Searching for standards of fairness in the transportation justice literature

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MOBILIZING JUSTICE

Towards Evidence-Based Transportation Equity Policy

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About Mobilizing Justice

The Mobilizing Justice Partnership is funded by the Social Sciences and Humanities Research Council (SSHRC). Based at the University of Toronto Scarborough, the national intersectoral research partnership aims to understand and address transportation poverty in Canada and to improve the well-being of Canadians at risk of transport poverty. Learn more at www.mobilizingjustice.ca.

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Table of contents

Executive Summary

Modern societies provide people with varying degrees of mobility and accessibility, from low wage Amazon workers' depending on infrequent bus service, to Jeff Bezos taking private flights into space. Societies implicitly tolerate different levels of inequality in access, though these levels are occasionally made legible through policy standards. For example, U.S. transit agencies are required to set and adhere to maximum levels of disparity in service quality between minority and non-minority routes as defined by the U.S. Civil Rights Act. In contrast to prior reviews on how to measure inequality in transportation systems, this report is concerned with the implied or explicit standards that are used to judge whether the measured inequalities are fundamentally "fair" or unacceptable. The present study achieves this objective by scanning the state of academic knowledge in defining "fairness" in the transport domain.

Borrowing from philosophers of justice (Jaggar 2009), the report's authors ask the following questions about existing standards of fairness in practice:

- **Where and when** are equity standards applied within the research depending on location and time of publication? How are context-specific planning processes changing?

- **Who** benefits and is burdened by transportation systems? Along which lines of identity are transportation inequities examined?

- **What** are those benefits and burdens of transportation systems? Are they qualified in sidewalk widths, bus frequency, travel times, accessibility, or some other consideration?

- **How**: are equity standards and inequities measured? Are they infrastructure provision thresholds, acceptable pollution levels, or some other kind of cut off? How are these studies born out of broader notions of justice, i.e. disability rights, environmental justice, egalitarianism, or something else?

Methods

The authors conducted a scoping review of the literature. The review involves entering combinations of equity-related keywords into academic databases to identify relevant studies. The team initially discovered 6,832 references from three diverse databases that they shrunk to a final corpus of studies using a four-step process:

1. A total of 611 duplicate studies were removed.

2. The researchers, supported by a team of trained research assistants, reviewed the remaining titles and abstracts for relevance, with 4,511 studies excluded for not sufficiently addressing transportation equity.

3. The full-texts of the remaining 1,711 studies were reviewed. At least two trained research assistants reviewed each document, with one of the the main researchers (listed as authors) breaking any ties. This resulted in 1,545 additional studies being excluded. At this stage, studies could be excluded if they did not include any standard for, or conceptual grounding for, equity.

4. The researchers examined the final corpus of 165 studies to extract data on the "When", "Where", "Who", "What", and "How" of transport equity in each study. This included annotating the methods used, standards suggested, and inferring conceptualizations of equity that may connect to broader notions of justice.

Results

When and Where: the contexts of justice. Most (60%) studies that deployed standards for equity stem from the Global North, including cases from Europe, the U.S., Canada, Australia, New Zealand, Japan, and Israel. The focus of these studies is on groups seen as disadvantaged within their respective national contexts, and strive to relate standards to national policies or issues. In contrast, research stemming from the Global South tends to adopt international standards in analyses, such as the U.N.'s Sustainable Development Goals (SDGs). Within the Global South, studies most commonly cover Asia, followed by Latin America. Studies in the latter region focus disproportionately on mobility barriers and the financial affordability of transportation. Studies pertaining to Africa are numbered, though they cover a broader scope of issues including informal transportation, citizens' accessibility needs, and infrastructure development needs. Across the globe, the studies reviewed apply equity standards overwhelmingly to urban contexts (85%) and are concerned with a focused set of issues around the need for and the impacts of daily mobility. Studies on rural contexts are broader in the topics examined, from the equity of ferry service in the Philippines to the impacts of road construction on remote Amazonian communities.

Who: the subjects of justice. Income groups are studied most, followed by age groups, and people with disabilities. People with low incomes generally experience the least benefits and greatest burdens of transportation systems, including regarding costs and pollution exposure. Studies examining equity with respect to age demonstrate how older adults and children face different levels of access to key destinations due to differences in their capabilities. Many studies apply universal design guidelines and laws as equity standards to evaluate the equity of transportation systems for people with disabilities. Finally, researchers also frequently develop composite indices of vulnerability to identify neighbourhoods with high concentrations of multiple vulnerable populations. This approach is common when examining environmental justice impacts.

What: the tools of mobility. Most studies that deploy equity standards apply them to either transit (37%) or pedestrian modes (25%). Many transit analyses are multimodal in nature, comparing accessibility by transit to accessibility by automobiles as an implicit standard. Others combine transit with non-auto modes to examine access for households without vehicles. These studies focus on delivering equitable mobility, sometimes in context of also meeting climate goals. However, they often fail to include explicit minima of service that should be provided to different populations. In contrast, rights-based, infrastructure-focused studies apply principles of universal design in the study of transport systems and related infrastructure.

What: the benefits of mobility. Studies measure either movement (i.e., trips taken, trip quality, etc.) or the potential for movement (i.e. accessibility to specific destinations, or generally), with most studies focused on the latter. Over a quarter of the papers that focus on accessibility do not consider specific destinations, but instead concentrate on the accessibility of the trip (i.e., level of service, barriers of infrastructure) or bundles of destinations. Other studies are centred on particular destinations considered as essential, including employment, healthcare, grocery stores, and greenspace. Access to community support or places of worship, as well as childcare activities are far less common in the literature reviewed.

How: concepts and standards of justice. The most common standards found in the literature, which we term opportunity standards, are defined using cut offs in access to opportunities (37.2%). Almost as common is the formulation of standards that use thresholds related to the perceptions or activities of specific populations (35.8%); we call these population standards. The latter often includes standards informed by public health, such as the number of physical activities undertaken in a week and perceived life satisfaction. Opportunity standards are evaluated through horizontal equity and spatial equity lenses, while population ones are evaluated through well-being frameworks. Another category of standards that emerged from the literature are based on infrastructure, and these include adherence to universal design guidelines or specific benchmarks for road network characteristics. Standards of thsi kind are comparatively less common in the literature and are often framed in terms of rights, particularly as they relate to achieving universal design. Infrastructure standards around sustainable infrastructure (i.e. block lengths or distance between transit stops) are also evaluated through vertical, horizontal and spatial lenses. The distribution of studies with respect to the kinds of standards deployed, and the broader concepts of justice used, are presented in the Figure below:
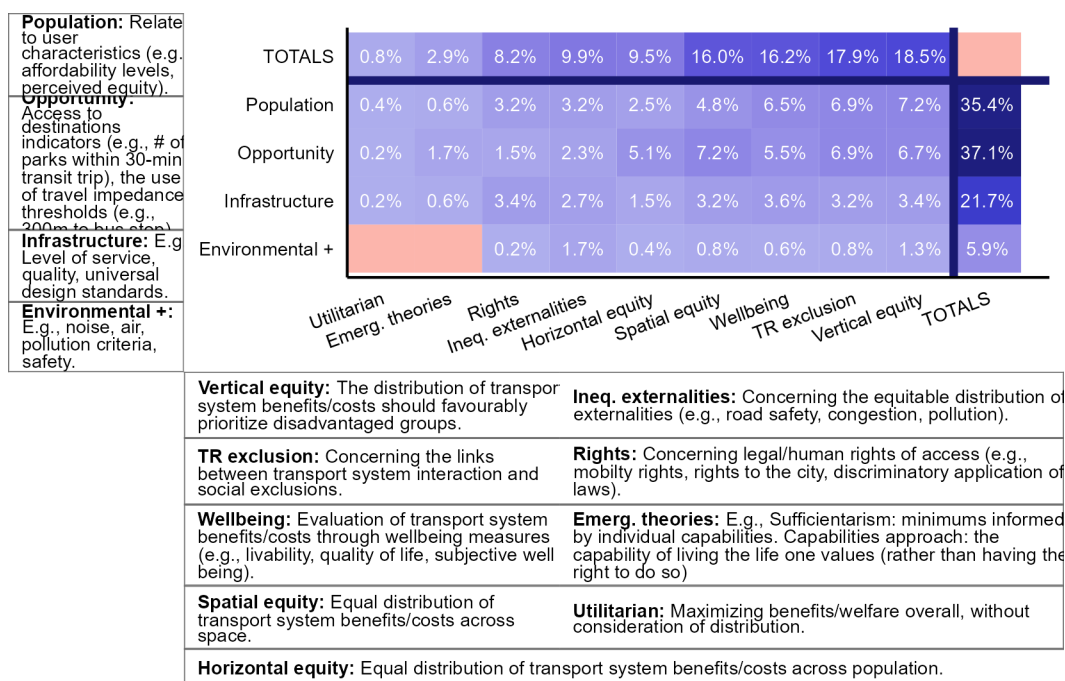

Figure 1: *The proportion of equity standards (vertical axis) within each type of equity conceptualization (horizontal axis) category.*

Calls to Action

The review conducted for this report provides a snapshot of the state of knowledge today in terms of how standards of fairness are developed and deployed. The review is telling both in terms of what it reveals about the literature, what is covered and what is not. Based on these, the authors challenge practitioners, researchers, advocates, and governments to commit to five calls to action:

Call 1: Underpin standards in rigorous concepts of justice.

The standards of equity used in research are often weakly linked to any legally, intellectually, or publicly accepted concepts of justice. Many standards are arbitrary. For example, the 15-

minute city sets a threshold that is easy to remember, but is this really what is needed to achieve sufficient sustainable mobility for urban residents, as opposed to a 10 or 20 minute city? And what conceptualization of human need should determine what services are essential enough to be included within this threshold, and for whom?

Call 2: Develop creative methods for systems-thinking approaches to equity.

Mixed-methods research can help governments set meaningful standards by better linking quantitative thresholds with qualitative assessments of well-being, as well as freedom of movement and perceived access, among other facets of transportation. Yet most of the research reviewed is purely quantitative or, to a much lesser degree, purely qualitative. The constant deployment of metrics Lorenz Curves of Gini coefficients without research on where such measures need to be to improve quality of life (i.e., a standard), will not help governments with limited resources achieve the best possible equity outcomes within their respective contexts. Mobilizing Justice's Priority Populations working group was inaugurated to advance new research in this area.

Call 3: Making data available is a matter of justice.

Several areas of critical importance, such as access to care and community, are under-researched, and the authors suspect this relates to lack of data on these kinds of destinations. Furthermore, data issues prevent the application of many methods of equity analyses in the Global South. The production, availability, transparency, and ownership of data is a matter of justice on which governments and NGOs should act. In the Canadian context, Mobilizing Justice's National Survey working group is working to advance data practices by conducting the first national survey on transportation poverty and striving to make data available in the form of Open Data Products.

Call 4: Develop more direct and explicit links between standards and lived experiences.

Linking standards to lived experiences and individual outcomes can help increase the likelihood of their adoption by governments. Further, they can help decision makers understand the role of transportation in improving policy outcomes in other domains like nutrition, physical and mental health, education, and human development. These links can help make the standards used in research and policy more comprehensible and relatable to community members and people with lived experience navigating unequal mobility systems. Mobilizing Justice launched it's Data Driven Standards working group to advance research in this area.

Call 5: Rigorously evaluate interventions and policies.

Approximately 10% of the studies reviewed aimed to assess interventions. Delivering new equity-focused policies and programs that do not actually advance equity harms communities, metastasizes mistrust, and delegitimates future efforts to promote transportation justice. Furthermore, policies that benefit one group of people in one context may not benefit other groups in other situations. A deep breadth of equity evaluations is needed to avoid failure and guide policymakers towards interventions that will work for the communities they serve. Mobilizing Justice launched its Innovative Pilots working group to begin filling this gap, through further work is needed.

Reading guide

This is your guide to scanning this document.

If you are primarily interested in the motivation behind this report, read the first section, Just transportation?

Keen to jump straight to a description of the conceptual framework for transport justice? See the second section, particularly the subsection: A framework to analyze questions of justice.

Interested in the methodological details of the literature review? See section three and extended information in the Appendix

Care more about the results and the critical appraisal of the results from the review? See sections four and five, respectively.

Want to know about our calls for action to move transport equity analysis and standard-setting substantively towards questions of transport justice? Read the sixth section Moving forward: calls for action and the final concluding section Final remarks. These sections are geared to both researchers and decision-makers.

Glossary

- **Accessibility**: the potential to reach destinations.

- **Equality**: a state where every group is treated identically.

- **Equity**: the distribution of benefits and burdens of things among the population, with a particular emphasis on those with the least advantage and quality in their outcomes.

- **Equity standards**: tools for answering the question of how to distribute the burdens and benefits and to whom? When operationalized standards effectively define what is fair.

- **Fairness**: a state of being that is achieved when a collective and individuals are treated equally and without bias as defined by their morals and values.

- **Justice**: A political ideal whereby people give and receive what they are due.

- **The temporal-spatial context of justice**: the answers to "Where?" and "When?". What regions, within what countries, spatial contexts, point of time, and processes of planning are impacting transport systems?

- **The subjects of justice**: the answer to "Who?" is the focus of justice.

- **The objects of justice**: the answer to "What?" is the focus of justice; what are the things that characterise (in)justice.

- **The methods for justice determination**: the answer to "How?" is justice defined and markers towards it tracked.

- **The rationale to justice**: the "Why?". The rationale connects with the context, subject, object and methods used for justice determination.

- **Mobility**: The potential to move.

- **Policy**: A deliberate system of principles to guide decisions and achieve desired outcomes.

- **Space-time convergence**: the main product of a transportation system is to reduce the time needed to cover a unit of distance; this effect makes space and time converge.

Just transportation?

> *"To be wealthy and honored in an unjust society is a disgrace."*
> — Confucius, The Annalects

The fiery wake of a rocket could be seen ascending, piercing the sky above West Texas. It was the morning of July 20, 2021, and on board of the rocket was a small group of four passengers that included Jeff Bezos, the founder of Amazon and then the world's richest person (Harwood 2021). The mission that day was among the first-ever private suborbital passenger flights, and the adventure (described as "intense" by one of the passengers) lasted a total of 10 minutes and 10 seconds (Harwood 2021). In addition to intense, the undertaking was expensive: a seat for the flight had previously been auctioned for no less than $28 million USD (Griffin 2021). Before it was even 10:00 am (EDT), Bezos was back from his excursion, and he took time to declare that this was the "[b]est day ever". To reporters covering the event he said "I want to thank every Amazon employee and every Amazon customer, because you guys paid for all of this" (Johnson and Anilkumar 2021).

Meanwhile, firmly grounded on planet Earth, the employees whom Bezos thanked for his suborbital jaunt were struggling with some very mundane problems of their own, and none as lofty as conflicting schedules that prevented them from flying in rockets (Griffin 2021). According to reports, people employed directly or indirectly by Amazon for warehouse or delivery work had, for years, been treated to "inhumane" conditions (Fung 2018; Scott 2019; Greene 2021), and subjected to surveillance on the job, degrading schedules that drove drivers to urinate in bottles, crushing demands for productivity quotas that led to injury, all the while facing little or no job security. From this perspective, they were treated less with gratitude and more as disposable inputs to feed Amazon's earnings and consumers' demands (Tung and Berkowitz 2020; BBC 2021; Reese and Alimahomed-Wilson 2022; Middleton 2023).

Coverage of the July 20 launch by the mainstream media was in many cases uncritical. "We're going to build a road to space so that our kids and their kids can build a future" Bezos declared, before adding "…we need to do that to solve the problems here on Earth" (Johnson and Anilkumar 2021). Few reporters saw it fit to ask what problems the billionaire planned to solve on Earth, or what kind of future Bezos was trying to build, and for whose children. In other words, the billionaire was not confronted with questions about what his trip did *for whom* and *to whom*. A less dispassionate observer might have been excused for wondering (possibly aloud) about the basic *fairness* of a man amassing a nigh unimaginable fortune that allowed him to build and fly his own spaceship, while masses of his employees were treated as throwaway cogs in the vast apparatus of his emporium[1].

The question of *fairness* is not a simple one. Most of us would probably have been stumped to explain in a precise way just why the above picture was disturbing. *Justice* is a political ideal based on the principle that individuals should be treated in a *fair* and *equitable* manner (Gössling 2016, 2), giving and receiving whatever they are *due* (Jaggar 2009, 1–2). The political (and contested; Vanoutrive and Cooper (2019)) nature of the concept presents challenges that are only narrowly amenable to scientific inquiry. For starters, the notion that people are "due" something depends on the values of a society, as embodied in its systems and institutions (Karner et al.

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[1] Not unlike in the empire of another space billionaire, where things feel like the future except for the lives of workers (Wong 2017), and everything soars—including worker injuries (Taylor 2023).

