Transport Policy 149 (2024) 11–20

Contents lists available at ScienceDirect

Transport Policy

journal homepage: www.elsevier.com/locate/tranpol

Equity and Social Justice considerations in road safety work: The case of Vision Zero in New York City

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ARTICLE INFO

Keywords:
Criticisms
Data-driven approach
Equity
New York City
Road safety
Safe systems
Social justice
Sweden
Vision Zero

ABSTRACT

This paper analyses how Vision Zero (VZ) efforts in New York City (NYC) account for equity and social justice implications of road safety work. VZ policy documents, research literature, popular science and opinion articles on road safety work in the city were studied with a prime focus on equity and social justice. Twelve semi-structured interviews with stakeholders involved in road safety and transport planning in the city and at national level were conducted to gain an in-depth understanding of policy design, the adoption process, and the role of equity considerations in the city's road safety work. The results show that major equity and social justice issues arise in the adoption and implementation of VZ. These issues are primarily related to equity and fairness in the distribution of life saving interventions, the socio-economic impacts of road safety strategies, and the nature of community engagement in policy design and implementation. The findings point to a need for VZ practitioners to give due considerations to equity and social justice implications of VZ policies and strategies. Among others, it supports the need for understanding the nature of past equity and social justice problems in road safety and transport planning in the VZ policy design process. Moreover, the findings suggest the need for empirical studies on the socio-economic implications of VZ strategies and interventions.

1. Introduction

Road fatalities and serious injuries are not only a public health problem but have major equity and social justice implications. Today, road crashes are the leading cause of death for children and young people (WHO, 2018). Low-income groups and minorities tend to be overburdened with the negative externalities of road transport, and road fatalities and injuries often disproportionately affect pedestrians, cyclists, and older people (Fox and Shahum, 2017; Rebentisch et al., 2019; Viola et al., 2022). Moreover, strategies and interventions promoted to address road safety problems have important equity and social justice implications. Sometimes, measures to further road safety impact positively on other goals, such as when the promotion of protected cyclist lanes have beneficial environmental effects (Yanocha and Mawdsley, 2022; Kraus and Koch, 2021; Taylor, 2022; Volker and Handy, 2021). At other times, planning, design, and institution of road safety measures have negative socio-economic impacts (Hoffmann and Lugo, 2014; Karner and Golub, 2019; Lugo, 2013). For example, police enforcement aiming to promote road safety can impact negatively on ethnic minorities. Often, transport and safety policies have implications that go beyond current generations. Many externalities of the transport system, including road fatalities and injuries, are a result of past transport policy choices promoted without considering the interests of future generations.

Many cities in the U.S. and beyond are promoting VZ in their road safety efforts (Kristianssen et al., 2018; Mendoza et al., 2017). VZ was first adopted by the Swedish parliament in 1997, as a long-term goal of road safety policy (prop. 1996/97:137).[1] It represents a paradigm shift in how the road safety problem is framed and addressed (Belin, 2021; Belin et al., 2012; Tingvall and Haworth, 1999). According to VZ, road fatalities and serious injuries are preventable, and the only morally acceptable road safety goal is, therefore, the eventual elimination of any such outcomes. This can be constrasted with a more 'traditional' road safety approach that considers fatal and serious injury crashes an acceptable price to pay for the benefits of mobility. VZ builds on two fundamental facts about human road users: they are physically fragile and cognitively fallible. The design of the road transport system must be adapted to these basic facts to effectively prevent fatal and serious

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[1] https://www.riksdagen.se/sv/dokument-och-lagar/dokument/proposition/nollvisionen-och-det-trafiksakra-samhallet_gk03137/(accessed 15-07-2023, in Swedish).

https://doi.org/10.1016/j.tranpol.2024.01.024
Received 15 March 2023; Received in revised form 17 October 2023; Accepted 25 January 2024
Available online 1 February 2024

injuries. That is, when road users make mistakes, the road system should protect them from death or permanent loss of health. Thus, in contrast to the emphasis in traditional road safety work on strategies intended to adapt the road users to the requirements of the road system, VZ seeks to adapt the road system to road users' needs and capabilities.

Another distinguishing feature of VZ is that it shifts the main responsibility for road safety from individual road users to the so-called 'system designers', i.e., road infrastructure designers, vehicle manufacturers, vehicle procurers, insurance companies, and government agencies. Thus, VZ promotes a radically different view on responsibility for road safety (Hysing, 2021; McAndrews, 2013; Nihlén Fahlquist, 2006). Since road safety problems are primarily due to defective design and operation of the road system, VZ requires that those primarily responsible for the design and operation of the road system ought to have the ultimate moral responsibility for ensuring road safety.

Despite VZ's proliferation globally, its implications on equity and social justice have not been systematically studied. Although there are quite a large number of studies that have looked into equity and social justice concerns in road transport (e.g Di Ciommo and Shiftan, 2017; Jones and Lucas, 2012; Karner and Golub, 2019; Pereira et al., 2017; Verlinghieri and Schwanen, 2020), only very few have specifically dealt with Vision Zero policies and their implications for equity and social justice (Conner, 2017; Rebentisch, 2018; Michael et al., 2021). For instance, Rebentisch (2018) analysed equity in the distribution of bike infrastructure developments in three U.S. cities using local policy documents. Michael et al. (2021) assessed how the safe systems approach could be used to address equity-related concerns associated with police enforcement work in the U.S. The present study differs from previously published works in terms of scope which is broader in that it analyses different road safety strategies, specific focus on equity and social justice implications of VZ policies and startegies, and in its use of multiple methods in data collection and analysis.

Considering that VZ is currently adopted in political, socio-economic, and cultural contexts that are different to where it was originally introduced (Sweden) – contexts that have historically been marked by inequities in road safety – it is valuable from a policy perspective to investigate how VZ impacts on equity and social justice and what measures VZ practitioners could take to mitigate those impacts. This paper explores the equity and social justice issues that arise in the implementation of VZ at city level, using NYC as empirical departure point. The findings of the study are relevant for road safety practitioners and stakeholders working with VZ, in particular those in contexts distinguished by inherited inequities and injustices in road safety.

In the next section, the methods used in the study are presented. In section three, the VZ policy adoption process in NYC is described along with the strategies and interventions promoted to enhance road safety. In section four, four equity and social justice-related criticisms against the NYC VZ are identified. In section five, the results and implications of the study are discussed. Section six contains the conclusions.

2. Methods

In this paper, case study methodology is used to explore the equity and social justice considerations that arise in the implementation of VZ in a specific geographic location. Case study methodology is appropriate when the scientific aim is to understand a contemporary phenomenon within its real-world context (Yin, 2015, 2018). Through a case study the contextual conditions of a phenomenon can be explored in a way that deepens understanding of the phenomenon.

