sense that the sites selected for improvement forward general AT/PA goals, and that those sites are also in previously agreed upon goals, plans, and programs to help shape fast-response street programs. Short-term pilot projects, like Safe Streets, could expand existing pedestrian and bicycle networks throughout a region at a

low cost, likely forwarding goals of many biking and walking master plans (e.g., safety, connections, walkable communities). While cities may have referenced master plans to site new safe street projects without mentioning it in their documentation, it could also be possible that some master plans were weak resources for siting decisions. Jones et al. (2010) found North Carolina pedestrian master plans often did not identify a group accountable for implementation, provide resources to implement the proposals, or create an implementation timeline (i.e., prioritization scheme). Such limited reference to existing plans may point to the need for AT/PA plans to specifically address rapid implementation projects; a nimbler master plan, perhaps, is one that identifies both long-term investments as well as opportunities (and funding) for quick-build infrastructure. With limited resources, cities can collect count data pre- and post-intervention treatments to identify and prioritize long-term infrastructure investments. This analysis found three cities (Seattle, Salt Lake City, and Atlanta) studied changes in bicycle or pedestrian counts and one (Salt Lake City) used that data to support extending the pilot program for only the most utilized street closures.

Finally, a larger share of cities actively encouraged PA for exercise rather than AT for trips. The benefit of AT, however, is that AT can serve as a source of PA, so if cities had also encouraged AT they would be encouraging PA by proxy. Plausible explanations for this gap could be that sprawling land use limits feasible active trips, a lack of dedicated pedestrian or bicycle infrastructure, or even limited resources (e.g., staffing and funding) at the municipal level (Buehler and Pucher, 2012; Cradock et al., 2009; Leland et al., 2022; Pucher and Buehler, 2010). Moreover, it could be that some cities did not see AT as a high priority during this time of the pandemic but were willing to encourage residents to get physical activity outside during stay-at-home orders because of the activity and mental health concerns in the literature from social isolation.

4.1. Study strengths and limitations

This study describes the context to COVID-19 AT intervention responses, though there are several limitations to note. First, the study is limited to 51 cities, chosen as the most populated municipality by state and the District of Columbia. Municipal boundaries (e.g., city versus county governments) and selecting the most populated city likely affects the presence and scale of AT-friendly responses. This self-selection bias may limit the generalizability of results for smaller communities (Kendal et al., 2020), and the small number of cities that enacted a safe street program limits the generalizability of those findings to other locations, regardless of size.

Second, this study selected only documents from March 2020 through the end of August 2020. While most cities enacted strict shelter-in-place orders and the public generally stayed home, differences in case counts, the transmissibility of variants, and seasonal effects may have impacted city responses. Given our limited temporal scope, we likely did not capture all relevant street reallocation projects. We hypothesize the documents used were biased towards cities with resources to react quickly or with higher case counts during the first waves of the pandemic. For example, Seattle and New York City, both hard hit during the first wave, started their respective safe street programs in April and May 2020.

Third, although the data collection process supplemented existing data from similar research and crowdsourced datasets to enhance the breadth of documents identified and used two trained, independent coders and a standardized protocol (including training and use of a guidance document), this process may not have identified all relevant documents produced in a city nor interpreted them as intended.

4.2. Future research

This database of city responses collects actions and design criteria for safe street programs. Future research can leverage this data on city actions, policy language (e.g., design criteria, connections to existing plans), and public health messaging and pair it with other quantitative data. Transportation and built environment data points may include population-weighted pedestrian or multimodal network density data, percent of car-free households, primary commute modes, or big data from popular exercise apps (e.g., Strava); while public health data may include model-based chronic health estimates (CDC's PLACES dataset, (Centers for Disease Control and Prevention, 2021a)) or state-level inactivity estimates (CDC's Behavioral Risk Factor Surveillance System, (Centers for Disease Control and Prevention, 2021b)).

4.3. Conclusion

This study reviewed documents from the 50 largest cities in US states and the District of Columbia between the onset of public health emergency orders and September 1, 2020, to characterize municipal responses, language involving PA and AT, and the design criteria for safe street programs.

In the case of Safe Streets, cities' documents mentioned the location of new interventions aligned with streets identified in master plans as needing improvements. Thus, developing *implementation-ready* bicycle and pedestrian master plans may help prioritize investments that provide meaningful connections to essential businesses while increasing geographic coverage of safe AT infrastructure. The justification for street reallocation was consistent across cities – to provide safe space for PA and to alleviate crowding on existing infrastructure. However, differences in stated location and prioritization criteria are revealing. Only a select group of cities considered equity (e.g., geographic, low-income, race, transportation investment need) in placement decisions. Future AT planning processes may mimic these early leaders by relying on fast-response pilots to meet mobility needs while ensuring sufficient time to study locations for more permanent solutions.

The review of documents identifies an opportunity to (1) further connect AT and PA messaging, (2) encourage AT while acknowledging gaps and barriers (3) explain Safe Streets reallocation criteria (i.e., transportation investment criteria), in document

decision-making, and (4) use street reallocations as a new public health tool to address the pandemic of physical inactivity.

Credit statement

Matthew D. Dean: Conceptualization, Methodology, Formal analysis, Visualization, Writing. **Kaelin A. Amaya:** Conceptualization, Methodology, Formal analysis, Writing. **Jennifer Hall:** Formal analysis, Writing. **Kalinda Marie Gupta:** Formal analysis, Writing. **Rachael T. Panik:** Formal analysis, Visualization, Writing. **Angie L. Cradock:** Conceptualization, Methodology, Resources, Supervision, Writing. **Jeanette Gustat:** Conceptualization, Methodology, Visualization, Writing. All authors contributed to the review & editing of the final version.

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Declaration of competing interest

The authors declare they have no competing interests.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jth.2023.101603.

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