2020a). Values, in turn, are not subject to natural laws, but rather are the result of intersubjective realities, which is to say illusions whose legitimacy derives from a collective will to believe. For example, justice would likely mean something very different to a person in a democratic society, than to another in a society where they owed their all to some collective illusion (e.g., the state, or a monarch). As well, the meaning of "justice" would likely differ in yet another society where very few owned most, and most owned very little due to a different illusion (e.g., that wealth equates merit). In these two hypothetical cases, elucidating the meaning of "fair" would in all certainty be beyond the dreams of most, since fair would be whatever organizational structures with power (e.g., the state, the monarch, or the extremely wealthy) said it was. In contrast, in democratic societies[2] individual rights tempered by a collective vision are valued above the whims of the few. In such a setting, the task of defining a "just" distribution of the burdens and benefits of things—from income, to roads, to space travel—quickly becomes muddled, encumbered even, by the necessity to pay attention to a multitude of voices, not all of them equally loud.

The rocket that took Bezos to the edge of space is a somewhat rare example of a transportation technology, a tool of space-time convergence. By enabling movement at very high speeds, rockets might—one day, at some indeterminate point in the future—prove essential to the expansion of the human species beyond our home planet. But in the present moment, the benefits of a private suborbital flight (e.g., the joy of movement, the sense of adventure, the awe of seeing Earth from space) are for a few, whereas the burdens (e.g., the use of non-renewable resources, the climate-altering emissions) affect us all, and not evenly at that. The benefits of public transportation, a much more common transportation technology, are for most, but in many cases we have penny-pinched these systems, leaving them moribund, while concentrating the costs on those who have less (Jeff Allen and Farber 2020; Kaeoruean et al. 2020). In a plutocratic society, those with most can (and often do argue[3]) that this distribution of burdens and benefits is fair since both benefits and burdens are earned. The fact that the likes of Bezos do travel to space is proof that the likes of Bezos are due those trips. In a democratic society, the members of the collective might actually agree that large rewards (e.g., space flight) must be offered to highly qualified individuals (e.g., Bezos) to entice them to take important responsibilities (e.g., founding and leading Amazon). The fact that some must give up jobs because it is too time consuming to reach them by public transportation would constitute proof that those people should have studied more, been earlier risers, worked harder (Spurr 2015; Greisman 2017). Again, the members of the collective might believe that this is a fine state of affairs, having come to this conclusion of their own accord or after being persuaded by billionaires. Or, contrariwise, the members of the collective might decide that this state of affairs is *unjust*: the *values* of those in charge of defining what is "fair" matter.

Multiple national and cross-national studies suggest that people in many societies do indeed have some tolerance for inequality (Kiatpongsan and Norton 2014): it would appear that *some* stratification, as suggested by Davis and Moore (1945), is perceived as fulfilling a valuable function. However, extreme inequality is often frowned upon, and can lead to social dysfunction and other ills (Acemoglu and Robinson 2000; Taydas and Peksen 2012; Du, King, and Chi 2019; Houle et al. 2022). But the perceptions of what is "fair" are neither universal or static. Instead, they are malleable, and can be affected by the existence of opportunities for social mobility (Shariff, Wiwad, and Aknin 2016; Artige, Lubart, and Neuss 2019), by exposure to inequality (Schröder 2017;

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[2]Paraphrasing, democracy is the worst of collective illusions, except for all others.

[3]Either directly, as in the so-called Techno-optimist Manifesto (Andreessen 2023), or through their mouthpieces (McArdle 2021)

García-Castro et al. 2023), by learned helplessness (Y. Kim, Jung, and Na 2022), and even by how information about inequality is communicated to the public (Walker, Tepper, and Gilovich 2021). It follows that, in general terms, there are at least three different manners of thinking about inequality[4]: 1) in a *positive* (or descriptive) manner, as the current or historic state of the distribution of benefits and burdens of things; 2) also descriptively, as the *perceptions* about the distribution of those benefits and burdens; and 3) normatively (or prescriptively), as the desired or ideal state of the same. Clearly, the three may coincide (e.g, if the perceived levels of inequality matched actual inequality and also how much of it the public desired). However, they do not necessarily have to, and in many cases will differ from one another. Measuring inequality as it is and in the most objective way possible, is an essential task to decide whether there is a need to develop inequality-related policies to increase fairness. In turn, measuring the perceptions of inequality, in the most accurate way possible, may be important to achieve sufficient public buy-in in order to enhance the chances that given policies will succeed.

Transportation systems, as a class of essential technologies that facilitate or impede social inclusion and activity participation (Church, Frost, and Sullivan 2000; Lucas, Grosvenor, and Simpson 2001; Social Exclusion Unit 2003; Cass, Shove, and Urry 2005; Casas 2007; Preston and Raje, n.d.; Páez et al. 2009), have increasingly come into focus from the perspective of equity. In response to this focus, a lively and rapidly growing literature has emerged on the topic (see *inter alia* (Karel Martens 2016; Di Ciommo and Shiftan 2017; Guo et al. 2020; Karner et al. 2020a; Vecchio, Tiznado-Aitken, and Hurtubia 2020; R. H. M. Pereira and Karner 2021; Wee and Mouter 2021; Zhang and Zhao 2021; E. Desjardins, Higgins, and Paez 2022; Karner, Pereira, and Farber 2023)). A cynical rationale for this interest could be that keeping track of objective and perceived inequalities can serve *at the very least* as a gauge of social discontent (as Chilean authorities discovered to their woe when an increase in Santiago Metro's fares became a flashpoint for social inequalities, and sparked a period of massive demonstrations and unrest in October 2019; (BBC News, Latin America 2019; Díaz Pabón and Palacio Ludeña 2021)). More optimistically, in democratic systems, tracking objective and perceived inequalities could be of interest for governing bodies to respond to popular demands for fairness. Several challenges arise when approaching this endeavor. The notorious complexity of transportation systems is one of them: transport systems simultaneously move people, goods, and information. Emerging technologies and service models can swiftly change the balance of benefits and burdens among a population (Guo et al. 2020), turning both users and service providers into digital rentiers (Birch and Cochrane 2022). The benefits and burdens of transportation systems are diffuse over space and time. For example, transportation systems engineered to offer higher mobility for people *somewhere*, can simultaneously cut others off from essential opportunities *elsewhere*, as Raje (2004) poignantly illustrated with examples of infrastructure in the UK. Furthermore, the shades of policies past can continue to haunt a region and even the planet for decades or longer, as shown by the legacy of displacement and decay caused by urban highways all across the US (Archer 2020) and the time horizon for the impacts of climate change to be fully felt (Markolf et al. 2019).

But complexity is no excuse to shirk the task.

The objective of this report is to scan the state of knowledge in terms of defining and operationalizing "fairness" in the transportation domain. Much research has been devoted to the issues of

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[4]Karel Martens (2016), in the introduction of his landmark text, talks about explanatory and prescriptive theories of justice; despite the saying "the arc of history is long and bends toward justice", it is unlikely that a predictive theory of justice exists.

measuring equity in transportation, including (among many others) Ramjerdi (2006), A. Delbosc and Currie (2011a), T. F. Welch and Mishra (2013), Karel Martens, Bastiaanssen, and Lucas (2019), and Pritchard, Zanchetta, and Martens (2022). Further, there are multiple sources that discuss the conceptual and philosophical foundations of equity and fairness in transportation (e.g., Karel Martens 2016; R. H. M. Pereira, Schwanen, and Banister 2017; Vanoutrive and Cooper 2019). Finally, previous reviews of planning documents have investigated equity from narrowly scoped perspectives, such as accessibility (Boisjoly and El-Geneidy 2017) or a particular mode of transportation [e.g., cycling; Doran, El-Geneidy, and Manaugh (2021)]. These inquiries are valuable to scholars, planning agencies, the public, and decision-makers alike, and the present review will tread similar, but not completely overlapping ground. In our estimation, there remains a gap in the literature in terms of understanding how standards for equity are developed and implemented in the transportation domain. In contrast, we do know that adoption of equity concepts in planning practice has lagged developments in academic work (R. H. M. Pereira and Karner 2021; Boisjoly and El-Geneidy 2017; Doran, El-Geneidy, and Manaugh 2021; Linovski 2020; Litman 2022).

To illustrate this gap, we note how Oswald Beiler and Mohammed (2016), in their exploration of transport equity, cite the following strategies identified by the US DOT to address matters of justice [p. 287]:

- Reduce adverse human health and environmental effects on minority and low-income populations.
- Include all potentially affected communities in the transportation decision-making process.
- Ensure that minority and low-income populations receive equitable benefits.

While commendable, the strategies are too vague, which means it is possible to implement them in a myriad ways, either genuinely to comply with the spirit of justice, or else performatively to deceive it (McCullough and Erasmus 2023). Some relevant questions include: how much should the adverse effects be reduced? To zero? Or to some tolerable level of adversity greater than zero? What should that level be? What are the criteria for deciding that a community is "potentially affected"? What benefits should be distributed? Should the benefits be based on simple population weights? Or, contrariwise, should more deprived individuals be eligible for a larger share of the benefits?

These questions boil down to the development and use of *standards* for transportation justice. The term "standard" connotes "something set up and established by authority as a rule for the measure of quantity, weight, extent, value, or quality"[5]. How much pollution is allowed to be generated, and where, depends on who is affected, and how much health is valued overall, as well as by whom. For example, firms may or may not adopt lower standards for the emission of pollutants in poorer areas; it might be that poor people end up being relegated to areas that already had lower emission standards (Gouldson 2006). Regardless of the cause, the result is the same: pollution tends to be worse were poorer people are (Deluca, Buist, and Johnston 2012).

Supporting the creation of (more) just transportation systems involves understanding the production and management of transportation benefits and costs; how they are distributed; and what values are implemented (and by whom) in the form of standards (R. H. M. Pereira, Schwanen, and Banister 2017; Sheller 2018; R. H. M. Pereira and Karner 2021). Thus, for this review we engage the literature with the following questions in mind: 1) what is our current understanding of the things that transportation systems do, for whom, and to whom; 2) what does the literature say

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[5]https://www.merriam-webster.com/dictionary/standard

about the distribution of the benefits and costs of transportation systems; and 3) what values are embodied in normative statements about said distribution. Ultimately, this review aims to collate the existing academic knowledge on the matter, and present it in a manner useful to support the development and implementation of standards for equity in transportation planning and policy. In this, we aim to provide relief to planners, especially in those places where calls for justice are explicitly made through legislation[6].

The rest of this report is structured as follows.

After this introduction, we set the stage for our investigation by laying out some important definitions. We then describe the methods used for searching, selecting, and reviewing the relevant literature. This is followed by a description of the findings from the review, which is then appraised critically. We conclude with some calls for action to improve the practice of setting and using standards of fairness for transportation justice.

Setting the stage

"Man's capacity for justice makes democracy possible, but man's inclination to injustice makes democracy necessary."
— Reinhold Niebuhr

"Never forget that justice is what love looks like in public."
— Cornel West

JUSTICE, EQUITY, FAIRNESS, AND STANDARDS

In the introductory paragraphs we used the terms "justice", "fairness", and "equity" relatively loosely. This was done purposefully. As we noted, people often have strong intuitions of what is "fair", "just", and "equitable". These conceptions may or may not match those of the authorities who set the standards of fairness. But in democratic societies, the authority of political leaders, bureaucrats, planners, and all those charged with the business of governing, derives from the will of the people. It is therefore important to explicitly state how we plan to use these words, to clearly spell out our intuitions of "justice", "fairness", and "equity". A clear mutual understanding of these concepts is essential for constructive debate, and for participants of a democratic society to be effective arbiters of what is just.

Let us begin by stating that justice is an end goal, that is, a desirable state of affairs that we are morally obligated to achieve.

It is said that justice is attained when people "give and receive whatever they are due" (Jaggar 2009, 1–2), and it ceases to exist when there are persons or groups that are denied "access to the opportunities they need to lead a meaningful and dignified life" (Karner et al. 2020b, 440). Justice is a fluid concept, because it depends on the desirability of different states of affairs, which may change between populations and over time. That said, it is possible to distinguish several forms

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[6](As recently as 2021, Martens and Golub note that Federal directives related to Title VI in the US "do not provide guidelines that can help agencies develop explicit standards to assess the distribution of accessibility benefits from projects or plans.")

of justice, including those listed below (see Jaggar 2009; R. H. M. Pereira, Schwanen, and Banister 2017; Karner et al. 2020b).

Retributive justice is concerned with the proportional retribution of wrongdoers with relation to legitimate punishers and the innocent (Walen 2023).

Reparative (or restorative) justice focuses on the reparation of caused harm; it centers 'reintegrative shaming' to restore victims, wrongdoers, and the community according to moral values (Tyler 2006).

Procedural justice strives to ensure that the views and preferences of all stakeholders are fairly accounted for in the decision-making and inter-personal procedures affecting their lives and communities (Tyler 2006).

Distributive justice is perhaps the most commonly studied form of justice (see Jaggar 2009, 2; R. H. M. Pereira, Schwanen, and Banister 2017), and its main concern is the way the benefits and burdens of the tangible and intangible products of society are collected by different segments of a population.

It might be argued that all of the above touch on forms of distributive justice. Retributive justice, for example, could be framed as being concerned with the distribution of the benefits and burdens of being a member of society; the way it is usually achieved is by distributing intangibles of a society's moral values like "freedom" (e.g., of movement, of association) as benefits, and/or the distribution of tangible resources as burdens (e.g., fines as a punishment). Reparative justice could look like the distribution of benefits and burdens to redress past wrongs, for example by asking those who have benefited from said wrongs, even if unwittingly, to shoulder a bigger fiscal burden in order to cover programs that mete benefits to those who are still harmed by past wrongs. Procedural justice could be the distribution of the benefits (e.g., the right to voice an opinion as a recognized stakeholder in the process) and burdens (e.g., the effort required to develop an educated opinion) of the processes that lead to decisions with collective consequences.

We can then speak of the *purposes* of distributive justice: to mete out retribution *fairly*, to repair past harms, and to ensure that procedures offer *equitable* opportunities to influence outcomes. Equity and fairness from this perspective are the instruments of justice, the tools by which society advances towards the end goal of justice.

The term "equity", as conceptualized alongside distributive justice, tends to encompass various tools to understand the distribution of benefits and burdens of things among a population; there is a particular emphasis on those with the least advantage and equality in their outcomes. In the transportation domain, the term is somewhat loaded because it is perceived as stemming from the authority of the state, and meant to assist with decisions about regulating and financing transportation spending (Karner et al. 2020b). Here, we are in agreement with Karner et al. (2020b) that equity analysis should not be seen as an end in and of itself, but rather as a means to gather information about actual and perceived inequities. In this respect, the analytical tradition of equity, at least in transportation planning, means that the relevant models become embedded in the "political ecology of the estimated truth" (King and Kraemer 1993): in principle their assumptions and scope must be open and transparent, or else they may be more vulnerable to misuse and even abuse as tools of subjugation.

Fairness, in contrast to equity, is somewhat more complicated to define. The concept does not have the same history of development as an analytical tool, and can be interpreted in numer-

ous, and possibly discordant ways. That this is the case is convincingly demonstrated by Karel Martens and Golub (2021) in their study of the application of Title VI of the Civil Rights Act of 1964 in accessibility planning in the US. Title VI explicitly talks about the distribution of benefits derived from Federal funding: "[n]o person in the United States shall, on the ground of race, color, or national origin, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any program or activity receiving Federal financial assistance." However, as Karel Martens and Golub (2021) show, there are several ways to comply with regulations while achieving different outcomes, ranging from the banal (do not *knowingly* discriminate), to the substantive (compensation for past discrimination within a societal context that recognizes harm was done, i.e., reparative justice). What kind of justice does fairness serve in each case? It depends on what was the rationale for seeking justice in the first place. Our reading of Karel Martens and Golub (2021) is that fairness is a yardstick that is best deployed *a priori* than *a posteriori*, for doing the latter risks rationalizing the outcomes rather than driving them.

The last concept that we discuss in this section is that of a standard. Briefly, standards are a way of making concrete statements about fairness. Returning to the ambiguities in Title VI discussed by Karel Martens and Golub (2021), the attainment of justice depends on the standard used to indicate fairness. For example, explicit non-discrimination constitutes a very weak standard that takes aim at the actions of agencies instead of the recipients of the benefits; accordingly, any distribution of benefits would be considered fair, as long as the agency does not explicitly and knowingly target or deny benefits to particular groups. The standard provides conditions to determine whether a situation is *fair*. A similarly weak standard is a *Pareto improvement*, whereby it is possible to concentrate the benefits as long as no group is worse off compared to the status quo. A policy is fair as long it does no harm. A somewhat more strict standard, a Pareto-Plus improvement, stipulates that an intervention is fair when all groups receive at least *some* (non-trivial) benefits; the size of the benefits for each group is irrelevant. In contrast to the notion of "do no harm", such a standard embodies the ideal that no one is denied benefits. An egalitarian standard would weigh the benefits or burdens by population, and fairness is achieved when each group gives or receives in proportion to their size. In contrast, an affirmative action standard is even stricter, since it requires the benefits to be distributed in a non-egalitarian way that favors those who are still harmed by past or present discriminatory practices.

To recap the discussion of definitions so far, justice is a goal of social progress. But to understand what that goal is, we must clearly define standards of fairness. Equity analysis is tool to measure where the actual or perceived distribution of the burdens and benefits of the products of transportation systems stand with respect to the standard, in other words, instruments to see how close or far we are from a just situation.

In the following section we discuss the analytical apparatus that we use to interrogate the literature on equity standards in transportation.