The choice of NYC was made based on several considerations. NYC was the first city in the U.S. to adopt and implement a VZ policy. Therefore, it was assumed that a sufficient amount of data concerning the adoption and implementation of the policy and its potential equity implications would be available for the researchers to draw valid and generalizable conclusions. Moreover, as compared to Sweden, where the VZ policy first emerged, NYC is characterized by a different demography and a different economic and political system. This provides an opportunity to study the equity and social justice implications of VZ in a socio-economic and political context different to the one in which it was originally adopted. Finally, although NYC has achieved relative success in road safety since the adoption of VZ, the implementation of the policy has generated significant public debate regarding the socio-economic and equity implications of promoted road safety interventions. Thus, data concerning the equity implications of VZ and the arguments for and against various interventionswere assumed to be readily available for normative analysis.

Two sets of data were used in the study: written material, i.e., policy documents, academic literature, and popular science and opinion articles, and interview data.

Written material: The analysis started with a desk-based study of relevant policy documents, academic literature, and popular science and opinion articles related to VZ in NYC. First, the major policy documents adopted at city level were located and analysed. These documents are listed in Table 1. These policy documents are publicly available on the government website dedicated to VZ work in the City.[2] In total, 20 policy documents and reports were studied.

Second, relevant academic research related to equity and social justice in the implementation of VZ were identified through a literature search in *Scopus*, *Web of Sciences*, *Science Direct*, *PubMed* and *Google Scholar* and snowballing.

Third, a Google search was conducted to identify popular science, opinion and media articles discussing equity and social implications of VZ and road safety interventions in NYC. The articles were studied with the specific aim to identify equity and social justice related issues and criticisms targeted at road safety work in NYC's VZ efforts.

Interview data: 12 semi-structured interviews with key stakeholders involved in road safety work in NYC were conducted to get an in-depth understanding of the initial policy design process and considerations given to equity and social justice. The respondents were asked about their views on the nature of equity problems in the city and how equity and social justice aspects are considered in current road safety efforts. The interviews followed a template that was adjusted depending on informant. Purposive sampling and snowball techniques were used to identify key informants. To ensure inclusivity, we included informants representing different stakeholders, including departments within the NYC administration (6 informants), NGOs and social justice groups (4), and academic researchers (2). Five of the interviews were made in person in October 2019 and seven were conducted online in 2020.

The interviews lasted about 1h on average. The audio interviews were transcribed word by word and analysed with a particular emphasis on the nature of equity and social justice issues. For the purpose of anonymity, the respondents are coded below.

The collected data was analysed using a triangulation of data analysis methods: qualitative content analysis, argumentation analysis, including categorization of arguments, and content analysis of interview statements, see Fig. 1. Qualitative content analysis involves identifying similar themes and concepts in the text data analysed (Bryman, 2016). It was used to analyse the policy documents and other written material. Argumenatation analysis is a philosophical method that involves critical analysis and evaluation of arguments, claims, and assumptions based on established rules of logic (Liakopoulos, 2000). The transcribed interview data were analysed qualitatively with the aim of identifying common themes, critical aspects and patterns in reasonings on issues related to equity and social justice.

3. Vision Zero in NYC

Since its initial adoption in the late 1990s, many countries and cities have adopted VZ as a response to the vision's relative success in reducing fatal and serious injuries, but also to accommodate the ethical

[2] https://www.nyc.gov/content/visionzero/pages/library.

Table 1
Major Vision Zero policy documents and progress reports in New York City.

Title	Year of adoption	Description	Link
Vision Zero Action Plan	2014	The first city wide VZ action plan adopted in NYC	https://www.nyc.gov/assets/visionzero/downloads/pdf/nyc-vision-zero-action-plan.pdf
Pedestrian Safety Action Plans	2015	Borough specific pedestrian safety action plans containing strategies and interventions aimed at improving pedestrian safety	http://www.nyc.gov/html/dot/downloads/pdf/ped-safety-action-plan-brooklyn.pdf http://www.nyc.gov/html/dot/downloads/pdf/ped-safety-action-plan-manhattan.pdf http://www.nyc.gov/html/dot/downloads/pdf/ped-safety-action-plan-queens.pdf http://www.nyc.gov/html/dot/downloads/pdf/ped-safety-action-plan-staten-island.pdf http://www.nyc.gov/html/dot/downloads/pdf/ped-safety-action-plan-bronx.pdf
Vision Zero Year One Report	2015	Implementation and progress report by the Mayor's Office of Operations	https://www1.nyc.gov/assets/visionzero/downloads/pdf/vision-zero-1-year-report.pdf
Vision Zero Year Two Report	2016	Implementation and progress report by the Mayor's Office of Operations	https://www1.nyc.gov/assets/visionzero/downloads/pdf/vision-zero-year-two-report.pdf
Vision Zero Year Three Report	2017	Implementation and progress report by the Mayor's Office of Operations	https://www1.nyc.gov/assets/visionzero/downloads/pdf/vision-zero-year-3-report.pdf
Vision Zero Year Four Report	2018	Implementation and progress report by the Mayor's Office of Operations	https://www1.nyc.gov/assets/visionzero/downloads/pdf/vision-zero-year-4-report.pdf
Vision Zero Year Five Report	2019	Implementation and progress report by the Mayor's Office of Operations	https://www1.nyc.gov/assets/visionzero/downloads/pdf/vision-zero-year-5-report.pdf
Update to Pedestrian Safety Action Plans	2019 and 2023	Revised borough specific action plans	https://www1.nyc.gov/html/dot/downloads/pdf/vz-2019-update-city-hall.pdf https://www.nyc.gov/html/dot/downloads/pdf/ped-safety-action-plan-update-2023.pdf
Vision Zero Year Six Report	2020	Implementation and progress report by the Mayor's Office of Operations	https://www.nyc.gov/assets/visionzero/downloads/pdf/vision-zero-year-6-report.pdf
Vision Zero Year Seven Report	2021	Implementation and progress report by the Mayor's Office of Operations	https://www1.nyc.gov/assets/visionzero/downloads/pdf/vision-zero-year-7-report.pdf

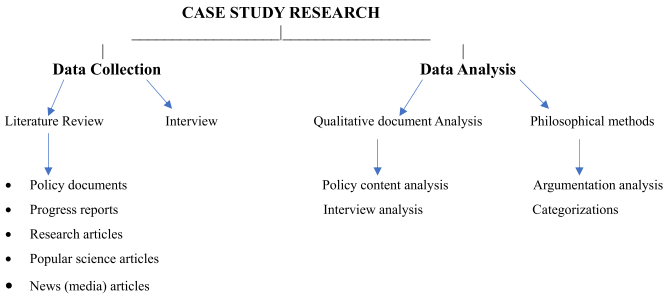

Fig. 1. Dendrogram showing study methodology.

commitment underlying the policy (Abebe et al., 2023). The expansion of VZ policy from Sweden to other places could be viewed as an example of policy transfer, as it involves the dissemination of road safety knowledge "generated and tested in the location from which it is transmitted at a specific point in time and applied in the receiving location at a later time" (Haupt, 2023, p. 5). Exploring the nature of this policy transfer and how local contexts influence the success of the policies introduced can help VZ practitioners adjust the VZ strategies and interventions so as to promote not only road safety but broader sustainability goals, including equity and social justice. In this section, we describe the initial policy adoption process and the strategies and interventions promoted in the NYC VZ policy documents.