A FRAMEWORK TO ANALYZE QUESTIONS OF JUSTICE

For this report, we are inspired by the framing of Jaggar (2009) for philosophical questions of justice[7]. According to Jaggar (2009), Western philosophy has approached the issue of justice

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[7]Similar questions are found peppered throughout the literature. This is done either explicitly, as for example in Karner et al. (2020b), who ask "of what", "for whom," and "how much" in reference to equity; or implicitly, as in Gössling (2016), who asks of the outputs of transportation "what?" (exposure, space, access) and "for whom?" (gender, age, ethnicity).

by asking "Where?", "When?", "Who?", "What?", and "How?". Conventionally, discussions about justice have been aspatial, or rather, seen from the point of view of social space instead of geographical space, despite an early interest of geographers on the matter (Pirie 1983). The texture of the questions becomes more immediate and crisp when talking about transportation, which is inherently about space and time.

- **"Where?"**: Such questions traditionally relate to the applicable domain or sphere of life relevant for justice. Conventionally this meant the in-group e.g., members of the same nation state (Jaggar 2009, 3). In the case of justice in transportation, the question of "where?" is paramount, as it might be argued that, by their very nature, transportation generates inequalities. By concentrating the effects of space-time convergence (for instance, by providing access to a transit system or a highway), an inequality is automatically generated. The burdens of transportation, in contrast, are often diffuse. They are incrementally paid, for example by a distributed population in the form of taxes, or by a population with a different spatial distribution in the form of poor health. As such, the definition of the spatial boundaries in the analysis is the answer to "where?".

- Conventionally, the question of **"When?"** refers to the temporal circumstances within which the demands of justice have application. In the cause of transportation justice, we ask about the temporal aspects of transportation systems, as examples: *when* did the equity analysis take place and under what historical policy context, *the right time* to invest in transportation infrastructure (e.g., Rabello Quadros and Nassi 2015) (and as a result when to generate a spatial inequality), for *how long* the burdens and benefits can still be associated to a specific transportation intervention, or even *timelines* of reparative justice interventions that reconcile the shadows of past transportation-related injustices.

- When answering **"Who?"**, we inquire about which entities should be regarded as subjects or arbiters of justice, meaning those entitled to make claims of moral consideration from the perspective of justice. To make it tractable, this question is often approached through the filter of population groups, which may include several concurrent traits, such as gender identity, ableness, ethnicity, age, caste, and income. Often, it is appropriate to reflect on the intersections between traits, given evidence that the lived experiences of, say, a White woman and a Black women, can be markedly different between each other, in addition to being different from those of White men. A possible complication in the case of transportation is that disentangling the "who" from their mobility tools is not always straightforward. Clearly, a person is not their mode of transportation; however in practice, there are large segments of the population who live in situations where they cannot extricate themselves from the mobility tools mobility that they can use, either because they have driven themselves out of choices (see Lavery, Paez, and Kanaroglou 2013), or have been driven out of choices by factors beyond their control (e.g., captive users of a single mode Jacques, Manaugh, and El-Geneidy 2012; Cheranchery and Maitra 2018). In societies that have grown into transportation monocultures with a predilection for automobility (Miller 2011) there may actually be less choice about mobility tools than we would like to assume. So, while it is important to avoid conflating the "who" with the "what", for analytical purposes we need to be mindful of the connection between person and their mobility tools. In the case of transportation, in addition to members of the public who use transportation systems, there is another category of **who**, that stands possibly in opposition to users, namely the entities charged with providing services, maintaining infrastructure, and so on. These could be ministries or departments of transportation, transit agencies, public works departments and others having

the power to act upon transportation (in)justices. Identifying these entities is relevant to ellucidate who is responsible, for example for apportioning the benefits or mitigating the burdens of transportation.

- **"What?"** asks which entities should be regarded as objects of inequities, meaning which kinds or categories of things should be distributed in a just manner. To understand the distributional implications of transportation systems, it is essential that we are clear about what they do. In other words, what do transportation systems *produce*? At their most fundamental, transportation systems are space-time convergence technologies, tools that improve the rate at which time is traded for space. They usually do this by increasing the speed of movement: sidewalks facilitate walking, traffic lights facilitate the ordered flow of vehicular traffic, and a launching pad makes it possible for a rocket to take off. With complex interlocking parts (sidewalk, road, traffic sign, parking regulations), transportation systems produce *mobility*, the potential for movement. The realization of this potentials happens through travel. However, as the adage goes, travel is derived demand, which seems to hold for most (even if not all) situations (e.g., Mokhtarian, Salomon, and Redmond 2001; Redmond and Mokhtarian 2001; A. Paez and Whalen 2010; Whalen, Paez, and Carrasco 2013). For this reason, we cannot stop at considering mobility, but the ulterior goal of mobility, which is to reach destinations. In combination with land use systems (the spatial distribution of opportunities on the landscape), mobility produces *accessibility*, the potential to reach places where activities that the traveler values take place. In this manner, we can think of the objects of transportation justice as being *proximate* (the tools of mobility, mobility itself), and *ulterior* (accessibility, opportunities for activity participation). The burdens of transportation are also many and varied. Some are direct and paid directly by the traveler (e.g., travel time, out-of-pocket costs), but many others are indirect and related to network externalities (e.g., exposure to pollution).

- The next question is **"How?"**, and it relates to the allocation of various objects of justice ("what") to various subjects of justice ("who") in various circumstances ("when" and "where"). **Equity standards** are a tool for answering this distributive question: how do we allocate burdens and benefits and to whom? Standards are thresholds that when operationalized effectively define what is fair, that is, (in)equitable. The thresholds can be quantitative (e.g., square meters of green space per capita), or they can be qualitative descriptions (e.g., do not knowingly discriminate), or a mix of the two. Some examples include: maximum travel distance/cost/time to or from key destinations, levels of maximum exposure to externalities (i.e., noise or air pollution),un/fulfilled needs, and dis/satisfaction with travel. A number of theoretical and conceptual frameworks exist to support us when approaching this question, and we can draw from concepts in transport-related social exclusion, transport disadvantage, and/or transport poverty, which are typically based on equity principles, such as utilitarianism, Sen's capabilities approach, and sufficientarism.

- Lastly, convincing answers to the above questions require a supporting rationale: a **"Why?"** (Jaggar 2009). This is perhaps the most slippery of all the questions posed here. Justice is an inherently social construct. Asking **why?** amounts to asking what sort of social contracts regulate human interactions, or in other words, what are the rules that our collective will to believe imposes on each of us. These contracts can be defined by constitution, but there are often unwritten and possibly contested variants. To give an example drawing from the Canadian Charter of Rights and Freedoms, a number of rights and fundamental freedoms [including the liberty to move freely; see Department of Justice (2023)] are recog-

nized to exist in Canada "without discrimination by reason of race, national origin, colour, religion or sex". Notice that this declaration includes several individual traits that define the subjects of justice, but does not consider age as one aspect of the person. Does this mean that they apply universally irrespective of age? Surely not, since no reasonable person would consider a toddler's demands for freedom of association as absolute. So, when do these rights fully apply in the life of a person? In 2017, Adrian Crook of Vancouver, B.C., was warned by the province's Ministry of Children and Family Development that his kids could not be out of home in the community, alone or with other kids the same age, without supervision. The Ministry's argument was that children riding the bus unsupervised compromised the parent's ability to provide care and placed them at risk (Brend 2017). Crook argued that the goal of teaching his kids (then aged 7, 8, 9 and 11) to ride transit to school was to raise self-reliant children (Stueck 2017). While both sides discovered to everyone's surprise that no clear rules existed regarding children's independent transit use (Brend 2017), statistically there is evidence that travel by car is riskier than travel by bus (Morency et al. 2018). If the public good is to reduce risk, shouldn't children be banned from riding in cars? The Canadian legal system concerns itself with fundamental freedoms and rights, one of which is the liberty to move freely. This provides an answer (of many) as to "why" we would even consider children as subjects of justice. But the devil is in the details, and answering the other questions discussed above is essential to pin the devil by the tail. Are children under the age of 10 subjects of justice (i.e., are they a "who") and who decides if they are (i.e., the courts or the parents in this case)? If so, is the ability to use transit unsupervised an object of justice that should be justly distributed (i.e., the "what") and under what circumstances (e.g, to school, to a social event; during the day, or late at night?). "When" (e.g., for all children going forward, for only 5 years) and "where" (e.g., only in the suburbs, across the country) do these questions apply? Eventually, in 2020, a court of appeals ruled in Crook's favor, allowing his children to continue to ride the bus, thus providing much needed clarity with respect to the use of transit by children who desire and are encouraged to exercise independent mobility (Stueck 2020). In actuality, the courts *created* a standard of equity: starting at a certain age, children are objects of justice from the perspective of freedom of movement, and they are due the benefits of independent mobility by transit.

Another perspective on the answer to "Why?" are cultural *norms* that provide a rationale. In this case, the liberty of movement for all—including children—reigns supreme. But a competing concern is that the outside is dangerous, and it is so in part due to vehicular traffic (Morency et al. 2018), and in part because of potential violence from others. Parents may have over-pronounced 'stranger danger' based on neighbourhood and socio-economic characteristics of neighbourhoods (Francis et al. 2017) and children themselves may fear potential violence based on real threats of victimization (Pain 2006). Whose voice, what perception of fear, and actions we take to intervene define and reproduce cultural norms, all play into the rationale behind the question "Why?". In this way, analyzing the "Why?" in the reviewed literature is not the focus of this review, partly because answers to "Why?" are not explicitly stated and challenge inference. As such, the focus of this report is on the standards of fairness that, combined with the use of equity analysis, can help us understand how better to move towards just transportation systems and better formulate answers to "Why?".

Scanning the lay of the land: Methods

"Not everything that is faced can be changed. But nothing can be changed until it is faced."
— James A. Baldwin

This review examines the breadth and depth of the academic literature on transportation to identify the extent to which standards for equity are defined and employed. In this task, we follow the Joanna Briggs Institute (JBI) approach to the conduct of scoping reviews, an approach that builds upon the Arksey and O'Malley (2005) framework (Peters et al. 2020).

Further, the review is also guided by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses, particularly the extension for scoping reviews (PRISMA-ScR), which is consistent with the JBI approach (Tricco et al. 2018). The use of these methods allows us to explore, in a consistent and organized manner, a relatively specialized topic within the broader transportation literature. In this way, we aim to collate the current knowledge as found in the landscape of published research.

The primary research question and the protocol were initially defined in consultation among the authors of the report. In other words, the starting point for the review was the level of knowledge of a group of experts in the field of transportation. The initial draft of the protocol was refined from preliminary searches of related-reviews (e.g., Iglesias et al. 2019; Sagaris, Berrios, and Tiznado-Aitken 2020; Vecchio and Martens 2021), and in consultation with a University of Toronto Research Services Librarian and a Liaison Librarian in City Studies. The methods are described in two parts: (i) development of the search strategy and (ii) selection of evidence and data extraction. The framework for analyzing questions of justice discussed in the preceding section was used in both stages, but was particularly valuable for selecting the evidence and for analysis for data extraction.

SEARCH STRATEGY

To guide the selection of search terms within the search query, **inclusion** and **exclusion** criteria were developed (Peters et al. 2020). For the inclusion criteria, the mnemonic PCC (population, concept, and context) was adopted (see Appendix Figure 8: for details).

Next, the inclusion and exclusion criteria were deployed to develop the search strategy. The search strategy was refined iteratively, adding topic search terms by stages (e.g., terms in the title, abstract or key words). The terms were bundled by means of logical connector terms "AND" and "OR". These stages are summarized next. The full search term queries can be consulted in Appendix Figure 8.

1. An initial limited search of Web of Science (WoS) Core Collection was undertaken to identify key documents This collection contains documents in journals, conference proceedings, and books published all over the world. Separate searches using the terms 'transportation' and 'equity' were generated. From these searches, we examined the text contained in the titles and abstracts of relevant papers, the index terms used to describe the papers, and subject heading searches when available. As we developed a clearer outline of the literature, we continued with this process by adjusting the terms used for the search. This took the form: ("Transport" OR "Transit" OR "Car*" OR "Walk" OR "Bike"…**1**) AND ("Equity"

OR "Justice" OR "Fair"…**2**), where **1** and **2** signify additional terms relating to 'transportation' and 'equity', respectively.

2. Upon inspection of the preliminary search results and after achieving a consensus among the authors, the set of search terms related to 'equity' was expanded into three sets of terms. The first set describes theories and concepts of equity, the second describes the object of justice (i.e., the "what" in our analytical framework), and the third describes terms referring to standards (i.e., the "how"). All three sets of terms were augmented following an iterative process of refinement. The final search query took the following general form: ("Transport" OR "Transit" OR "Car*" OR "Walk" OR "Bike"…**1**) AND ("Equity" OR "Justice" OR "Equity" OR "Fair"…**2**) AND ("Accessibility" OR "Mobility" OR …**3**) AND ("Standard" OR "Threshold" OR …**4**) where **1,2,3**, and **4** signify additional terms included in the sets combined with "OR" logical connectors.

After testing the search strategy on WoS Core Collection, we proceeded to apply to an augmented list of databases, that expanded on our search using the Core Collection of WoS. The databases used are: WoS General Collection-Science Citation Index Expanded, WoS Social Sciences Citation Index, and Transportation Research International Documentation (TRID). The definitive version of the search was completed and exported by the lead author on March 21st, 2021.

EVIDENCE SELECTION AND DATA EXTRACTION

The semi-automated nature of the search strategy tends to be overly inclusive, which serves our purpose well, since we aim to begin with more documents than are strictly needed, and so reduce the risk of omitting relevant material. The next stage is to trim the corpus of documents, a task that can no longer be automated, and requires expert knowledge. Selection of evidence is where this expert knowledge really comes to bear, and it consists of scanning the literature retrieved by the search strategy to retain in the corous only those papers that fit the inclusion and exclusion criteria. This process was pilot-tested with a subset of papers before being implemented on the full set. *Covidence*[8], an online application for literature screening, was used for all steps of selection and data extraction on the full export of literature. Covidence is designed for collaborative work, and helps to document the work of multiple reviewers. The steps of this process are shown in Figure 2.

The following steps summarize the process:

1. The first step (orange box in Figure 2) included screening all titles and abstracts of papers on whether they included transportation equity as defined by the PCC. Each paper was screened by two independent reviewers who then voted for inclusion, exclusion, or uncertain inclusion. All uncertain papers, conflicting papers, and papers missing abstracts were reviewed by a third person for inclusion or exclusion.

2. The second step (green box in Figure 2) included scanning all full-text papers which passed step 1. These papers were reviewed to determine if they included a relevant "how", i.e., an standard and/or relevant theoretical or conceptual discussion. At this stage, papers were evaluated again by two independent reviewers who voted for inclusion or exclusion. If an article was voted to be excluded, it was tagged with one of five possible reasons for exclusion, namely (1) no standards included; (2) no relevant conceptual elements included;
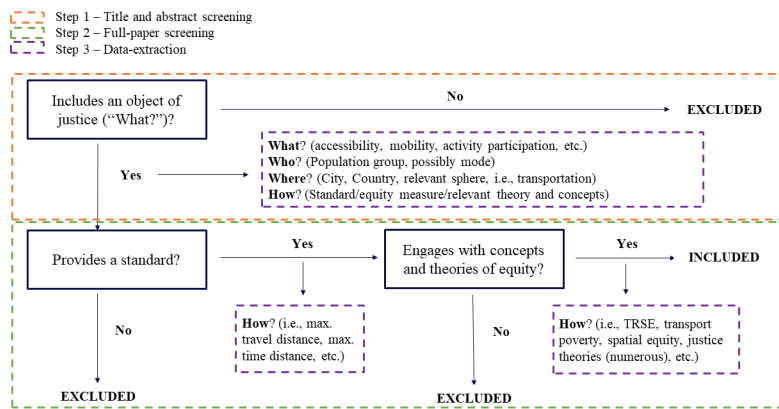
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[8]https://www.covidence.org/

Figure 2: Evidence selection process framework. Step 1 (orange) is title and abstract screening, step 2 (green) is full-text review, and step 3 (purple) is data extraction.

(3) no standard and no conceptual elements included; (4) send back – QA issue; or (5) other. Discrepancies were resolved by a third reviewer.

3. In the last step, a data extraction template for each record was filled by one reviewer (purple box in Figure 2). The data extraction template was created with the aim of striking a balance between the complexity of categories and the simplicity of summary; information related to "Where?" (the geographical context and sphere of life), "When?" (temporal circumstances for the application of justice), "Who?" (the subject of justice), "What?" (the object of justice), and "How?" (equity standard(s) and concepts) was filled out for each study. Figure 9 contains the template that was input into *Covidence* and used throughout.
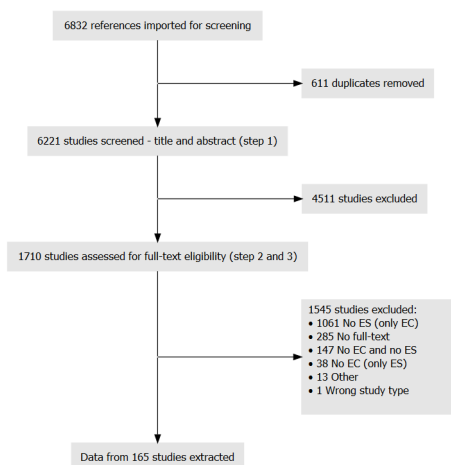
Figure 3: PRISMA flow diagram for the evidence selection process. ES signifies equity standard and EC signifies equity conceptualization.

The evidence selection process is also represented using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) flow diagram (Page et al. 2021) in Figure 3. Notably, two rounds of exclusion occurred during the assessment for full-text eligibility. 1710 studies entered step 2, 1223 were excluded and the remaining 487 papers entered step 3. The data extraction template used by the reviewers (authorship team) in step 3 revealed that, as expected, inclusion was initially too generous, and some papers were not sufficiently relevant, because of a lack of content on standards and/or conceptual/theoretical elements. In this fashion, 322 papers

were further excluded and data extraction was completed to give a final corpus of 165 papers. A summary of the reasons for exclusion of the 1545 papers (between steps 2 and 3) are included in Figure 3.

The lay of the land: a summary of findings

"Give me knowledge, so that I may have kindness for all."
— Native American Proverb

A synthesis of the findings from the data extraction process (based on the template shown in Figure 9) is detailed in this section. The presentation of findings is less granular than the template to highlight the key trends in the literature.

"WHEN" AND "WHERE": THE CONTEXT FOR JUSTICE

Figure 4 displays the papers included in this review by year of publication and geographical provenance. The literature related to transportation equity has grown evidently voluminous, particularly since 2019. Of note is the geographic scope of the relevant literature. The majority of papers (60%) contain case studies based in the Global North, with many studies from North America (particularly USA and Canada), Europe (particularly UK, France, Spain and Scandinavia), Oceania (Australia and New Zealand), and Asia (Japan and Israel). For the reasons previously discussed, setting standards (that is, making statements of fairness) is a highly context-specific endeavor. Publication patterns, being what they are, display a disproportionately low number of items from the Global South where equity issues are perhaps as, or even more pressing, than in the Global North (e.g., BBC News, Latin America 2019). While our search strategy and review tries to be as faithful to the literature as possible, it does not allow us to lay claim to reporting about on-the-ground transportation justice efforts from a truly global perspective.

The smattering of studies from the Global South are predominately from **Asia**, notably China, but also India, Thailand, Iran, Philippines, and Indonesia. The next most common focus within the literature from the Global South is from **South America**. Many of these studies mention a systemic absence of evidence relevant to the region (Vecchio, Tiznado-Aitken, and Hurtubia 2020). Despite the growing recognition in the literature of the interconnections between transport development, social exclusion, and poverty (Benevenuto and Caulfield 2020), a number of studies underscore an ongoing neglect of the social dimension of transport during the planning stage (Benevenuto and Caulfield 2020; Boisjoly et al. 2020). Many studies also point at affordability as one of the main mobility barriers in the region (Falavigna and Hernandez 2016; Rivas, Serebrisky, and Suárez-Alemán 2018), while some highlight multi-dimensional concerns such as public transport accessibility and quality of walking environments that contribute to mobility inequalities (Tiznado-Aitken, Munoz, and Hurtubia 2018).

Studies pertaining to **Africa** are even less numerous compared to the South American literature. A shared characteristic among the studies from these two continents is a scarcity of official transport data (Fried et al. 2020) and a reliance on policy guidelines developed by international organizations. These studies also incorporate the use of informal transportation options and the pressures to develop road network infrastructure (which tends to support car dependency) over meeting the mobility/accessibility needs of citizens (Thondoo et al. 2020). To address
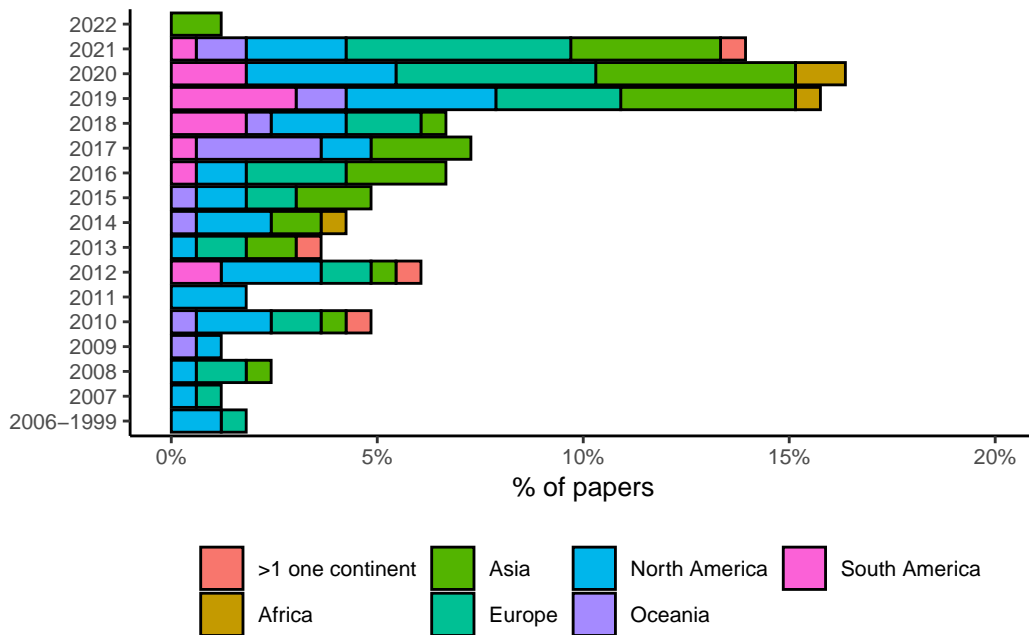
Figure 4: Papers included in the review by year of publication and case study continent.

these challenges, researchers compile databases based on open and geo-referenced data, calculate objective and/or subjective measures (Berhe, Martinez, and Verplanke 2014), and focus on advancing transport justice for low to medium income countries (LMIC) by aligning their goals with external policy guidelines such as the Sustainability Development Goals (SDGs), particularly those related to universal accessibility (Fried et al. 2020).

Of all the studies reviewed, 85% focus on urban and suburban settings and are highly varied in their research aims. To give an example, Cox and Bartle (2020) qualitatively examine cycling as a mode of travel for people with disabilities in a typical mid-size town in the UK. Ampe et al. (2020), on the other hand, work to identify the lateral clearance that motorists should maintain when passing cyclists with children seats. While both studies refer to the same objects of justice ("what", i.e., the right to the road and cycling), the subjects of inequities (the "who") are different (people with disabilities and children), and the "where", that is, the geographical context for the examination of fairness, differs as well.

The remainder of the studies reviewed focus on rural regions (14%). To illustrate, we highlight the work of Cao and Stanley (2017), who examined transportation disadvantage in remote places which rely on inter-island ferry trips in the rural Philippines. Similarly, Parry et al. (2018) studied remote communities in the Amazonian region, and suggest that "increasing accessibility through road building would be maladaptive, exposing marginalized people to further harm and exacerbating climatic change by driving deforestation" (pp. 125).

"WHO": THE SUBJECTS OF JUSTICE

Figure 5 showcases the population group types that are the focus of the papers in our review. From this tally, papers that consider population by income groups are the most widely represented in the literature reviewed. Particularly, most papers that center income usually focus on the lowest-income groups, as they experience the least benefits in terms of mobility and accessi-

bility, and usually the greatest burdens as well, in terms of cost, exposure, and so on (Peungnumsai et al. 2020; PJ Zhao, Li, and Liu 2020; Falavigna and Hernandez 2016).
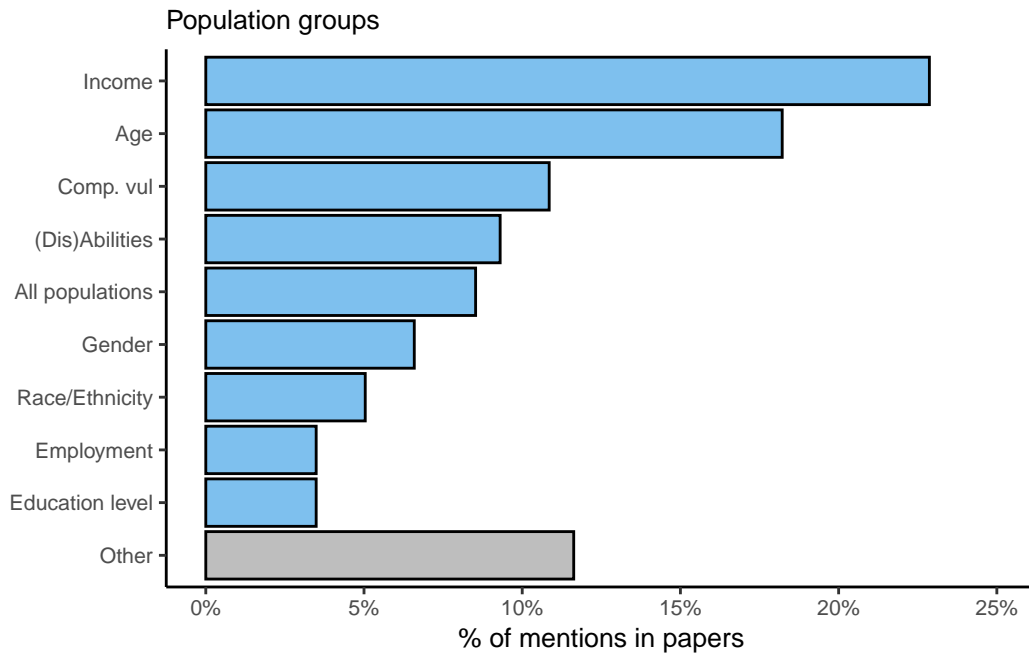
Population groups

Figure 5: The proportion of papers that focus on each type of population group. Categories for population groups were generated upon data extraction.

For example, there is an abundance of evidence to suggest that low-levels of household income is a significant determinant of transport-related inequities (e.g., access to public transport supply in Bangkok region (Thailand) (Peungnumsai et al. 2020), access to employment opportunities in various cities in Brazil (Boisjoly et al. 2020), and unfavorable rates of environmental noise, air pollution, and green space per resident in Rijnmond region (Netherlands) (Kruize et al. 2007). However, this should be kept in context, as low-income is not universally associated with lower transport-related benefits for every object of justice. For instance, in Sheffield (UK), Mears et al. (2019) demonstrates that historically working-class neighbourhoods (i.e., lower income working population) have more access to green space than other neighbourhoods due to urban planning approaches during the Victorian-era. However, the quality of green spaces are less than average. Similarly, Bertrand, Therien, and Cloutier (2008) finds that lower income groups do not always have below average accessibility depending on the granularity of analysis (i.e., the distance-to-food threshold for the cumulative opportunity measure).

Age is the second most common category of population group of focus within the reviewed literature. Many papers that focus on this category highlight differences in age-related capabilities; for instance, Martinez-Jimenez and Salinas-Perez (2019) and Arranz-Lopez, Soria-Lara, and Pueyo-Campos (2019) investigate travel distances and times to various opportunities based on specific age groups, acknowledging that age is an important consideration, and associated with differences in access to opportunities. The most commonly studied age groups are school-aged children and older populations. Research on school-aged children analyzes their wellbeing (Laszkiewicz and Sikorska 2020), exposure to green space (Corazza et al. 2020), access to schools (Sharma and Patil 2022), and aims at understanding and encouraging active travel journeys (Mackie 2009; Mehdizadeh, Mamdoohi, and Nordfjaern 2017). Papers that focus on

older adults often have similar aims as those on children, and try to understand transport-related impacts on wellbeing (e.g, Y. Chen et al. 2020), measuring accessibility to key destinations by population group (e.g. Cheng et al. 2019), and seeking to understand how to better meet travel needs (e.g., Nordbakke and Schwanen 2015).

The third population group most commonly studied is what might be called 'composite vulnerable population groups': the intersection of several individual traits. These papers use composite vulnerability indices that captures multiple population characteristics, including low-income, unemployment, immigrant status, family household characteristics, and so on. These indices are typically generated from official government sources or author-informed census data creation, and produced using a variety of methodologies. For instance, Awuor and Melles (2019) use the Neighbourhood Equity Index (NEI) to investigate disparities in premature death in Toronto (Canada). The NEI is a composite index that was developed by the city to capture differences in the City's neighbourhoods by ranking them based on socio-economic characteristics (e.g., social assistance, unemployment, income) and physical environmental characteristics such as green space availability. Other works use national census indicators such as the social and housing deprivation index [e.g., Pucci et al. (2019) or explore transport disadvantage, equity in policy implementation, or transport-related mortality burden by means of census measures (e.g., household poverty) and transport-related indicators [e.g., accessibility; Aldred et al. (2021); Iungman et al. (2021); Sun and Thakuriah (2021); Scheurer, Curtis, and McLeod (2017)]. Similarly, Environmental Justice (EJ) indicators have been used in the US literature to identify neighbourhoods that have a higher than average proportion of low-income and non-white populations (i.e., a composite vulnerable population group'). Numerous studies have used EJ analysis to evaluate the equity impacts of transportation projects (e.g., D. Rowangould, Karner, and London 2016; K. Park et al. 2021; Reddy, Chennadu, and Lu 2010).

Papers that exclusively focus on populations with (dis)abilities e.g., (J. Park et al. 2017; Chiscano 2021; Orellana et al. 2020) are relatively common in the literature. They often assess universal design guidelines and the capabilities of people who face disabilities to travel. However, from another perspective, papers with an exclusive focus on gender, race/ethnicity, or education level/employment are less common in the literature reviewed. Only two papers focus on gendered differences in cycling/active transportation (e.g., Adlakha and Parra (2020)'s case study in Chennai (India) and Xie and Spinney (2018)'s case study in Cardiff (UK)). Only two papers focus on race/ethnicity exclusively focusing on how minority ethnicity communities are in proximity to green space (Silva et al. 2018) and culturally diverse family physicians in Toronto (Canada) (Wang and Roisman 2011). Furthermore, papers that focus *solely* on education/employment status are not present in the reviewed papers. This is to say, papers that feature gender, race/ethnicity, or education level/employment population groups often feature them alongside other population group characteristics (as a trait in 'composite vulnerability measures'). This contrasts the prominence of studies that exclusively center on disabilities.

We include a catch-all category of papers (*Other*) that include group populations that less commonly have been the subject of research. Examples include: veterans and access to specific-healthcare needs (Mooney et al. 2000), pregnant people and access to services (Vadrevu and Kanjilal 2016), and youths who live in foster care (Batsche and Reader 2012). Overall, the diversity of the *Other* population group classification demonstrates the diversity of transportation-equity concerns across population groups in the reviewed literature and the interplay of characteristics in the literature (Vecchio et al. 2022).
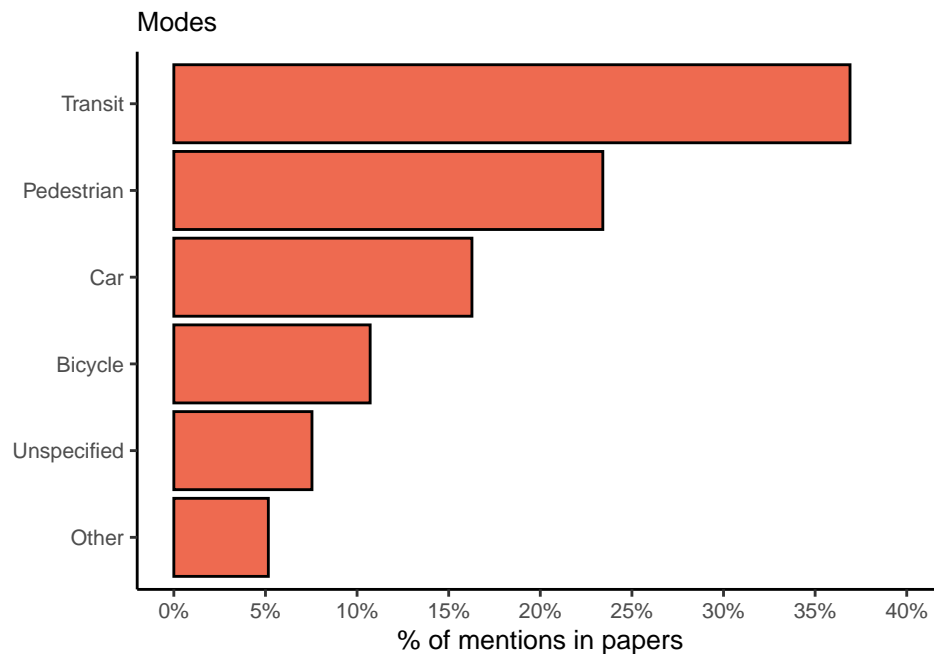
Figure 6: The proportion of papers that investiage each type of mode. Categories for modes were generated upon data extraction.

As previously noted, mode of travel is not a trait of the individual, but in principle is a modifiable factor. That said, the existence of captive users by mode makes it challenging at times to extricate the mobility tool from the individual. In this section, we choose to view the mode of travel primarily as an object of justice (i.e., a "what"), but occasionally this will be enjoined to the subject of justice (i.e., the "who").