The NYC VZ policy was formally adopted in 2014 but followed earlier calls from road safety advocacy groups, such as *Transportation Alternatives* and *Families for Safe Streets* (Kristianssen, 2023; Michael et al., 2022). By 2011, *Transportation Alternatives*, an advocacy group established in 1970 with the aim of promoting walking, biking, and public transit in NYC, had already published a report titled "*Vision Zero: How Safer Streets Can Save More Than 100 Lives a Year*" in which it explicitly called for the city to commit to the goal of zero fatal and serious injuries (Petro and Ganson, 2011). The report recommended that safety becomes the primary goal of the NYC street transportation system. *Transportation Alternatives* was later joined by *Families for Safe Streets,* an advocacy group consisting of people who have either lost a family member due to road crashes or are themselves crash survivors. The early calls from these advocacy groups was critical in garnering political support for the VZ policy in the city (Kristianssen, 2023).

The VZ policy was endorsed by the then elect mayor of NYC, Bill De Blasio, who after his election proceeded to create the city's VZ Task Force to oversee the design and implementation of the VZ policy. Soon the NYC mayor adopted NYC's first action plan to serve as the "the City's foundation for ending traffic deaths and injuries" (City of New York, 2014, p. 7). The mayor's political commitment was subsequently confirmed and strengthened through a series of policy documents, see Table 1. The key features of the NYC VZ policy, as set out in these policy documents, are described next.

3.1. Data driven approach in prioritization of areas for road safety improvement work

There is no clear definition of the Data Driven Approach (DDA). The term appears in the NYC VZ policy documents and refers to how road safety interventions and areas for safety improvement are selected. As a general principle, the DDA implies that the city's limited resources should be allocated to empirically confirmed high-risk areas (Viola et al., 2015c). Based on pedestrian fatal and serious injury data, the NYC Department of Transportation (DoT) selects high-risk areas that deserve priority, so-called "Priority Corridors", "Priority Intersections", and "Priority Areas" (Viola et al., 2019).

From the policy documents it is clear that the DDA is believed to contribute to a more equitable distribution of road safety risks, since it ensures that resources are allocated to areas where they are needed the

most, rather than, for example, safer areas where socio-economically advantaged groups can more easily mobilize and raise public complaints (U.S. DoT, 2019; NYC DoT, 2021). The purported equity advantages of the DDA were confirmed in the interview data. Several respondents argued that the DDA provides a neutral and equitable way of distributing road safety resources:

> "We had both the data of where people are actually dying and then data about where people were requesting safety projects, and if you looked at those two maps, you saw that where people were requesting safety projects it tended to be in higher income neighbourhoods, where people were more connected to the government, where people felt like they could shape the government around them, that people would be more responsive … But when you looked at where actually people were dying there was a different set of neighbourhoods that were less willing to go out there and say hey, what I need is a safety upgrade. So, …we have been … following where the danger is …" (Public Agency 2)

In literature, it is argued that, depending on how it is designed the DDA can also be used to account for past injustices. For example, Fox and Shahum (2017) argue that the use of DDA has resulted in an increased awareness of how Black, Brown, and immigrant communities are affected by past disinvestment and under-investment in road safety.

3.2. VZ strategies and interventions

NYC has implemented numerous road safety strategies and interventions since the adoption of the first city wide VZ action plan in 2014. The major strategies and interventions are: road and vehicle engineering, police enforcement, education campaigns and training, and legislation, see Table 2.

3.2.1. Engineering interventions

The 2014 action plan identified numerous road and vehicle engineering improvements to be implemented over the coming five years, primarily by the NYC Department of Transportation (DoT) (City of New York, 2014). The proposed infrastructure improvement measures, which particularly targeted pedestrian safety, were developed further through the city boroughs' action plans and included measures such as the expansion of safe infrastructures, expansion of leading pedestrian intervals, and pedestrian crossings (Viola et al., 2015c). Proposed vehicle safety interventions included the use of in-vehicle technology to coordinate reporting of collisions and aggressive driver behavior across the fleet of city government vehicle (U.S. DoT, 2019) and a Safe Fleet Transition Plan that mandated installation of automatic braking and other technologies in city fleet vehicles (U.S. DoT, 2019).

3.2.2. Police enforcement

The NYC VZ policy documents emphasize the importance of strong enforcement to curb dangerous behaviors in the road system that are associated with fatal and serious injuries. The initial VZ action plan stated: "Vision Zero demands strong street presence and increased street-level enforcement against dangerous driving. The NYPD will target the most dangerous driving behaviours …." (City of New York, 2014, p. 16). Automated enforcement in the form of speed and red-light cameras has also become a very important aspect of policing efforts in NYC. As of 2022 over 2000 speed cameras were installed and operational in around 750 school zones in the city (NYC DoT, 2022). The city's enforcement efforts are not limited to the work done by the NYPD. The Taxi and Limousine Commission is also given the mandate to use its own officers and in-vehicle automated enforcement technologies to enforce traffic rules among taxi drivers and other for-hire drivers under its jurisdiction (City of New York, 2014).

3.2.3. Education campaigns and training

In addition to engineering and enforcement interventions, there is a strong emphasis on educational initiatives targeting different types of road users. Educational visits at schools and elderly centres, trainings for drivers and unprotected road users, and informational campaigns are widely promoted. Between 2014 and 2018, about 1484 school visits and 356 senior center visits were made for safety education in "Priority Locations" (Viola et al., 2019). In 2014, a VZ public information campaign targeting night-time drivers and specific risk groups, such as younger adults and overnight commuters, was promoted. In 2016, the *Dusk and Darkness* campaign was commenced to address the problem of fatalities and injuries occurring in the early morning and evening of winter times. The campaign involved increased enforcement, dissemination of print media information, and engagement with drivers and other road users at priority locations during these times of the day. The Taxi and Limousine Commission also trained over 27,000 new drivers in 2018, creating a new training video to cover the five most dangerous driving behaviours specific to for-hire urban driving.