It is interesting to note that the primary emphasis within the literature reviewed centers on public transit (Figure 6), a mode that often is perceived by users as less than ideal (A. Paez and Whalen 2010; Mella Lira and Paez 2021) and that yet is often reckoned as the only realistic mobility tool for many (Jacques, Manaugh, and El-Geneidy 2012; T. F. Welch and Mishra 2013; Cheranchery and Maitra 2018). The variety of topics assessed from the perspective of public transit are varied. For instance, McKey, Kim, and Seo (2020) identifies 'food deserts' in Dallas (USA) considering public transit accessibility. Other contributions intersect public transport and individual needs. Examples include the study of universal design and barrier-free transportation for people who face disabilities (e.g., Jiménez-Espada and González-Escobar 2021; Liu et al. 2019) or possible improvements to public transport for people with autism (Lim et al. 2021; Feeley 2019). The strong focus on public passenger transport systems could be due to their policy importance. They are a clear public good, and seen as a natural object of justice. Accordingly, public transportation is seen as adaptable to meet the demands of justice, for example by funding it sufficiently to provide barrier-free transport for most. In this respect, the literature points at a variety of factors that conspire against it, including low population and opportunity density (the outcome of decades of deliberate policy choices), fiscal prudence (the public face of the choice to lower taxes), and political will [to maintain or further unsustainable socio-technological systems, from SUVs to space tourism; Markard et al. (2023)].

Transit is also often central to multi-modal or holistic comparisons that may serve transport equity analysis. As an example, Brussel et al. (2019) compares three different approaches to measure accessibility in the context of the Sustainability Development Goals (11.2) for the case of Bogota (Colombia), all of which capture some/all of the public transit system while others capture road and/or pedestrian systems. From a different perspective, Renne and Mayorga (2018) reviews natural disaster emergency evacuation plans from the lens of car-less (and oftentimes vulnerable) households in regions across the USA, paying particular attention to transit and pedestrian networks.

In contrast, only a few papers in the literature frame transit as a 'car-free' option and compare transit to car access. This framing is notable as car travel can be seen as a direct competitor to transit or as a benchmark for travel times and accessibility levels (Golub and Martens 2014; K. Martens, Golub, and Robinson 2012). As an example, Warren et al. (2015) propose a standard for per capita car ownership for Havana (Cuba), in recognition that car mobility is needed to alleviate transportation disadvantage in the short-term where public transit has yet to be sufficiently addressed. In this context, Warren et al. (2015) acknowledge the tension between household vulnerability and their need for mobility against GHG emission reduction goals and car-dependency cycles. However, not all papers see transit as a direct competitor, but as a mode that can be used to satisfy individual capabilities. For instance, Smith, Hirsch, and Davis (2012) focus on rural areas in the UK and various types of households (e.g., retired, no-children, with children, single, etc.). In this investigation, perspectives about minimum transport needs and costs for a variety of living standards are explored. The papers reviewed vary in the importance they place on climate urgency, with some focusing more on satisfying *all* sufficient individual needs while planning for less car-dependent cities in the future.

Following a focus on transit, a focus on pedestrian travel is the second most common object of justice considered in the literature. Pedestrians are the most extreme case of confluence between the "what" and the "who", since the mobility tool is the person's own body, with its inherent range of abilities. In papers that focus exclusively on walking, many use or develop walkability scores to explore perceptions of neighbourhood quality (Evans 2015) or pedestrian mobility with a focus on middle-aged and older adults (Towne et al. 2016), gender (H. Kim et al. 2016), or urban peripherical regions (Blecic et al. 2021). These papers use 'walkability' as a way to measure the equity in its distribution. Other papers use walkability as an indicator for public health and urban vitality (Sung and Lee 2015; McCormack et al. 2012).

Additionally, papers that focus on pedestrians also often see walking as a bridge to connect multiple modes: they often discuss 'walkability' as part of active transportation, which focuses on both walking and bicycle and/or transit. Concepts discussed include how active transport contributes to children's physical activity levels (Mammen et al. 2014), walkability as an alternative to car predominance (Bertrand, Therien, and Cloutier 2008) or tension that exists between modes, creating unsafe conditions for walking (Siu 2019; Ferenchak and Marshall 2019).

In contrast to transit and walking, cars are seldom the only mode examined within a paper. When car as a mobility tool is studied, it is often used as a comparison with transit or as the only mode of transport for areas with sub-standard transit systems e.g., (Kimmel et al. 2018; Aljoufie 2016). Similarly, a number of car studies focus on externalities such as air pollution or safety (Tao Feng and Timmermans 2014; Houston et al. 2006).

"WHAT": THE BENEFITS OF MOBILITY AND ACCESSIBILITY

The most fundamental benefits of transportation systems are mobility (enabling or impeding movement) and accessibility (the ease of reaching destinations). These benefits, however, are not necessarily valued by themselves, but rather are seen as instrumental to achieve an ulterior goal (e.g., activity participation). For example, although vehicle kilometers travelled (VKT) is still sometimes seen as a useful policy instrument (Pengjun Zhao and Li 2021), travelling more is not necessarily a sign of advantage when accessibility is low (A. Paez et al. 2010), and similarly short trips may be a sign of advantage (K. Park et al. 2021). For this reason, although the right to the road (and to transportation systems more generally) is important, the literature leans heavy on the ulterior object, namely accessibility to destinations.

In this respect, we find that most papers tend to be wide sighted, in that they do not focus on a particular destination (e.g., 28% of studies). Within these papers, a variety of equity dimensions, often in combination with different modes of transportation. Typically, they are multi-modal and focus on factors that impact the **trip itself** (e.g., the trip experience, the quality of infrastructure, the level of service) or on the **people and relevant destinations that can be accessed** (e.g., a bundle of trips made by specific population groups, and whether they are enough for 'sufficient' quality of life). For the first, the focus is on the quality of infrastructure, safety issues, perceived accessibility and facets of the level of service such as frequency (Zhe et al. 2008; Prasertsubpakij and Nitivattananon 2012; Fürst and Vogelauer 2013 ; Lattman, Friman, and Olsson 2016). For the second, the focus is on bundles of trips tailored for specific population groups, such as women (Russell et al. 2021) or people who face physical disabilities (Wilkinson-Meyers et al. 2015). More broadly there is the question of what is enough for the quality of life to be 'sufficient' (Churchill and Smyth 2019). These papers further demonstrate the multi-dimensional role of transportation systems: they provide a utilitarian service that can be used to get from A to B but they too are experienced by the people that use them. Papers that examine 'all trips' best exemplify this trend in the transportation equity literature.

In terms of papers that study specific destinations, healthcare services (11%) and employment (15%) are activities commonly studied. Papers that exclusively focus on healthcare typically originate from the healthcare planning literature, and look to inform planners about disparities in services and corrective actions. For instance, Wang and Roisman (2011) model access of Chinese-language speakers in Toronto (Canada) to Mandarin-speaking family physicians. These authors infer an inequity from the spatial mismatch between language competent healthcare providers and Chinese speakers. Papers that exclusively focus on employment typically focus on these trips as they are the most common trip purpose and are often correlated with other trip activities like shops, recreation, and other services. For instance, J. Allen and Farber (2019) propose a low employment-based accessibility threshold and a composite population vulnerability index to identify transportation-poor neighbourhoods in urban Canada. Papers that focus on healthcare and employment typically source data from representative travel surveys/diaries, census data, and points-of-interest databases. In other words, these studies often benefit from well developed and institutional data that represents 'typical trips', especially in the Global North where these data are more readily available.

But what about non-healthcare and non-employment activity types? Papers that focus on other activities are not framed as 'typical travel patterns' and they often have different intentions. For instance, papers that focus on shopping destinations, such as grocery stores or markets (12%), frequently aim to identify food deserts (e.g., Choi and Suzuki 2013; Jiao et al. 2012; McKey, Kim,

and Seo 2020; D. Kim and Park 2020). Papers that focus on educational facilities, including primary, secondary, and post-secondary schools, represent only 11% of the studies, and examine children's active transportation to school (e.g., Laszkiewicz and Sikorska 2020) or universal design (e.g., Larkins, Dunning, and Ridout 2011). When green space or other places of leisure is the exclusive focus (11% of papers), studies examine different accessibility questions such as the spatial distribution of green space e.g., (Xu et al. 2017), for whom its accessible to (e.g., Mavoa et al. 2015), and the reasons why the distribution of these spaces may be unequitable (e.g., Mears et al. 2019). Very few of the papers we reviewed include 'community' destinations (e.g., public service centres, places of community support, and places of worship (6% of studies) or childcare activity types (3% of studies). In the few papers that do include them, these destinations are considered in a holistic representation of activity participation (Alberts, Pfeffer, and Baud 2016; Smith, Hirsch, and Davis 2012). The lack of information about community destinations is particularly pronounced in the case of children, as per Elise Desjardins et al. (2022).

The literature offers a variety of conclusions and recommendations that span across the benefits of transportation (e.g., destinations types), often co-mingled with population groups and the tools of mobility. In addition, as we will discuss next, there is a variety of perspectives in terms of the philosophical foundations and the standards of fairness.

"HOW": CONCEPTS OF JUSTICE AND STANDARDS OF FAIRNESS

Population: Relate to user characteristics (e.g. affordability levels, perceived equity).

Opportunity: Access to destinations indicators (e.g., # of parks within 30-min transit trip), the use of travel impedance thresholds (e.g., 200m to bus stop).

Infrastructure: E.g. Level of service, quality, universal design standards.

Environmental +: E.g., noise, air, pollution criteria, safety.

	Utilitarian	Emerg. theories	Rights	Ineq. externalities	Horizontal equity	Spatial equity	Wellbeing	TR exclusion	Vertical equity	TOTALS
TOTALS	0.8%	2.9%	8.2%	9.9%	9.5%	16.0%	16.2%	17.9%	18.5%	
Population	0.4%	0.6%	3.2%	3.2%	2.5%	4.8%	6.5%	6.9%	7.2%	35.4%
Opportunity	0.2%	1.7%	1.5%	2.3%	5.1%	7.2%	5.5%	6.9%	6.7%	37.1%
Infrastructure	0.2%	0.6%	3.4%	2.7%	1.5%	3.2%	3.6%	3.2%	3.4%	21.7%
Environmental +			0.2%	1.7%	0.4%	0.8%	0.6%	0.8%	1.3%	5.9%

Vertical equity: The distribution of transport system benefits/costs should favourably prioritize disadvantaged groups.

Ineq. externalities: Concerning the equitable distribution of externalities (e.g., road safety, congestion, pollution).

TR exclusion: Concerning the links between transport system interaction and social exclusions.

Rights: Concerning legal/human rights of access (e.g., mobilty rights, rights to the city, discriminatory application of laws).

Wellbeing: Evaluation of transport system benefits/costs through wellbeing measures (e.g., livability, quality of life, subjective well being).

Emerg. theories: E.g., Sufficientarism: minimums informed by individual capabilities. Capabilities approach: the capability of living the life one values (rather than having the right to do so)

Spatial equity: Equal distribution of transport system benefits/costs across space.

Utilitarian: Maximizing benefits/welfare overall, without consideration of distribution.

Horizontal equity: Equal distribution of transport system benefits/costs across population.
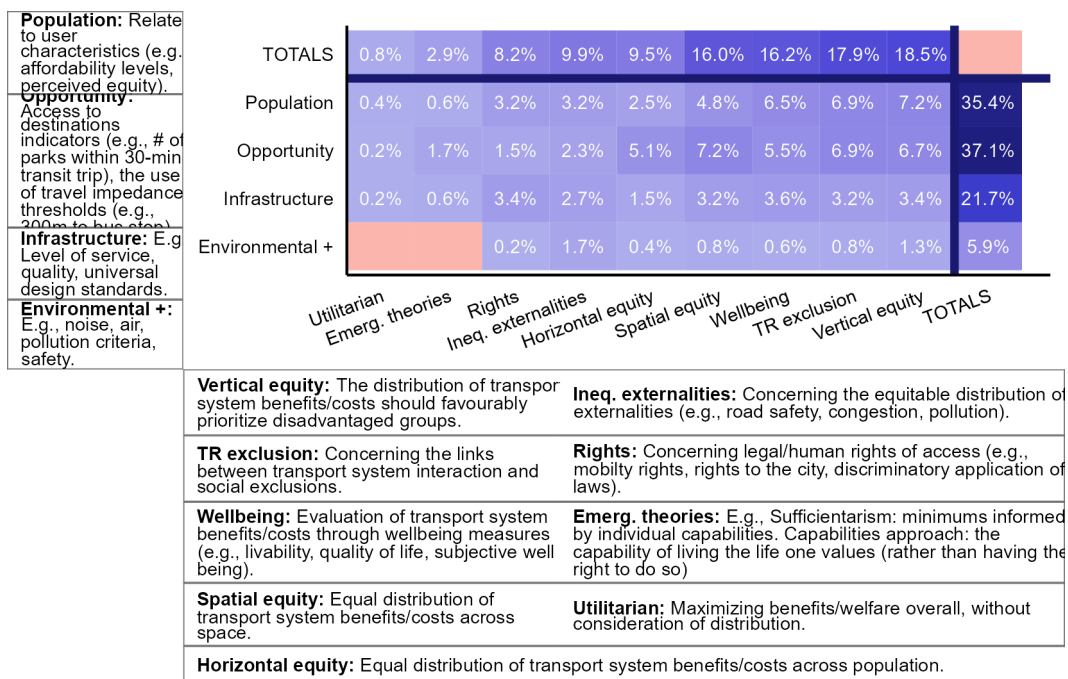
Figure 7: The proportion of equity standards (vertical axis) within each type of equity conceptualization (horizontal axis) category.

We begin this section with our reflections about the way equity standards connect with conceptual and theoretical frameworks of justice. Broadly speaking, some trends emerge in terms of the methods used depending on the way equity is conceptualized and the type of standard suggested; See Figure 7 for definitions of of conceptualizations along the horizontal axis and types of standards along the vertical axis. These categories emerged as we reviewed the literature and we

use them to discuss trends; they are by no means an exhaustive list of equity conceptualizations and types of standards.

Referring to Figure 7, **Opportunity** and **population** are the most commonly suggested standards in the literature reviewed; they appear in the literature in similar proportions (37.2% vs. 35.8%), but frequently correspond to different conceptualizations of equity. Papers suggesting **opportunity standards** often address questions of **horizontal equity** and **spatial equity** and suggest standards that relate to travel impedance; these standards describes how fast, far, or costly it is to travel from one place to another. We think of this as a type of opportunity standard because travel impedance is essential to the measurement of accessibility (i.e., the ease of reaching opportunities). Some examples include the work of Z. Chen and Haynes (2017), who uses a standard of 4 hours or less by high-speed rail for municipalities to be considered "comfortably connected". In a similar manner, Yenisetty and Bahadure (2020) assumes that a travel distance of less than 1,200 m is sufficient for a resident to interact with its transit system locally. And Shen et al. (2020) identify regions where populations cannot access hospitals within 1 hour by car - in other words, more than sixty minutes travel time is already seen as an unfair burden. These papers uses these standards as a benchmark to indicate what areas are better or worse-off in terms of travel impedance; we can interpret them to be a type of *difference* threshold.

Papers that suggest these **opportunity** standards sometimes also employ disparity analysis through a variety of quantitative approaches to discuss the fairness in distribution. These include inequality measures such as the Gini coefficient and Lorenz curve, or poverty measures e.g., (van der Veen et al. 2020; Tiznado-Aitken, Munoz, and Hurtubia 2018)). They can also include spatial descriptive analysis as well as comparisons to service benchmarks (e.g., equal supply to demand of public transit in a spatial unit as in Peungnumsai et al. 2020) to determine which locations are spatially and horizontally (in)equitable. Another branch of opportunity-standard-suggesting papers conceive the externalities of transportation system as trade-offs, and aim to maximize transport-related benefits (i.e., time savings, emissions reductions, congestion reductions, user fares) through optimization/location-allocation methodologies e.g., (T. Feng and Zhang 2014; Fakhrmoosavi, Zockaie, and Abdelghany 2021; Zheng and Geroliminis 2020; Wismadi et al. 2014). In the reviewed papers that focus primarily on **horizontal equity** and/or **spatial equity** seldom use exclusively qualitative methods and operationalise predominately quantitative methods.

A different way to approach standards is to see them from the lens of **population**, and when this is done, other methods are commonly used, often depending on how equity is conceptualised. Papers that suggest **population**-based standards are often founded on concepts of **well-being**: they typically ask *what is enough to lead a satisfactory life (as related to transportation)?*. Standards suggested include: questionnaires and relative comparisons to recommended physical activity per week e.g., (Adlakha and Parra 2020; Auchincloss et al. 2020; McCormack et al. 2012; H. Kim et al. 2016; Towne et al. 2016), summative per capita benchmarks (e.g., such as energy consumption for a 'decent living' as suggested in Rao and Baer (2012)), region-relative comparisons in health-related outcomes (e.g., premature mortality rates (Awuor and Melles 2019)), spatial access benchmarks to hospitals e.g., (R. Pereira et al. 2021), as well as spatial access to supermarkets, active-mode-usage, and Body Mass Index (BMI) e.g., (Murphy et al. 2017). The majority of these papers use quantitative/mixed-methods to identify inequities in **wellbeing**. However, a minority do use exclusively qualitative methods to distill themes, as for example in the exploration of perceived quality of life by Berhe, Martinez, and Verplanke (2014).

Papers that combine **population**- and **opportunity**-based standards often rely on **vertical equity** and **transport-related social exclusion** (note the similar proportions in these standards in Figure 7). Perhaps not surprisingly, these papers commonly use a combination of methods: questionnaires and other qualitative methods related to population standards and quantitative methods such as accessibility indices for opportunity standards are usually deployed. For instance, census data and the estimated proportion of households within some travel distance/time/availability to/of key destinations is used to identify a variety of social exclusionary situations e.g., (Mackett, Achuthan, and Titheridge 2010; W.-H. Chen 2010; Daniels and Mulley 2011; Sun and Thakuriah 2021; Sharma and Patil 2021), the linkages between well-being and transport-related social exclusion e.g.,(A. Delbosc and Currie 2011b; Churchill and Smyth 2019), areas more likely to experience transport poverty (J. Allen and Farber 2019), food deserts (McKey, Kim, and Seo 2020), or transport-related energy poverty e.g., (Robinson and Mattioli 2020; Berry et al. 2016; Berry 2019).

Similar to papers interested in **wellbeing**, the majority of papers concerned with **social-exclusion** use quantitative/mixed-methods to identify areas, households, and/or populations at risk. They use a variety of methods to identify *where* populations at risk may be located, such as clustering methods (Mohri, Mortazavi, and Nassir 2021). Some papers that exclusively use qualitative methods operationalise survey data to study the willingness/barriers to travel e.g., (W.-H. Chen 2010; Mehdizadeh, Mamdoohi, and Nordfjaern 2017) or conducts interviews on topics of unmet activity needs (Nordbakke and Schwanen 2015). Travel that *did not* take place is notoriously slippery to capture in standard surveys, and understanding whether this is a preference or the consequence of constraints is not straightforward (e.g., A. Paez and Farber 2012).

Besides **opportunity**- and **population**-based standards, another way to create statements about fairness is through **infrastructure**-based standards. Among papers that use this lens, the most common conceptual grounding used relates to **rights**. **Infrastructure**-standards appear in 37% of all papers in this review, and within this segment of the corpus, discussions of **rights** appear two times as often than any other conceptual approach. These papers often focus on populations who face mobility disabilities and non-car users, and the discussion often centers on their right to use existing transportation systems. The methods operationalised by this strand of the literature are varied but are more or less split between infrastructure and environmental audits, and qualitative methods. Audits of existing infrastructure are sometimes used in comparisons against best-practice universal design e.g., (Odeck, Hagen, and Fearnley 2010; Larkins, Dunning, and Ridout 2011; Jiménez-Espada and González-Escobar 2021; Perez-delHoyo et al. 2021) or to understand the elements of infrastructure that correlate well with use of a mode by particular populations (e.g., walking by older adults Moniruzzaman and Paez 2016). Qualitative methods are used to interview/survey users about their perceived access to transport systems (e.g., Marquez, Poveda, and Vega 2019; Iderlina Mateo-Babiano, Kumar, and Mejia 2017; Fürst and Vogelauer 2013; Velho et al. 2016; J. Park et al. 2017; Lim et al. 2021; Stjernborg 2019; Elise Desjardins et al. 2021) or to assess standards under best-practice considerations (e.g., Daamen, de Boer, and de Kloe 2008; Velho et al. 2016; Bharathy and D'Souza 2018).

Papers that suggest **infrastructure**-based standards are also sometimes multi-dimensional, and extend beyond **rights** (to the infrastructure) to suggest **opportunity**- and **population**-based standards as well. These papers often apply **vertical**, **horizontal** and **spatial** equity lenses. Papers in this slice of the literature can refer to established guidelines and suggest composite indices. For instance, Rachele et al. (2017) combine various properties of transport networks (e.g., street connectivity, cul-de-sac length, street block length, traffic volume, public transport stops and service

frequency), and use these attributes as inputs to define an indicator of transport design that supports walkability and access to public transport. Other works assess the quality of infrastructure (Xu et al. 2017), the severity and frequency of accidents on the system (Benevenuto and Caulfield 2020; Appleyard, Ferrell, and Taecker 2017), user-groups (particularly disadvantaged groups in the case of vertical equity conceptualisations) (Prasertsubpakij and Nitivattananon 2012) as part of multi-criteria indicators. Yet another branch of infrastructure-based standard-suggesting literature explicitly focuses on affordability or other barriers to the transport system, and suggests improvements to the infrastructure such that all groups (especially the most disadvantaged) can sufficiently interact with the system (e.g., Basu and Alves 2019; Song, Kirschen, and Taylor 2019; T. Welch 2013). These studies are grounded on concepts of **transport-related social exclusion** (e.g., Kent and Karner 2019) or **sufficientarian/capabilities** approaches (e.g., Smith, Hirsch, and Davis 2012).

Our corpus of literature was more or less muted in terms of studies with **environmental**-based standards (only about 4% of all papers). Of those papers, the most frequent focus is on **inequitable externalities**. This paucity in our corpus could be due to the fact that the the environmental burdens of transportation are covered more broadly in other literatures (e.g., environmental justice). Papers that work with environmental-based standards often use traffic-related air pollution, noise pollution, green-space, urban design elements, urban air temperature, health related outcome, and physical activity guidelines to quantify externalities. The methods used are almost always quantitative or mixed-methods, and inequalities are identified using spatial clustering techniques, Gini coefficients (T. Feng and Zhang 2014), comparisons to established environmental thresholds or health guidelines (Agost-Felip, Rua, and Kouidmi 2021, 2021; Kruize et al. 2007; Iungman et al. 2021; Apparicio et al. 2021; Khomenko et al. 2020; Mueller et al. 2018). They sometimes create composite multi-dimensional indices (Agost-Felip, Rua, and Kouidmi 2021; Miranda and da Silva 2012; Corazza et al. 2020), occasionally supported by spatial analysis (Jephcote and Chen 2013; Carrier et al. 2014).

See the final table in the appendix that presents detailed examples of various standards as retrieved from our corpus.

A critical appraisal of the lay of the land

> "*Justice is itself the great standing policy of civil society; and any eminent departure from it, under any circumstances, lies under the suspicion of being no policy at all.*"
> — Edmund Burke

Here, we critically review some of the trends identified from the literature in terms of concepts and standards (the "how") and how they apply to the objects (the "what") and subjects (the "who") of justice, as well as under which situations ("when" and "where").

"WHEN" AND "WHERE" IS TRANSPORTATION CONSIDERED A SPHERE OF JUSTICE

Most papers within our corpus (60%) focus on case studies in the Global North. Though their subject matter is varied, their spatial context mainly pertains to North American and Europe, and thus more often than not, in conversation with more developed and formal government transport planning apparatuses and technologies (e.g., planning for equitable high-speed rail, as in Monzon,

Ortega, and Lopez 2013; autonomous vehicle technology, as in Eppenberger and Richter 2021; or on the public consultation processes, as in Reddy, Chennadu, and Lu 2010)).

However, studies from the Global South, specifically South America and Africa, have key differences in focus compared to the Global North. Three emerge from our review: 1) affordability-as-a-barrier is often what motivates them; 2) the tension between investing in new transportation infrastructure (typically roads) or prioritizing other modes; and 3) more serious data availability limitations. In this way, work from the Global South does not engage as immediately with emerging mobility technologies that have large capital costs. Informal aspects present in transport planning are a more overbearing presence. In the present day, countries in the Global South still struggle with the consequences of past colonialism under Northern states. This has left them more heavily reliant on primary sector exports (lower efficiency, lower national GDP) under growing global financial markets, and with more fragile democracies. Because of lower data availability and more extreme needs for 'sufficient' transport, analysis of transportation inequities are often cast along economic lines. An example of a standard in this context involves improving transit to ensure that at least 60% of those below the poverty line face a similar burden travelling to work, school, and services, as the average transit user in the region (i.e., 60 min travel time to destinations Basu and Alves 2019).

Temporally, we see the literature from the Global North and Global South in our corupus as laying on different transport inequity continuums. Literature from the Global North is concerned with particularly disadvantaged groups and creating indicators that may be used to guide the remedy of formal processes that ensure access to societal benefits e.g., (Cui et al. 2020). Global North countries often surpass international sufficiency thresholds related to transport and public health (e.g., Carrier et al. (2014) measures NO_2 road-side air pollution and find no levels are below the WHO guidelines) but advocate for the reduction in disproportional impact of air pollution on lower-income groups. These international guidelines, while perhaps being relevant at a time of lower transport-related development, are no longer relevant for some areas in the Global North. Along this line, inequities in the Global North are rising - high-income countries contain the wealthiest populations that have the most mobility (and produce associated carbon externalities) (Chancel and Piketty 2015).

In reference to transport inequity continuum, literature from the Global South tend to operationalize international standards as guidelines. Though not covered in this review, Global South nations' formal processes for planning are newer (relatively), more fragile, and operating under more strict financial constraints than the Global North. Informal processes are thus more important to account for equity (e.g, informal transit (Fried et al. 2020), populations living in informal residential locations (Sharma and Patil 2021)). Comparisons to thresholds set by governing international bodies are relevant as minimums are relatively lower (e.g., traffic related pollution, access to basic healthcare). Global South, along some dimensions, are lagging Global North development, but have the opportunity to plan better and not repeat Global North mistakes (e.g., car-centric development (Warren et al. 2015)).

So what's missing from the answers to "Where?" and "When?": standards that are context-specific, particularly those that frame the disproportionate impacts of inequities on both disadvantage groups and the most advantaged. Inequities in the Global North and Global South are broadly different as a result of globalizing forces, but systems thinking is required to advocate for equity standards that re-balance, develop, and uphold equitable formal transport planning processes.

"WHO" ARE THE SUBJECTS OF TRANSPORTATION JUSTICE

Though the literature reviewed most commonly considers low-income as a socio-demographic characteristics of populations deserving equity as either by itself or alongside other characteristics (11.08% of the papers). Many employ accessibility methods (e.g., walking accessibility to open space (Tang et al. 2021)) but others use qualitative or mixed-methods to gain perspectives of inequalities that are typically cross-dimensional (e.g., Milan and Creutzig (2017) asks Medellin (Colombia) residents living in TOD areas compared to non-TOD areas about the impact of TOD on their wellbeing based on income group and gender). The use of qualitative methods allows for a more nuanced reflection of residents perspectives, and different inequities emerge.

From a modal perspective, people who use a certain mode can be seen as the subjects of transportation equity in the literature. In this way, transit users are the primary focus. Upon the rise of automobility, transit came to be seen as a social service and sometimes as a hindrance to the full realization of automobility. After transit users, cyclists and pedestrians are the next most common populations of interest. Historically, walking is how people get around (Roberts 1998), and cycling and transit use space more efficiently and have relatively low impact. Automobility is in direct tension with other modes as it requires massive amounts of space and receives extraordinary public subsidies, from the way its true cost is systematically underestimated (Gössling et al. 2019) to the way governments support the industries that feed it (Timperley 2021). This may be one reason why transport inequity research focuses on these modes, although often car is the main driver of inequalities in other dimensions (e.g., access/mobility, traffic-related pollution, traffic-safety, and human-health). The focus on active travel and transit is to some extent understandable, given the common but perhaps misleading notion, that travel by car equates privilege. We argue that this is a somewhat mypoic omission in the literature reviewed, since it is possible that there are obligated car users who lack other privileges including, for example, people with mobility disabilities (Darcy and Burke 2018) or the working poor (Blumenberg and Pierce 2012).

So what's missing from the "Who" question? We believe, more nuisances perspectives of inequities are needed. We must go beyond the focus on the low-income transit rider; positioning intersectionality of socio-economic and mode-use to create community-based definitions of equity and tailored standards are critical.

As shown in the variety of methods, dimensions, conceptualizations and standards used, transport inequalities are multi-dimensional. How decision makers define an equity-deserving community will impact results (e.g., (Dana Rowangould et al. 2015)). In this sense, standards that are defined need to be sensitive to changing community-based definitions of inequities. Are issues of economic-inequity at the root of transport inequities for a specific community? Are (dis)abilities? Are inequities in the service of transit the focus of a study because it can be improved to address transport inequities and are alternative modes driving these inequities? Access to what sorts of opportunities are driving transport inequities? How do populations, transit modes, and opportunities saught intersect to define the "who" of inequities? A community- informed understanding of inequities and tracking how it changes are needed. Different slices of analysis are important to different groups, as such, we believe all should be studied with an explicit justice framing.

"WHAT" ARE THE OBJECTS OF TRANSPORTATION JUSTICE

Defining "What" are the things measured and the inequities that characterise their distribution is fundamental to tracking the progress towards transport justice. In the corpus reviewed, we char-

acterize the 'thing' of inequities (the "What") in the following dimensions: 1) a focus on accessibility and mobility, 2) transport-related environmental externalities, 3) centering human-health as related to transport systems, 4) human safety related to vehicular-traffic, and 5) cross-dimensional classifications.

Depending on the characterisation of "What", the thing of inequities and the object of justice, the focus varies. In the corpus reviewed, destinations of interest are predominantly to employment and healthcare; other destination types are less frequently studied. We know other destinations-type matter too, but we can only assume due to data restrictions and/or incomplete framing of "Who?" are the subjects of justice, these destinations are underrepresented in the corpus. In another significant branch of the corpus however, many papers do not consider specific destinations but the trip themselves – be it the the travel experience, the quality of the infrastructure, the mode or service, a bundle of trips taken a month to all locations, etc. Again, the framing of "Who?" is exceptionally important in determining what objects of justice are relevant to whom.

The literature offers a variety of conclusions and recommendations that span across the benefits of transportation (e.g., destinations types) that are often co-mingled with population groups and the tools of mobility. For instance, in a slice of the literature centered on the distributions of accessibility/mobility, some literature centers their equity analysis on populations with disabilities (the "Who") and their limitations in accessing transportation infrastructure (their mobility tools) e.g., (Jiménez-Espada and González-Escobar 2021; Daamen, de Boer, and de Kloe 2008; Bharathy and D'Souza 2018); the "What?" are these inequities of accessing existing transportation infrastructure (relative to other populations) and can be extended to describe the unequal application of *Rights* in a legal sense and/or beyond as the *right* to participate in the production of urban space (Lefebvre 1967). Inequities in accessing infrastructure, the "What", can be seen as supported by a rationale for justice (the "Why"). In a lot of the reviewed corpus, the rationale often stopped short in advocating for the *right* to the city, and instead frames the rational as a *legal or envisioned legal right* (e.g., ADA regulation (Bharathy and D'Souza 2018) or the goal of "access for all" in a land-use transportation master plan (Lim et al. 2021)).

Another slice of the objects (the "What") of justice in the corpus see their distributions assessed through conceptualizations of *horizontal* and/or *spatial* equity. These papers typically apply quantitative methods and see *inequity* in the distribution as the issue at hand; they are quiet in their rationales of justice. As mentioned in the summary of findings, examples often include literature that has selected some sort of travel impedance threshold (e.g, populations who cannot access hospitals within 1 hour by car (Shen et al. 2020)) and discusses the distribution of the calculated accessibility index spatially across the population e.g., (Monzon, Ortega, and Lopez 2013) or population groups (the "Who") e.g., (Sharma and Patil 2021). These papers may also conceptualize traffic-related air pollution, noise pollution, urban air temperature, among other transport-related externalities. Inequities in this "What" can be theorized to be equal if similar levels are attainable by all populations (horizontal equity) or all spatial areas (spatial equity). However, discussion of both minimums and maximums (those contributing the most to inequities) is seldom explicitly discussed through the lens of justice in the reviewed corpus.

Another branch of papers theorize the object of justice to be population *well-being* and they typically ask *what is enough to lead a satisfactory life (as related to transportation)*. These papers are typically quantitative or mixed-methods, and typically more explicitly identify the object of (in)justice, relative to papers concerned with *spatial* and *horizontal* inequities. For instance, as previously discussed, papers using minimum physical activity guidelines and questionnaires that

seek to understand population's activity related to active transportation infrastructure. We can assume the use of mixed/qualitative methods in a study's design as well as the use of standards linked to health outcomes (e.g., minimum travel times to get emergency treatment, premature mortality) leads to papers with a firmer identification of objects of justice.

Finally, there is another branch of research that is predominately quantitative and incorporates qualitative results or uses mixed-methods. These papers conceptualize the object of justice to be *transport related social exclusion*, *vertical equity*, and/or *sufficientarian/capabilities*. What is characteristic of these papers is the identification of standards that are often linked to outcomes like papers that conceptualize *well being*, however outcomes are often more tangible or welfare informed. As discussed, disadvantaged groups are the focus of analysis and the linkages between well-being and transport-related social exclusion (e.g., A. Delbosc and Currie 2011b; Churchill and Smyth 2019), areas more likely to experience transport poverty (J. Allen and Farber 2019), food deserts (McKey, Kim, and Seo 2020), or transport-related energy poverty (Robinson and Mattioli 2020; Berry et al. 2016; Berry 2019) are centered as the objects of justice.

What's missing from the "What?" in the equity analyses of the literature reviewed is the consistently explicit rationale for the object of justice. Specifically, "What?" are the benefits and burdens of a transportation system in terms of its: accessibility and mobility, or environmental externalities, or human-health externalities, or traffic related safety, or multi-criteria mix. In the inter-disciplinary analysis of transport systems, crystalising "What?" is the object of justice can create a stronger foundation to select appropriate methods to determine fairness and support the "Why?", the rationale of justice. In the equity literature reviewed, strong conceptualizations of the object of justice often falls short.