3.2.4. New legislation

Since the adoption of VZ, NYC has introduced new legislations and amended past laws to further enhance the state of road safety in general and the safety of pedestrians and cyclists in particular (NYC Mayor's Office of Operations, 2021).[3]

4. Equity and social justice-related criticisms against NYC VZ

Despite its relative success in road safety, the adoption and implementation of VZ has been criticized from an equity and social justice perspective (Abebe et al., 2023). From the literature and interview responses, four equity and social justice-related criticisms against road safety work in NYC can be identified. The analysis of these criticisms is important to understand the nature of equity and social justice in road safety policy implementation and to determine if strategies designed to address the issues are sufficiently effective.

4.1. Criticism one: the DDA as potential source of inequity

The use of crash data to identify and prioritize the most risky areas is intuitively appealing, since it is arguably morally laudable that areas with high fatality and serious injury risk are prioritized in road safety work. However, using crash data to inform road safety work could be criticised from an equity and social justice perspective. At least three partly overlapping arguments could be forwarded to challenge the use of crash data in road safety policy. First, the purported objectivity of crash data might be questioned. Thus, when using crash data to guide road safety decisions and prioritizations it is not obvious that the outcomes will be justified from an equity and social justice perspective. Second, since crash data is morally neutral, decisions about what areas or interventions to prioritize will require some normative justification. It is not obvious that the only justification that comes into play when prioritizing between geographic locations and interventions relates to the severity of the outcomes involved; other normative justifications may count too. Third, using crash data can be seen as a top-down and technocratic way of implementing road safety policies that neglects the value of participatory decision-making and inclusion.

Purported objectivity of crash data: A recent systematic literature review of research on DDA in public services showed that collection, storage, and interpretation of policy-relevant data can have negative equity and social justice implications (Ruijer et al., 2023). To avoid bias in data-driven decision-making, it is important to be cautious about the quality of the data used. In particular, it is vital to realize that the choice of what data to use could be influenced by the economic and political values of decision makers and other agents involved in the data collection chain.

[3] https://www.nyc.gov/content/visionzero/pages/legislation (accessed 15-07-2023).

Table 2
Major road safety strategies and selected interventions in New York City.

NYC VZ STRATEGIES					
Engineering interventions		Policing		Education	Legislation
Road infrastructure safety improvement projects	Vehicle engineering initiatives	New York City Police Department	Taxi and Limousine Commission	• school visits • elderly visit • road safety campaigns targeting different road user groups. • road safety trainings for different road user groups	• Bill No. A10144 (2014): lowered the default speed limit on City streets from 30 MPH to 25 MPH. • Bill No. S4331/A6449 (2019) allowed the expansion of automated camera enforcement • Side Guards (LL 56 of 2015 as amended by LL 108 of 2021) required to have side guards installed by January 1st, 2024
• expansion of protected bike lanes. • installation of Leading Pedestrian Intervals, • introduction of slow zones, • installation of speed bumps, • enhancement of street lighting, • maintenance of street markings, and • installation of traffic signals, and speed limit signs	• installation of extensive video camera system in buses to improve driver view of vulnerable road users. • safety retrofitting for trucks. • mandatory side guards for trucks over 10,000 p. • the promotion of backup alarms,	• police enforcement • automated enforcement: Speed camera, red light camera	• personnel enforcement of taxi drivers • in-vehicle enforcement		

Traditionally, the major source of crash data is the police crash report. There is a growing recognition that police crash data might have problematic implications for road safety work. Police crash data often suffers from under-reporting that may affect its objectivity and the effectiveness of efforts based on such data (National Safety Council, 2017).[4] Under-reporting may occur due to different reasons. Due to distrust and fear of the police, minorities and people of color might be less willing to report crashes (Lee, 2018; Theodore, 2013; Wilson, 2021). A recent study in Washington D.C. showed that almost a third of car crashes involving a vulnerable road user went unreported. Other types of crash data might go unreported, too. When poor people are injured they may not be able to afford health care. Consequently, reliable road safety-related health care data might not be readily available to decision-makers and road safety practitioners.

Moreover, there is another aspect concerning police crash data that could render the needs of poor and marginalized groups potentially invisible in data-driven road safety efforts, namely the decision not to collect race and ethnic information in police enforcement work. Despite ample evidence of police bias and violence and years of protest and complaints from minorities and marginalized groups, many U.S. cities, including NYC, do not collect racial data in police stops. In the absence of such data, it is arguably difficult to determine the equity impacts of enforcement strategies in road safety work.

The examples show that road safety decisions that are based solely on quantitative crash statistics, whether in the form of police crash data or health care data, or data that is 'blind' from a vulnerability perspective, might not accurately capture all relevant road safety aspects or the needs of all road user groups. When used to guide the prioritization and implementation of road safety measures, a DDA using such data might therefore have the unfortunate consequence of exacerbating existing social inequalities.

Moral neutrality of crash data: As noted above, it appears intuitively reasonable to base road safety work on crash data and prioritize areas with the highest risk of fatality and serious injury. Directing road safety interventions to locations where the need is greatest is in line with the utilitarian principle of maximising utility. However, other normative justifications than utility maximization might come into play when allocating scare resources in road safety work. Although areas that account for the majority of fatalities and serious injuries may deserve special attention, there is no obvious reason why areas with fewer deaths and serious injuries should be left as they are. Sometimes, it might be morally appropriate to give equal attention or even priority to areas with few fatalities and serious injuries, for instance, if there are justifiable grounds for believing that the risk imposition is morally unjust.

Depending on how it is implemented the DDA could be insensitive to other moral considerations than those relating to utility maximization. To see how, consider the three imaginary areas X, Y and Z.

> Area X: 3 fatalities and 5 serious injuries. All fatalities and serious injuries pertain to pedestrians of more than 80 years of age.
> Area Y: 15 serious child injuries but no fatalities.
> Area Z: 10 fatalities and 20 serious injuries. All fatalities were drunk drivers who resided in the area.

The question is which area should receive priority in road infrastructure investment. According to the DDA, neighbourhood Z should receive priority, since this is where the greatest number of fatalities and serious injuries occur. However, it might be argued that this is wrong, since prioritizing children's safety is more urgent from a moral perspective (Hokstad and Vatn, 2008). The example points to another important moral dilemma in road safety work, namely whether road safety efforts should provide equal protection to law abiders and those who violate traffic rules and regulations (Hokstad and Vatn, 2008; Nihlén Fahlquist, 2009). It might be argued that, since those who are killed and injured in area Z are drunk drivers and are to a larger degree responsible for the harm inflicted on themselves, they should be given less priority in road safety work. Moreover, even if an area has low fatality and injury rate, it could be a good candidate for road safety improvement if there are reasonable grounds to believe that the risk imposition is unjust and a product of past discriminatory policy choices (Hansson, 2018). To the extent that the DDA follows crash data only, it does not properly account for these and other morally relevant considerations that may contribute towards a fair and just implementation of road safety policies and strategies.

Crash data and top-town technocratic decision-making: When road safety work is founded on quantative crash data alone, it may have negative implications for equity and social justice, as explained above. However, a data-driven approach to road safety does not necessarily

[4] More genereally, the over-reliance on police crash data has led to a situation in which road safety problems are primarily viewed as individual road user problems. There is a worry that reliance on police data could lead to so-called "omitted-variables bias", i.e., neglect of important explanatory factors as to why a crash might have occurred (Abdulhafedh, 2017). This could lead to wrong inferences and prevent proactive ways that may be promoted to prevent fatal and serious injuries.

have to be restricted to quantitative crash data. Crash data can be supplemented with quantitative socioeconomic data relating to, for example, demography, poverty, crime, pollution burden, and health conditions, that can help identifying priority areas. It has been shown that linking quantitative transportation and population health data could reduce racial and ethnic disparities in transportation injury (McAndrews et al., 2017). Furthermore, also qualitative data could be used to assist decision-making. Fox and Shahum (2017, p. 5) suggest: "community-led observations, based on the experiences of people in the communities most affected by traffic crashes, should also be valued and incorporated into the process and guide strategies". Supplementing quantitative crash data with socioeconomic data and qualitative community-oriented data could make the process of data collection and analysis more "inclusive" and, thus, more accurately account for existing inequalities in society.

Inclusion of citizens in decision-making concerning proposed road safety policies and interventions is an important democratic quality. It shows that road safety planners acknowledge peoples' rights and value their views. Moreover, the outcomes of an inclusive and participatory decision process typically enjoy a greater degree of legitimacy and, thus, are more likely to be accepted by different stakeholders (Belin et al., 2010; Elvebakk, 2015; Eriksson and Bjørnskau, 2012; Jones and Bayer, 2007; Vlassenroot, 2011). However, the value of inclusion and participation sometimes have to be balanced against the need for prompt action. In those situations, there is a risk that a more narrow version of the DDA is used regardless of how road users and residents view the proposed interventions. The interview data shows that some respondents consider the consultation processes with community boards as time consuming and inefficient and believe that effective lifesaving interventions should be implemented regardless of how they are viewed by local communities. In their view, only crash data and evidence concerning the effectiveness of interventions should inform what and where safety improvement work should take place. In fact, during the interviews some respondents stated the importance of bypassing community consultation processes so that effective road safety interventions are implemented without delays. This response suggests that there is a need for further empirical studies into the nature and effectiveness of community engagement processes in VZ implementation and their equity and social justice implications.

4.2. Criticism two: road safety engineering improvements are inequitably distributed

Whether implemented road engineering interventions are equitably distributed or not is primarily an empirical question. The literature search identified a few studies that investigate how the benfits and burdens of engineering interventions were distributed in NYC. A report by the Manhattan Institute points out that the number of pedestrian and bicycle fatalities at intersections receiving at least one safety treatment have declined significantly; however, the report concludes that lower-income residential neighborhoods have not received intensive VZ improvements relative to their risk and, consequently, continue to be disproportionately exposed to car crashes (Armlovich, 2017, p. 6). According to the report, NIMBYism in poorer neighborhoods is a major reason for why road safety interventions are not being promoted as per the NYC DoT's plan.[5]

Another study used temporal, spatial, and socio-economic data to examine the distribution of protected bike lanes and other safety improvements in NYC between income groups and boroughs between the years 2009–2018 (Rebentisch et al., 2019). According to the study, "the implementation of safety improvements and speed humps are significantly related to reported injuries in previous years; this finding supports the city's stated goals of targeting improvements to areas most in need of improved safety for vulnerable road users" (p. 762). Moreover, the study attributes the decline in the number of fatalities and injuries to the impressive number of safety improvement investments implemented since the adoption of VZ in the city. Nonetheless, the study indicates that in some boroughs, gains in terms of safety improvement do not improve the position of lower-income groups (Rebentisch et al., 2019).

The interview data confirms that conflicting normative views exist regarding the distribution of road safety interventions. Some repondents believed that the DDA ensures that road safety work is implemented in an equitable manner. However, repondents representing advocacy and social justice groups argued that infrastructure development tends to ignore unprotected road users and low-income neighbourhoods. One respondent stated:

> "there should be so much more safe space for pedestrians and cyclists and alternative forms of transportation in neighbourhoods in Brooklyn and Queens, you know, underserved lower-income neighbourhoods, we do not see the known traffic improvements that you want to see in some of our midtown Manhattan neighbourhoods or elsewhere." (NGO 1)

Similarly, another respondent stated:

> "… a lot of resources have been concentrated in Manhattan and Brooklyn. and also there has been a lot of areas that have been designated VZ priority neighbourhoods, corridors, intersections, arterials, that have been in the further or in the lower income neighbourhoods that have not been touched." (NGO 2)

Noting that cyclist fatalities are higher in neighbourhoods that have historically fewer safe road infrastructure for cyclists, the latter respondent emphasized the need to promote the same infrastructure improvement in every neighbourhood.

4.3. Criticism three: police enforcement tends to be biased and unfair towards minorities and people of color

The use of enforcement in VZ efforts has been heavily criticized by social justice activists and scholars (Barajas, 2021; Conner, 2017; Hoffmann, 2019; Lee, 2018; Lugo, 2015; Morse, 2015; Pedestrian Observations, 2016). For instance, Lee (2018), citing empirical evidence, argues that VZ has been used to justify heavy policing of immigrant delivery cyclists in NYC. Rather than improving safety, he argues, police enforcement imposes punitive forms of racial and social control under the guise of public safety. Hoffmann (2019) argues that enforcement work in VZ is often used to police marginalized communities rather than targeting "those who kill the most". Based on empirical evidence of violence and disproportionate policing of minority cyclists and drivers, Hoffmann concludes that police enforcement is part of the safety problem rather than the solution.

Conner (2017) relates the systemic bias in police enforcement work to the so-called "broken windows approach". This policing approach assumes that the best way to prevent more serious criminal offenses is to intensively target and penalize minor criminal offenses. According to Conner (2017), this approach results in the disparate stopping, ticketing, and arresting of drivers and bicyclists in predominantly African-American neighbourhoods for violations that are less relevant from road safety point of view. Moreover, he argues that because the summonses and arrests that result are tried in a racist criminal justice system, investigatory traffic stops are inherently inequitable. Consequently, in his view, it is impossible to achieve the VZ goal without finding a proper solution to racial biases in police enforcement work and the justice system.