"HOW" IS FAIRNESS DETERMINED

How we define fairness should be fundamental to equity analysis. In the reviewed literature, we summarize the philosophical perspectives and "how" (by what methods and measures) they are operationalized into standards that we group as: 1) opportunity standards, 2) infrastructure standards, 3) environmental+ standards, and 4) population standards.

Papers that put forward opportunity standards typically use methods related to travel impedance (e.g., more than 10% of monthly income should not be spent on transport (Rivas, Serebrisky, and Suárez-Alemán 2018) to work and/or other necessary destinations). Alternatively, they operationalize spatial mismatch (disparity analysis) (e.g., Mulley et al. 2015) and identify areas of *relative* (regionally) inequities that should be addressed base on impedance thresholds to certain destination types. Others apply these same types of methods but tend to focus of human health, traffic-related safety, or cross-dimensional "What?"s. Methods can include inequality measures, poverty measures, and optimization methods to create 'optimal' landscapes, and once again vary depending on "Who?" and "What>" is centered.

Infrastructure standards are also suggested and used implicitly or explicitly as standards for fairness. Often times, access to destinations is conceptualized as a *Right* or a *right*, as such being able to enter the transportation network and physically use it the pre-requisite that accessibility measures do not capture (e.g., (dis)abilities focused). But reflected in the selection of a wide variety of approaches, the way the equity analysis is approached (who is centered and what is counted) informs *how* fairness is assessed; be it an established engineering standard, a critic of an engineering standard, or a community-informed infrastructure need.

Papers that propose transport-related environmental externalities standards are typically informed by international or regional health- or environmental- standards. A commonly used guidance document are WHO standards, be it traffic-related pollution, or noise standards and SGS goals on urban sustainability. The advantage of the use of these international standards is that they can facilitate cross community and temporal comparison to track progress towards equity targets; though they have limitations, as they have been critiques for being too general for practical application. Overall, the ability to measure externalities tangibly (i.e., the road-side noise pollution produced by vehicles, the reduction of emissions associated with public transit modal shift) create interpretable numbers that can be measured and compared against to track progress towards these goals. These tangible metrics may be easier to interpret and compare across communities than using accessibility/mobility measures (being their methods are abundant, and contain embedded differing assumptions depending on the application).

In terms of population standards, papers that operationalize them in their analysis typically focus on health-informed standards (e.g., physical activity guidelines (Timperio, Veitch, and Carver 2015)) or identify a significant population-based threshold (e.g., an EJ community as defined by U.S. EJ analysis (D. Rowangould, Karner, and London 2016)).

We believe that all forms of these standards, when linked to tangible outcomes can be used to track "fairness" in a region and can be used to track multi-dimensional progress towards justice depending on how robustly these standards are justified. Justification is exceptionally important, and we believe that a lot of the literature reviewed may miss this mark. However, literature that does not, usually connects to qualitative results and/or operationalizes mixed-methods.

Moving forward: calls for action

"The way to right wrongs is to turn the light of truth upon them._"
— Ida B. Wells

Measuring context-specific evidence of transport inequities is necessary to build knowledge of injustices and inspire creative interventions that advance the cause of justice. Understanding and tracking transport inequities over time and space, specifically knowledge of the "who", "what", "where", "how" and especially "why" (the rationale) is essential. Armed with this knowledge, the public, policy- and decision-makers, and scholars can help design policies to address these inequities, while remaining adaptable to face the changing demands of justice.

Flexible frameworks are important. As mentioned, transport is derived demand. But what is considered (in)essential today may change during the next pandemic or technological revolution. Who is to say what demand for travel will look like tomorrow and beyond? Creating adaptable transport equity frameworks that lend themselves to change as the demands of justice change is as important as ensuring that they are resilient to backsliding. We argue for the necessity of setting standards from a systems approach, consiering both *positive* rights (a right to have access to sufficient quality of essential services, for example) as well as *negative* rights (mobility of cars must be limited to reduce their impact on air quality, health, safety, and positive rights).

In this report, we outlined a conceptual framework for structuring equity analysis that aims to satisfy the above needs. We also summarize the findings from 165 relevant transportation equity papers from the academic literature, and critically appraise them. From what we saw and what

we did not see in the reviewed literature, we set out the following calls for action. Some of these calls target one or more of different audiences, including decision- and policy-makers, planners, scholars, and members of the public.

CALL 1: UNDERPIN STANDARDS IN RIGOROUS CONCEPTS OF JUSTICE

The conceptual grounding for standards is often left implicit within the literature: for example, Mueller et al. (2018) suggests the relative risk of mortality as related to transport-related air pollution should not be higher in deprived groups than the general population. It is not evident from the paper what are the conceptual foundations for this analysis, but we can infer with some confidence that this is a standard that conceptualizes *wellbeing* and could be in service of reparative justice. To move equity analysis outputs towards just transport futures, explicit inclusion of the rationale for justice, the "Why?", should become more common place. We must be clear with our terms – what is equity and for whom?

Standards are used as a benchmark for fairness, but some standards are also seemingly arbitrary in the reviewed literature. For example, Cao and Stanley (2017) proposes 20 ferries per day to avoid social exclusion for inter-island transport planning in the Philippines. However, these authors admit that a standard should be politically determined. It is unclear if, for instance, 10 or 30 ferries would make a difference in any specific object of justice (e.g., accessibility to particular destinations) or if that number is tied to funding or resource constraints. As another example, what is the conceptual underpinning of the 15-minute city, where 15 minutes is the standard for travel times? Is it sufficientarism? Or is it egalitariansm? The standard can be interpreted in a multitude of ways. The framing used to conceptualize justice must guide the standard. As Karel Martens and Golub (2021) convincingly show, being explicit about "why" is important.

Furthermore, if one function of the literature is to recommend standards, researchers need to link them to conceptualisations of equity that are compatible with justice frameworks. For decision-makers, setting standards, measuring inequities and moving towards setting flexible guidelines for standards that are also compatible with community-informed calls for justice is the next step. As such, we believe, firmer justification of standards using justice frameworks are often missing in the reviewed literature, but they are sorely needed.

CALL 2: DEVELOP CREATIVE METHODS FOR SYSTEMS-THINKING APPROACHES TO EQUITY

On the methodological side, we believe the wider application of mixed-methods are needed in transport equity research. Concepts and standards are usually discussed from purely qualitative or quantitative approaches. We believe this is a missed opportunity to combine the strengths of both approaches, whether by deep diving into some particular experiences or perceptions through qualitative methods or tailoring more meaningful quantitative analysis after qualitative explorations. For instance, Xie and Spinney (2018) find through interviews and go-alongs with women cyclists that the standard Cycling Level of Service (CLS) tools used by engineers to plan cycling infrastructure misses the critical gendered perspective. Further, Somenahalli and Taylor (2007) survey older adults to understand their mobility issues, revealing factors that are unseen in standard daily travel surveys.

While there is plenty of disparity analysis in the reviewed literature, frequently the standards used do not explicitly reflect practical application. For example, metrics of accessibility (usually mea-

sured with travel impedance cut-offs of between 15 to 60 minutes depending on the destination, population group and mode) are used to show descriptive differences among areas and groups but with scarce implications as to the experience of travellers. How low of an accessibility index is too low? Conversely, if a sufficient accessibility is met, high accessibility results in higher inequalities, but are inequalities of a certain level an issue? This lack of discussion makes translating results from these equity analysis into policy practice that may move conditions towards justice challenging. Creative methods and discussion of metrics of quantitative accessibility with intention of practical intervention should be paired with results; they should yield interpretable results and the explicit discussion of minimum *and* maximum values in the distribution of the object of justice (the "What?"), as applicable, is critical.

Other times, when analysis engages with metrics that may be tied to particular concepts of equity (like Gini coefficient or Theil index), they fall short in assessing whether the results are good or bad (e.g., Mijares, Suzuki, and Yai 2013). If a Gini coefficient of 0 means that all people have the same access to public transport stops, what does it mean if the result is 0.2, 0.3, or 0.4? Is this good or bad news? How should a decision-maker interpret this? Are new policies needed to reduce that number to a certain threshold, orienting future interventions? These questions usually remain unanswered despite its importance. These measurements can also bring some challenges and pitfalls (as recently summarized by Karner, Pereira, and Farber (2023)) but are necessary to move equity analysis into application and towards transport justice.

CALL 3: MAKING DATA AVAILABLE IS A MATTER OF JUSTICE

In the review of the literature, we were left wondering specifically - what are the motivations for the use of some destination-types and the choice to not include other destinations types? For instance, papers including leisure destinations (e.g., green space, parks, recreation) are infrequently studied and some categories are missing all together like 'mobilities of care'.

Of course, like all literature reviews, there are limitations, but we suspect that since methods used are predominately quantitative, the reliance on commonly used point of interest (POI) databases is also high. These databases typically include education, health and occasionally include aggregated categories for leisure and community. They are quiet on types of 'community' and 'leisure' (are they a community organization, government services, a visit to a family or friend, a caregiving destination). Further, they may be missing categories all together like childcare, typically daycare or facilities – domestic work, mobilities of care, and mobility interdependence. These missing categories are unrepresented in the reviewed relative to the presence of work and healthcare destinations.

We can only track what we have collected and compiled; and we know that transport systems' focus is more than just to work or as a source of economic development (though in underdeveloped regions, transport systems as a force of economic development is pronounced based on the concentration of Global South transport-induce economic development studies e.g., high-speed rail (Z. Chen and Haynes 2017; Monzon, Ortega, and Lopez 2013; H. Kim and Sultana 2015)). As such, data availability matters, especially in the context of the Global South and rural geographies as fewer official data sources and public research resources exist relative to urban communities and areas in the Global North. As well as in the operationalization of emerging conceptual theories (i.e., sufficientariansm (van der Veen et al. 2020)) in equity analysis.

The calls for and relevant issues of data availability are not new, but they have at least three

parts. What and who is the subject of justice? When/Where/How is it measured? And, who gets the consult and use the data? Deciding who is the subject of justice frames the data collection activity; if it's the mobility of those that do domestic work the classification of who does this work and how it changes over time/space is fundamental. How we classify has implications for our understanding of just who is a subject of justice, as illustrated by the history of racial classifications in the US (see Lee 1993). What methods we're using, under what spatio-temporal boundaries we conduct data collection, and who has access to the collected data (and who does not) can all impact fulsome conceptualizations of justice. In the case of transportation, the issue of data (collection/availability) as a matter of justice is gaining traction as digitalization of data casts a starker light on these questions Behrendt and Sheller (2023).

CALL 4: DEVELOP MORE DIRECT AND EXPLICIT LINKS BETWEEN STANDARDS AND LIVED EXPERIENCES

We believe that robust assessments of the implications of equity standards on the experience of the public is still lacking in the literature, but it is essential for equity analysis that translates into just practice. While the estimation of the benefits of increased mobility or accessibility, or reducing affordability burdens and transport externalities is commonplace in the literature, these estimations need to be associated with outcomes like life and neighbourhood satisfaction, subjective well-being, mental and physical health, social capital, among others.

Composite measures such as a transport-land-use index proposed by Appleyard, Ferrell, and Taecker (2017) is an example of systems-thinking approach that links findings to quality-of-life proxies; they ground their measure in the principle of *livability* along corridors of varying levels of estimated transport-land-use integration. However, the methods used demonstrate areas of relative high and low livability could go further; they could be tied to absolute goals of integration or livability. Relatably, Higgs et al. (2019) develops an urban livability index and demonstrates the relationship between the population's use of a certain mode in a neighbourhood and a one unit increase in the index. However, are there absolute minimums or maximums for the index or the mode-choice goals that should not be crossed?

We need more explicit discussion of the boundaries in the distribution of the object of justice (the "What?") alongside these creative methods. These links may be used to track progress towards justice across time and space, a critical point for practitioners.

CALL 5: RIGOROUSLY EVALUATE INTERVENTIONS AND POLICIES

We believe there is a need to evaluate equity interventions and policies: track their before, during, and after impacts. In this review, only approximately 10% of studies assess specific transport-related policy interventions through an equity lens . Examples include mode-shift from driving to active school travel (Mammen et al. 2014), transit fare restructures (Hickey, Lu, and Reddy 2010) and spatial analysis of Low Traffic neighbourhoods (Aldred et al. 2021). The assessment of interventions and tracking associated outcomes can be thought of as a key step towards transport justice.

Outcomes of interventions can be compared within and between communities, and cross community comparisons can be created that may expedite the adoption of effective policies that move towards just outcomes; the presence of these synthesis and comparative studies could support brave decision-makers in the application of research into practice.

Final remarks

We began this report with the history-making suborbital flight of Jeff Bezos and his fellow passengers, all of them very wealthy people. We wondered why coverage of the event, in particular Bezos' declarations planetside, were not met with more critical questions: who are the subjects of the marvelous future that Bezos fancies his trip will contribute to? All of the human species or only those who can afford space tourism? What are the benefits of space tourism and how are they distributed? Who are the recipients of the impacts?

As a point for contrast, we noted the treatment that Amazon workers receive, including the degrading need of drivers to urinate in bottles while in their delivery trucks, in between dropping off Amazon parcels, in order to meet their productivity quotas. Who benefits from this indignity? Who pays for it?

These are questions that intuitively seem easy: as we noted, humans have a keen sense of what is fair. But to move the political needle, it is critical that we have the concepts, the vocabulary, and the knowledge to express our intuitions of justice. The objective of this report is to provide a measure of clarity, with a particular focus on the definition and use of standards of fairness in transportation.

We argue that transportation, as an essential technology that can facilitate or hinder participation in society, is a very relevant sphere for matters of justice. The analysis of fairness and equity in transportation is vitally important for planning, Transportation systems and technologies converge space-time, and by definition they *always* leave certain populations, depending on the area and time scale, more or less burdened or benefited. The analysis and tracking of equity implications is fundamental in formulating standards that are flexible to the fluid demands of transport justice. In this spirit, this report outlines a conceptual framework for structuring equity analysis that may move us closer to transport justice, summarize findings from 165 relevant transportation equity papers from the academic literature, and critically appraised these findings with the conceptual transport justice framework.

The transportation justice framework can be seen as a flexible classification exercise that is supported by a "Why" rationale. In conducting an equity analysis, the subject of justice (the "Who?") must contextualize the process, the distribution of the object of justice (the "what?") must be measured, be it transport-related benefits, burdens or both, "How?" these inequities are measured and benchmarked must be described, and these questions must be contextualized by the "Where?" across temporally changing "When?"s. The explicit acknowledge and answers to these questions clarify the boundaries of the equity analysis. In this way, the rationale for "Why?" the equity analysis is important and what root cause of/for (in)justice is motivating the analysis in the first place may be critical to ultimately mobilizing equity analyses into experienced transport justice.

From this framework and the critical appraisal of the literature, we outline five call to actions for researchers and decision-makers that should be adopted to move equity analysis closer to transport justice. These include:

- Explicitly explain "Why?", the rationale for justice, along with supporting "Where", "When", "Who", "What, and"How" framings for equity analysis. This means specific conceptualizations and grounded standards.

- Creative methods of equity appraisal that can be paired with systems thinking; current methods are not used to support this processes.
- Data availability as a matter of justice: who is not being counted and who should be by whom and why?
- More explicit links between equity standards and experienced conditions and outcomes.
- Encouragement to continue work towards analysis and comparison of applied interventions, across communities and internationally.

As mentioned in the introductory paragraphs, defining *fairness* is complex, but complexity is no excuse to shirk away from the task. We hope that this report will prove useful to promote the idea that an anonymous Amazon driver is no less deserving of "access to the opportunities they need to lead a meaningful and dignified life" (Karner et al. 2020b, 440) than Bezos is for all his wealth. Likewise, we hope that in reviewing the literature, this report will contribute to advance the development and implementation of standards that help bend the arc of history towards more just transportation systems, and ultimately better societies.