The problematic nature of police enforcement in terms of effectiveness and equity was also recognized in the interview data. Most

[5] NIMBY is a short acronym for Not In My Back Yard. It has its roots from the environmental justice movements of the 1980s in the U.S. where minorities and people of color opposed proposed land use projects in their neighboorhoods due to the adverse health and environmental impacts associated with them (Fischel, 2001).

respondents stated that the policing of cyclists and pedestrians is ineffective in improving road safety, since there is no empirical evidence associating these groups of road users with grave safety risks. Some respondents also viewed the policing of immigrant delivery cyclists and confiscation of their e-bikes by the NYPD as unfair. Others, however, argued that the measures might have been justified, since operating an e-bike was illegal at the time.[6]

Thus, from the literature as well as the interview data it is clear that there are conflicting views regarding the role enforcement in road safety work. Critics argue that police enforcement should not be part of road safety efforts at all (Hoffmann, 2019; Keegan, 2016; Kim, 2016; Lugo, 2015; Woods, 2021). Hoffmann (2019), for instance, argues that cities in the USA should abstain from using police enforcement, since it is difficult to expect the police will enforce traffic laws equitably. Some respondents shared the view that police enforcement should not be part of VZ work:

> "I think the adoption of enforcement as part of Vison Zero … reflects a blind spot on the part of the strategists but I also think that it is a bind spot that a much large group of people have on traffic safety. And even though, you know, there is a lot of documented evidence that if you ask a police department to increase police enforcement the burden will fall particularly on black communities, and those who have not as much security, it doesn't lead to safer roads. I really think, especially since our uprisings in the US accelerated this year because of George Floyd's murder. It had made me think we actually, in road transportation, we need to push for reconsidering whether the law enforcement model is doing any good. What good is it doing? I am not really sure, because my witness …. is people braking all kinds of traffic laws, but I know that increasing police enforcement isn't the solution." (Researcher 1)

Others recognized the problematic nature of policing but emphasized the importance of reforming how police enforcement is conducted (Conner, 2017; Fox and Shahum, 2017; Vision Zero Network, 2021). Among the suggestions for how to tackle bias in police enforcement are: community policing, increasing the transparency of traffic stop data, decriminalization of minor offenses, provision of education and anti-racism trainings to police officers, promotion of community-based restorative justice programs, and independent civilian oversight of police work. Automated enforcement has also been recommended as a remedy, since it removes officer subjectivity in traffic stops (Abonour, 2018; Conner, 2017; Ferrier et al., 2017; Fox and Shahum, 2017). Moreover, the fine associated with a speed camera is much smaller (around $50) than officer mandated tickets, which could range between $90-$600 depending on the individual circumstance of the violation and previous history of the violator (NYC DoT, 2022).

Whether automated enforcement has positive equity and social justice implications largely depends on how it is designed and implemented. Farrell (2018) showed that in Washington D.C. low-income communities have received an inequitable amount of automated enforcement citations due to the disproportionate placement of cameras in poor neighborhoods. Similarly, Abonour (2018) argued that also automated enforcement might have negative equity and social justice impacts if flat rates are used. In NYC, everyone who has been given a citation pays the same amount of money regardless of their economic status. According to Abonour, this will hurt people of color, who are disproportionately low-income as compared to white drivers.

Another way of avoiding the negative equity and social justice implications of police enforcement suggested in literature is to prioritize safe infrastructure designs, as per requirements of VZ's Safe Systems thinking (Barajas, 2021; Ferrier et al., 2017; Gordon, 2019; Michael et al., 2021, 2022; Shahum, 2017; Pedestrian Observations, 2016). Thus, Michael et al. (2022, p. 9) call for "a deliberate shift away from dependence on strong laws and enforcement as the means for improving road safety" and instead advocate a Safe Systems approach that emphasizes the promotion of safe road infrastructure designs. Nonetheless, some critics argue that the turn to Safe Systems approach and emphasis on infrastructural fixes cannot ensure equal accessibility for all if police continue to be involved (Barajas, 2021). Moreover, even if road infrastructures can eliminate the risk of dying from a vehicle crash they cannot eliminate the risk of dying from police violence and other crimes in the road system, the fear of which prevents people of color and minorities from using transport infrastructures (interview Researcher 1). A study by Greenfield (2017) identified fear of traffic, robbery and assault, fear of being stranded, fear of being profiled by the police, and fear of verbal harassment as barriers to bicycling in Black and Hispanic communities. Thus, it is reasonable to assume that even if infrastructural changes can address fatalities and serious injuries from road crashes, they cannot in themselves guarantee safe travel for all.

4.4. Criticism four: the promotion of bike and pedestrian lanes neglects their socio-economic impacts

For the past few decades, the promotion of bike lanes and pedestrian facilities has been at the center of transport policies in many countries due to the health and environmental friendliness of cycling and walking. Despite their continued proliferation, bike lanes and pedestrian infrastructures have received opposition in NYC from business owners and local communities, among others.[7] To take one example, in February 2020, a petition was launched and signed by about 250 local business owners against NYC DoT's plan for Protected Bicycle Lanes on 31st Street. Commenting on why they were against the bike lane project, one business owner said the introduction of bike lanes "interfere with my business as it would be a hazard for people pulling in and out. It would be impossible for people and deliveries to stop and come into my shop since they would be interfering with the bike lane" (Dorgan, 2020, see also Volker and Handy (2021) for a general discussion). In 2019, loss of parking spaces due to the introduction of bike lanes on Grand Street led to the vandalizing of the bike lanes with broken glasses and spray painting that reads "Bring back our parking" (Kim, 2019). In 2018, Community Boards rejected DoT's plan to redesign 43rd Avenue and introduce protected bike lanes by taking away 120 parking spaces (Pesantez, 2018).

Sometimes, local communities oppose bike lanes due to fear of gentrification and displacement.[8] Wild et al. (2018) argued that the fear of gentrification is behind the opposition against bike lanes from low-income, working class, and ethnically diverse neighbourhoods in cities such as Portland, Chicago, Washington, New York and London. Golub et al. (2016, p. 4) discussed how traditional bike planning in U.S. cities is structurally linked with the gentrification and displacement of low-income residents and residents of color, i.e., "the exact population that is dependent on cycling as an affordable mode of transport" (see also Stein, 2011).

The criticism that road safety improvement work has negative impacts on businesses and marginalized communities is primarily an empirical issue. In general, studies show mixed findings, which indicates

[6] According to the City Administrative Code (19–176.2.(b)), an "e-bike" constitutes a "motorized scooter" and "no person shall operate a motorized scooter in the City of New York".

[7] Opposition towards bike lanes has been there prior to the adoption of Vision Zero. See for example:https://www.nytimes.com/2010/11/23/nyregion/23bicycle.html,https://www.dnainfo.com/20101109/upper-west-side/columbus-ave-business-owners-say-bikes-lanes-are-driving-down-bottom-lines/, https://www.gothamgazette.com/index.php/archives/129-bike-lanes-run-into-opposition (accessed 15-07-2023).

[8] Some neighbourhoods have also opposed bike lanes on religious grounds: https://gothamist.com/news/new-bike-lanes-coming-to-nyc-but-wont-fill-south-williamsburg-gap-due-to-opposition (accessed 15-07-2023).

that there is a complex relationship between the introduction of road safety infrastructures and gentrification (Ferenchak and Marshall, 2021; Stein, 2011). Volker and Handy (2021) reviewed 23 studies conducted in the U.S. and Canada investigating the economic impacts of bicycle and pedestrian infrastructure on local businesses and found that active travel facilities have positive or non-significant economic impacts on retail and food service businesses geographically close to the facilities. It was also found that similar economic impacts are identified regardless of whether vehicular parking or travel lanes are removed or reduced to make room for the active travel facilities. Nonethless, the study showed that bicycle facilities could have negative economic effects on auto-centric businesses (e.g., gas stations, auto repair shops, auto parts stores, and large home-goods stores). The authors concluded that fears of disastrous consequences for local businesses were largely unfounded. Findings from NYC support this conclusion. A study by NYC DoT, conducted after the introduction of bike lanes on 9th Avenue between 23rd Street and 31st Street, showed that retail sales increased by 49 percent, compared to a 3 percent increase borough-wide (NYC DoT, 2013). The DoT report also shows that commercial vacancies dropped by 49 percent with the expansion of public spaces at Union Square, while they increased by 5 percent borough-wide (see also Brown and Hawkins, 2012).

5. Discussion

The study has several findings that have not been shown previously and that contribute significantly to the corpus of VZ and road safety knowledge. Although the findings pertain to a particular geographic location, they can be generalized to a broader VZ policy context. Below, it is explained how.

First, the study shows that equity and social justice considerations played a significant role in the adoption and implementation of VZ in NYC. Two important manifestations of this could be identified. One is the fact that VZ was initially endorsed and promoted by cyclist and pedestrian safety advocacy groups as the best way to ensure equity in road safety for groups formarily exposed to disproportionate burden of road fatalities and injuries. The other is the recognition and adoption of VZ by the city's mayor and the subsequent emphasis placed on VZ to improve the safety of unprotected road users, such as pedestrians and cyclists. These findings point to two possible success factors in the promotion of equitable road safety policies: the importance of involving marginalized groups when formulating policy goals and interventions, so as make sure their needs and values are adequately accounted for throughout the policy process, and the importance of commitment to equity and social justice considerations among key political actors responsible for road safety.

Second, the study shows how the use of a 'restricted' version of the DDA, which merely considers quantitative crash data in the prioritization of road safety interventions, could have negative equity and social justice implications. Relying on crash data when making road safety decisions ignores important ethical questions regarding who determines what data to collect, where and how data is collected, and how collected data should be interpreted and used in decision-making. In the case of NYC, application of a 'restricted' version of DDA has resulted in road safety being inconsistently promoted and primarily restricted to priority areas. In non-priority areas, the number of fatal and serious injury carshes has instead increased for some groups of road users, primarily cyclists. These problems could partly be addressed by adopting a more comprehensive understanding of data-driven decision-making that incorporates crash data as well as data on the potential causes and remedies of inequities and injustices in road safety. Also in this regard the involvement of diverse groups of stakeholders is vital to ensure road safety decision-making does not neglect important equity-related data and evidence. In particular, the identification and involvement of groups formerly marginalized in transport planning and road safety work could provide opportunities to incorporate the values, concerns, and interests of such groups in future road safety efforts.

Third, the study shows that key VZ strategies and interventions in the city, such as policing and protected bike lanes, can have major equity and socio-economic implications. Nonethless, since there is a lack of empirical studies investigating the distributional impacts of the implemented measures, it is difficult to establish how well they fare in an equity and social justice perspective. This points to the need for further empirical studies to better understand the equity and socio-economic implications of strategies and interventions promoted in VZ. From the data it is clear that equity and social justice aspects of road safety work were already contentious issues at the time of the adoption of the NYC VZ and, hence, not necessarily caused by the various measures that were subsequently adopted. This points to the importance of giving due attention to the nature of past road safety inequities at all stages in the VZ policy design process. This will not only allow practitioners to identify sources of past inequities and injustices in road safety work but design effective strategies to prevent them from influencing road safety work. Thus, this study confirms the need for explicit consideration of equity and social justice in VZ efforts, as proposed by others (Fox and Shahum, 2017; Vision Zero Network, 2021).

Fourth, the study shows that even when there is no major disagreement on the promotion of the overarching VZ goal, the implementation of effective road safety policies and strategies can become highly contentious due to the specific socio-economic and political peculiarities of the society in which VZ is implemented. Oppositions often delay, and sometimes prevent, the implementation of effective lifesaving interventions. This supports the need for a proactive approach on the part of VZ planners to design and implement strategies helpful in garnering public support for road safety strategies and avoid unnecessary delays in implementation. The disagreements among different stakeholders over the nature of community engagement in the implementation of VZ in NYC also implies the need for VZ practitioners to strive for consensus on what counts as meaningful community engagement in policy formulation and implementation.

Finally, although the study does not contain a systematic comparison of the Swedish and the NYC VZ, a key observation is that the implementation of the NYC VZ differs significantly from how the policy is implemented in Sweden. More importantly, the different ways in which the two VZs are implemented have important equity and social justice implications. The two VZs differ significantly in terms of their method of prioritization in the selection of areas for road safety improvement. While Swedish VZ policies demand system level prioritization of safety in the road system, the NYC VZ prioritizes risky areas identified on the basis of crash data. Although the emphasis on high-risk areas is important, in theory, a system wide prioritization of safety in the design and operation of road traffic ensures safety for all road users more effectively. Moreover, in contrast to the Swedish VZ which does not specify when the goal of zero fatalities and serious injuries should be achieved, NYC's VZ has a short deadline assigned to it. The equity and social justice implications of assigning short deadlines to VZ is an area worth exploring. Among others, the amount of time available for policy design and implementation of interventions might influence the amount of time available for community engagement and the nature of such public engagement processes and, thus, affect to what extent adopted policies should be considered legitimate from a procedural justice perspective.