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Appendix

SEARCH STRATEGY

Database/Index (Platform)	Search	Hits
Web of Science General Collection -Science Citation Index Expanded; Social Sciences Citation Index (Web of Science)	(TS= (("transport*" OR "travel" or "paratransit" or "microtransit" or "micro-transit" or "transit" OR "bus" OR "buses" OR "e-bus" or "e-buses" OR "busing" OR "streetcar*" OR "subway*" OR "tram" or "trams" or "tramway" or "public transport*" OR "rail*" OR "train" or "trains" or "bik*" Or "biking" OR "bike-shar*" OR "bike shar*" OR "cycling" OR "bicyclist*" OR "bicycling" OR "*scooter*" or "pedestrian*" OR "walk*" OR "active transport*" OR "active travel" or "ride-shar*" OR "ride shar*" OR "ride-hail*" OR "car" OR "cars" OR "car-shar*" Or "car shar*" OR "taxi*" or "*motori*ed")) AND (TS=(("MCA" or "CBA" or "wider impact*" or "mobility" or "accessibility" or "access" or "affordab*" or "user fees" or "user-fees" or "poverty" or "activity participation" or "quality of service" or "level of service" or "service frequency" or "congestion" or "crowding" or "safety" or "collisions" or "accidents" or "crashes" or "vulnerable road user*" or "*policing" or "*policed" or "externalit*" or "pollution" or "air quality" or "emissions" or "energy consumption" or "fuel consumption"))) AND (TS=(("justice*" or "fairness" or "fair" or "ethic*" or "equit*" OR "inequit*" OR "equalit*" OR "inequalit*" OR "equal" OR "unequal" OR "dispari*t" OR "relian*" or "*dependent" OR "social inclusion" OR "social exclusion" or "capabilit*" or "marginali*" or "barrier*" OR "disadvantage*" or "needs-based" or "dissonance" OR "wellbeing" or "well*being" or "transport poverty" or "social assessment" or "equity assessment" or "universal design" or "captive" or "deprived"))) AND (TS = (("standard*" OR "threshold*" or "indicator*" or "criteria" or "criterion" or "guideline*" or "guidance" or "score*" or "equ* ind*" or "pricing strateg*" or "priorit*"))) and (TASCA == (Transportation or Public Environmental Occupational Health or Environmental Sciences or Transportation Science Technology or Economics or Engineering Civil or Environmental Studies or Geography or Green Sustainable Science Technology or Energy Fuels or Engineering Environmental or Geography Physical or Social Sciences Interdisciplinary or Social Issues or Social Sciences Mathematical Methods or Social Sciences Biomedical or Social Work or Sociology or Philosophy or Urban Studies or Engineering Multidisciplinary or Regional Urban Planning)) 1992 to 2022; English; Doc type: Articles, Early Access, Book Chapters	4187
Transportation Research International Documentation - (TRID)	Keywords = ("MCA" or "CBA" or "wider impact*" or "mobility" or "accessibility" or "access" or "affordab*" or "user fees" or "user-fees" or "poverty" or "activity participation" or "quality of service" or "level of service" or "service frequency" or "congestion" or "crowding" or "safety" or "collisions" or "accidents" or "crashes" or "vulnerable road user*" or "*policing" or "*policed" or "externalit*" or "pollution" or "air quality" or "emissions" or "energy consumption" or "fuel consumption") AND ("justice*" or "fairness" or "fair" or "ethic*" or "equit*" OR "inequit*" OR "equalit*" OR "inequalit*" OR "equal" or "unequal" OR "dispari*t" OR "relian*" or "*dependent" OR "social inclusion" OR "social exclusion" or "capabilit*" or "marginali*" or "barrier*" OR "disadvantage*" or "needs-based" or "dissonance" OR "wellbeing" or "well*being" or "transport poverty" or "social assessment" or "equity assessment" or "universal design" or "captive" or "deprived") AND ("standard*" OR "threshold*" or "indicator*" or "criteria" or "criterion" or "guideline*" or "guidance" or "score*" or "pricing strateg*" or "priorit*" or "equ* ind*") Subject Areas: Passenger Transportation OR Pedestrians and Bicyclists OR Policy OR Public Transportation OR Transportation (General) OR Railroads - (the use of subject areas replaces the Transport concept) Language: English Document type: Articles and papers Published: 1992 to 2014 then another search for 2015 to 2025	2645

Figure 8: The search query. TS = topic search (keywords, abstract, title). TASCA = subject categories. Green text area transportation system related terms, blue text are equity dimension related terms, purple text are equity/justice conceptualization related terms, and orange text are standards related terms. Hits corresponds the number of papers that the search yielded and was retained into the evidence selection process.

Definitions of the population-concept context (PCC) used in the creation of the inclusion and exclusion criteria for the search strategy.

- **Population**: the focus of the included studies should be on individuals, groups, communities, or entire regional areas that are impacted by passenger transportation infrastructure and systems (i.e., all modes and flows) from the perspective of equity (i.e., fair distribution, production, and re-production of burdens and benefits). This criteria is reflected in the creation of the first set of topic search terms that relate to transportation modes (e.g., "walking" OR "cycling" OR "transit" - see green text in Figure 8 for the full list).
- **Concept**: the included studies should also include equity dimensions and conceptualizes equity as discussed in the previous section. This inclusion criteria is reflected in the second and third set of topic search terms developed in the search strategy. These terms relate to types of equity dimensions (e.g., "accessibility" OR "mobility" or "transport-related air pollution" - see blue text in the Figure 8 for the full list) and equity conceptualizations (e.g., "Justice" OR "equity" - see purple text in Figure 8 for the full list).
- **Context**: the included studies should also be limited to publications that include equity standards. Context can be more difficult to explicitly search for with key terms so synonyms for 'standards' were added to the query as a four set of topic search terms (e.g., threshold, indicator, criteria - see orange text in Figure 8 for full list). Additionally, journal article and conference papers, English-language literature from any country, any study design (e.g., quantitative, qualitative, or mixed-method studies, or conceptual frameworks), and any record published within the past 30 years are included (January 1992 to March 2022). The time period is selected as the first (to the authors knowledge) peer-reviewed article which operationalized equity standards and equity conceptualization was published in

1996 (Khisty 1996); we are broadening the search by a few years for completeness. English is selected as it is the common language spoken across the authorship team. Furthermore, papers that explicitly fall within the Transportation or related topic/category is included in the query (e.g., "Transportation", "Social Sciences", "Geography", "Civil Engineering", "Philosophy" - see the Figure 8 for full query).

The **exclusion criteria** for the search are papers that are not within the inclusion criteria. Specifically:

- Literature published before January 1992.
- Papers which do not include transportation equity dimensions.
- Grey as concepts contained within are frequently published in a more developed form in journals.

EXAMPLE OF THE DATA EXTRACTION TEMPLATE:

EXAMPLES OF PAPERS SUMMARIZED BY ELEMENT OF THE ANALYTICAL FRAMEWORK

Dimension	Continent	Conceptualization
What?: **mobility and accessibility**	Where? (Rivas, Serebrisky, and Suárez-Alemán 2018) - South America (select cities)	Analyses how affordable urban public transportation is in select Latin A
	Where?: (Bharathy and D'Souza 2018) - North America (USA - National)	This study designed a web-based tool and took a representative sample
	(Ryan and Pereira 2021) - Europe (Stockholm, Gothenburg and Malmo cities in Sweden)	Investigates what the literature and planning process is missing when w
	Where?: (Wismadi et al. 2014) - Asia (Yogyakarta, Indonesia)	Explores the equitable provision of transport infrastructure provision: ar
	Where?: (Zheng and Geroliminis 2020) - North America	This paper conceptualizes equity in the multimodal network (transit, ca
What?: **health impacts** / environmental pollution	Where?: (Carrier et al. 2014) - North America (Montreal, Canada)	This work examines the statistical association between different social
	Where?: (Jephcote and Chen 2013) - Europe (Leicester, UK)	Geospatial analysis of naturally occurring boundaries in road-transport
	Where? (Adlakha and Parra 2020) - Asia (Chennai, India)	From the perspective of disparity in gendered physical activity, this pape
	Where? (Saving Mothers et al. 2019) - Africa (Select urban and rural regions in Uganda)	The **well-being** of mothers, this paper examines the timely access to en
	Where?: (Iungman et al. 2021) - Europe (Madrid and Barcelona, Spain)	They use environmental pollution guidelines, but from the position of he
	Where?: (Mehdizadeh, Mamdoohi, and Nordfjaern 2017) - Asia (Rasht, Iran)	From the perspective of children's **well-being**, assesses the walking tim
	Where? (Murphy et al. 2017) - Oceania (Melbourne, Australia)	Assesses the relationship between supermarket access and transport n
What?: **transport-related safety**	Where?: (Ferenchak and Marshall 2019) - North America (Denver, USA)	Operationalizes and compares an equity analysis of proactively- and rea
	Where?: (Zhe et al. 2008) - Asia (Tokyo, Takamatsu, and Tokushima)	Evaluates the observed safety of shared use pedestrian and bicycle path

Dimension	Continent	Conceptualization
What?: **mobility/accessibility and safety**What?: mobility/accessibility, health impacts, and safetyWhat?: **Mobility/ accessibility** and **health impacts**What?: mobility/accessibility and health impactsWhat?: **mobility/accessibility and health impacts**	Where?: (Alderton et al. 2019) - Asia (Bangkok, Thailand) – **Mobility/ accessibility** and **health**	Establishes short-, medium-, and long-term goals for the city in collabor
	Where?: (Berhe, Martinez, and Verplanke 2014) - Africa (Mekelle, Ethiopia)	Examines adaption and dissonance in the quality of life (QoL) of resider
	Where? (Agost-Felip, Rua, and Kouidmi 2021) - Europe (Castellon, Spain)	Conceptualizes equity through age-friendly urban spaces that reduce (a
	Where?: (Mateo-Babiano 2016) - Asian (Manila, Philippine)	The perception of pedestrians' walking environments should be sufficie

	Our reference definition and/or action * = definition is redundant

GENERAL PUBLICATION DETAILS

Author	(write-in)
Title	(write-in)
Publication year	(write-in)
Type of publication (academic paper or conference paper)	Multiple choice
Research goal/question	(write-in)

EQUITY DIMENSION AND CATEGORIES

Equity dimension (multiple choice + write in)		
	(Im)Mobility	Focus on people and their ability to freely move between activities (e.g., physical barriers).
	Accessibility	Focus on people/infrastructure and the potential for interaction with activities.
	Activity participation	The ability to freely participate in activities.
	Quality of service	Related to user satisfaction with transportation service and/or objective measures (i.e., service frequency, road quality, congestion, crowding).
	Affordability	Associated with socio-economic conditions of users and/or user-fees (e.g., housing affordability related to transportation, transport affordability, transport user fees)
	Pollution - air, noise, visual	Pollution as a result of transportation systems or modes.
	Energy	Related to transportation energy consumption and/or related concepts (e.g., fuel poverty).
	Safety - Road safety/vision zero/sense of safety	Risk of physical injury related to transportation (e.g., car crashes, bike injuries, over-policing related risk, sense of safety using transportation systems such as harassment or over-policing.)
	Health	Health aspects related to transportation systems (e.g., mode choice, health-related pollution, stress level).
	Community severance	A focus on the transport system+communities and how it limits people's mobility.
	System resilience	Related to how transportation systems mitigate the severity and likelihood of failures/disruptions, to adapt to changing conditions, and to respond appropriately after the fact.
	Other	(write-in)
Case study continent (multiple choice)	North America	*
	South America	
	Europe	
	Asia	
	Africa	
	Australia	
Case study city and country (write in)	City, neighborhood, metropolitan area, county, state, or similar (separate multiple entries with a semi-colon)	(write in)
	Country (separate multiple entries with a semi-colon)	(write in)
Case study urban form (multiple choice)	Urban	*
	Rural	
	Suburban	
	Other	(write-in)
Service mode (multiple choice + write in)	Private	Privately owned vehicle, operating as owner's/household's transportation (i.e., transit, bike-share, publically owned micro-mobility options)
	Public	Publically owned vehicle, operating as public transportation
	Private-Shared	Privately owned vehicle, operating as shared transportation (i.e., carshare, ride-share)
	Autonomous	Autonomous or semi-autonomous operation
	Other	(write-in)
Mode (multiple choice + write in)	Transit	Bus, subway, light-rail, BRT
	Commuter rail	Heavy-rail train
	Pedestrian	Any pedestrian travel, assisted or otherwise
	Car	Any car, SUV, light truck, or van
	Micromobility options	Bicycles, e-bikes, e-scooters, e-skateboards, shared bikes, scooters, skateboards
	Other	(write in)
Network conditions (multiple choice + write in)	Peak	Peak traffic conditions (e.g., AM, PM)
	Off-Peak	Off-peak conditions
	Disrupted	e.g., COVID-19, emergency evaluation, planned service disruptions
	Other	(write-in)
Associated intervention (multiple choice + write in)	Pedestrian-related	Equitable improvements to facilities e.g., sidewalks, trails, lighting
	Transit-related	Equitable improvements to facilities (e.g., stations, dedicated lanes, vehicles) or fare pricing schemes
	Car-related	Equitable improvements to facilities (e.g., lanes, parking) or fare/toll pricing schemes
	Micro-mobility-related	Equitable improvements to facilities (e.g., lanes, parking) or user pricing schemes
Population group (multiple choice + write in)	Age	(write in)
	Gendered	(write in)
	LGBTQ+	(write in)
	Income groups	(write in)
	Unemployed status	(write in)
	New-comer status	(write in)
	(Dis)Abilities	(write in)
	Race/Ethnicity	(write in)
	Vulnerable groups (composite)	(write in)
	Other	(write in)
Activities/Opportunities (multiple choice + write in)	Employment	Activities/opportunities viewed explicitly as employment within the record
	Healthcare	e.g., Hospital, dentist, community health services
	Educational facilities	e.g., primary/secondary schools, post-secondary institions, apprentice training
	Childcare facilities	e.g., home daycare, institutional daycares, child-minding services
	Shops, markets or grocery stores	e.g., food stores, convience stores, malls, electronic stores , stationary stores, pet shops, flower shops
	Leisure (recreation or entertainment)	e.g., restaurants, theatre and cinema, museums, restaurants, beach
	Places for exercise, outdoor activities, or sports	e.g., physical fitness facilities, parks (in different scales), sports stadiums
	Community support , cultural or worship	e.g., governmental organization & social group, religious organizations, cultural facilities
	Other	(write in)
EQUITY DIMENSION AND CATEGORIES	Additional details	(write in)

EQUITY STANDARDS

Type (multiple choice + write in)	Max./min. travel distance	(write in)
	Max./min. travel time	
	Opportunity availability	
	Max. benefit and/or min. Cost	
	Accessibility score min/max.	
	Other	(write-in)
How the type is mentioned	Explicit	Explicitly sited in the paper
	Implicit	Infered based on measurement
Measure (multiple choice + write in)	Gini/Lorenz	(write in)
	De Palma index	
	Poverty measures (FGT or other)	
	Maximum gap approach	
	Needs-based approach	
	Capability approach	
	Composite mobility index	
	Composite vulnerability index	
	Accessibility index	
	Level of service	
	Other	(write in)
EQUITY STANDARDS	Additional details	(write in)

EQUITY CONCEPTUALIZTION

Type (multiple choice + write in)	Utilitarian	Concerned with the aggregate distribution of transportation benefits/burdens (not individual). Net benefit is maximized and/or net burden is minimized (Pereira et al., 2017).
	Libertarianism	Distribution of transportation benefits/burdens as a result of free-market transactions (Pereira et al., 2017).
	Rawl's Egalitarianism – Different Principle	Interventions (i.e., infrastructure investments, subsidies, service provision) can only be considered fair if they improve the accessibility levels of the least advantaged groups (Pereira et al., 2017).
	Sufficientarian / Capabilities approach	Minimum and/or thresholds for interventions and/or outcomes related to key activities (accessibility/mobility, etc.) and quality of life/capability. (Pereira et al., 2017).
	Horizontal equity	Equal interventions for all groups; this means treating individuals equally in equal circumstances and opposing unjustifiable preferences of one individual or group over another. e.g., a planner would distribute transit burdens and benefits evenly throughout the community (Camporeale et al., 2019; van Wee, 2011) .
	Vertical equity	Equal outcomes for all groups; this means groups with greater ability should contribute more to groups with less ability (i.e., considers existing social inequities and/or different mobility or accessibility). E.g., a planner would prioritize transit benefits and the reduction of burdens for socio-economic disadvantages groups and/or mobility/accessibility disadvantages groups (Camporeale et al., 2019; van Wee, 2011).
	Rights	Concerned with fundamental rights- i.e., right to the city/right to mobility/universal design principles
	Transport disadvantage	Interrelation between inadequate transport, dispersed services and/or lack residential location choices. The focus could be disadvantaged groups who experience these problems, or transport/urban form characteristics
	Transport poverty	An individual is transport poor if at least one of the following conditions apply: • There is no transport option available that is suited to the individual's physical condition and capabilities (Mobility poverty) • The existing transport options do not reach destinations where the individual can fulfil his/her daily activity needs, in order to maintain a reasonable quality of life. (Accessibility poverty) • The necessary weekly amount spent on transport leaves the household with a residual income below the official poverty line. (Affordability) • The individual needs to spend an excessive amount of time travelling, leading to time poverty or social isolation (Time poverty) • The prevailing travel conditions are dangerous, unsafe or unhealthy for the individual (Exposure to externalities)
	Time poverty	Lucas et al (2016) transport-related definition: "The individual needs to spend an excessive amount of time travelling, leading to time poverty or social isolation". Could relate to income-status but does not necessarily have to.
	Transport-related social exclusion	Kenyon et al. (2002) have defined transport related social exclusion as "the process by which people are prevented from participating in the economic, political and social life of the community because of reduced accessibility to opportunities, services and social networks, due in whole or in part to insufficient mobility in a society and environment built around the assumption of high mobility"
	Wellbeing/satisfaction	Focus on subjective wellbeing or user satisfaction
	Spatial or modal equity/equality	Focused on spatial differences in interventions, outcomes, and/or socio-demographic composition of transportation users.
	Community engagement and recognition –bottom-up transport planning	Focus on public participation and procedural justice as it concerns transportation planning.
	Restorative justice	Focus on repairing harm for those harmed in any transportation dimension
	Other	(write-in)
How the type is mentioned	Explicit	The paper mentions the conceptualization by name
	Implicitly	The concept is inferred
EQUITY CONCEPTUALIZTION	Additional details	(write in)