As this study is one of a few studies that have looked into the equity and social justice implications of VZ policies, it provides important input for road safety practitioners and decision makers already working with VZ, as well as those aiming to adopt it in new contexts. The use of multiple data sets and analysis methods is an important strength of the study, since it enabled us to identify and analyse several different equity and social justice aspects of VZ policy implementation. However, the results of the study are limited in that they concern equity and social justice implications of road safety work at city level. Thus, the results and conclusions might be less relevant for national contexts. Further to the point, the study might have benefited from a more systematic

literature review and a broader set of interviewees, e.g., representatives of major stakeholders in the city, national road safety organizations, and academia. Even if we made an effort to include representatives from major stakeholders involved in road safety in NYC, some groups might have been left out unintentionally. Their views and concerns are thus not explored in the current analysis. Therefore, we believe that more robust and inclusive data from interviews and scientific studies would have further strengthened the results of the study.

6. Conclusions

In almost all places where VZ has been adopted, the road traffic system is characterized by major distributional inequities and injustices in road safety. Moreover, the VZ strategies and interventions promoted in those road traffic systems tend to have important equity and socio-economic implications. Combined these facts justify the incorporation equity and social justice considerations in the design and implementation of VZ policies. It is suggested that the process of adopting and implementing VZ should be designed so that it.

- Recognizes the inequities and injustices that exist in the current policy context;
- Clearly communicates to all stakeholders the political commitment to road safety on equal terms for different road user and socioeconomic groups in society;
- Integrates equity and social justice into road safety work, for example, by adopting a broader conceptualization of the DDA that includes socioeconomic and community data in addition to quantitative crash data;
- Recognizes and addresses the ethically problematic aspects of police enforcement;
- Allows for meaningful inclusion and participation of different road user and socioeconomic groups in the goal-setting and implementation of VZ policies.

These measures will contribute to a more equitable and just implementation of VZ, not just in NYC but in all locations where it is presently introduced. Finally, it is important that the implementation of VZ is complemented by empirical studies on the distributional effects of road safety strategies and interventions, so that informed normative positions can be taken on who should receive what and why in terms of road safety improvements.

CRediT contribution statement

Henok Girma Abebe: Conceptualization, Analysis, Investigation, Methodology, Writing -Original Draft, Writing -Review & Editing.

Matts-Åke Belin: Conceptualization, Analysis, Methodology, Resources, Writing -Review & Editing, Supervision,

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Declaration of competing interests

The authors have no conflict of interest to report.

Data availability

The authors do not have permission to share data.

Acknowledgements

The authors would like to thank the two anonymous referees of this journal for carefully reading the different versions of this manuscript, and for their critical comments and ideas for improvement. We also would like to extend out gratitude to Prof. Sven-Ove Hansson and Mr. Axel Rimbaud for their valuable comments on earlier versions of this article. We also would like to thank attendees of the higher seminar held on February 14, 2022, at the Division of Philosophy at KTH Royal Institute of Technology, for their feedback and critical discussion. Last, but not the least, we extend our gratitude to the Swedish Transport Agency (Trafikverket) for funding this research (Grant number TRV 2017/105570).

References

Abdulhafedh, A., 2017. Road traffic crash data: an overview on sources, problems, and collection methods. J. Transport. Technol. 7 (2), 206–219. https://doi.org/10.4236/jtts.2017.72015.

Abebe, H.G., Hansson, S.O., Edvardsson Björnberg, K., 2023. Arguments against vision zero: a literature review. In: Björnberg, K.E., Hansson, S.O., Belin, M.Å., Tingvall, C. (Eds.), The Vision Zero Handbook: Theory, Technology and Management for a Zero Casualty Policy. Springer Nature. https://doi.org/10.1007/978-3-030-76505-7_3.

Abonour, R., 2018. *Vision Zero's Enforcement Problem*. A Thesis Submitted in Partial Satisfaction of the Requirements for the Degree Master of Urban & Regional Planning. University of California. https://doi.org/10.17610/T6MS3Q.

Armlovich, A., 2017. Poverty and Progress in New York XI: Vision Zero and Traffic Safety. https://nacto.org/wp-content/uploads/2017/11/IB-AA-0517-v2-1.pdf.

Barajas, J.M., 2021. Biking where Black: connecting transportation planning and infrastructure to disproportionate policing. Transport. Res. Transport Environ. 99 (September), 103027 https://doi.org/10.1016/j.trd.2021.103027.

Belin, M.-Å., 2021. The Swedish Vision Zero: A Policy Innovation. International Encyclopedia of Transportation, pp. 675–680. https://doi.org/10.1016/b978-0-08-102671-7.10206-4.

Belin, M.Å., Tillgren, P., Vedung, E., Cameron, M., Tingvall, C., 2010. Speed cameras in Sweden and Victoria, Australia - a case study. Accid. Anal. Prev. 42 (6), 2165–2170. https://doi.org/10.1016/j.aap.2010.07.010.

Belin, M.Å., Tillgren, P., Vedung, E., 2012. Vision Zero - a road safety policy innovation. Int. J. Inj. Control Saf. Promot. 19 (2), 171–179. https://doi.org/10.1080/17457300.2011.635213.

Brown, C., Hawkins, J., 2012. The Economic Impacts of Active Transportation in New Jersey. https://vtc.rutgers.edu/wp-content/uploads/2014/07/Economic-Impacts-of-Active-Transportation-in-NJ.pdf.

Bryman, A., 2016. Social Research Methods. Oxford university press.

Di Ciommo, F., Shiftan, Y., 2017. Transport equity analysis. Transport Rev. 37 (2), 139–151. https://doi.org/10.1080/01441647.2017.1278647.

City of New York, 2014. *Vision Zero Action Plan*. 1–42. http://www.nyc.gov/html/visionzero/assets/downloads/pdf/nyc-vision-zero-action-plan.pdf.

Conner, M., 2017. Traffic justice: achieving effective and equitable traffic enforcement in the age of vision zero. Fordham Urban Law J. 44 (4). https://ir.lawnet.fordham.edu/ulj/vol44/iss4/2.

Dorgan, M., 2020. Business Owners Launch Petition in Opposition to DOT's Plan for Protected Bicycle Lanes on 31st Street. https://licpost.com/business-owners-launch-petition-in-opposition-to-dots-plan-for-protected-bicycle-lanes-on-31st-street.

DoT, N.Y.C., 2013. *Measuring the Street: New Metrics for 21st Century Streets*. 1–16. https://www.nyc.gov/html/dot/downloads/pdf/2012-10-measuring-the-street.pdf.

DoT, U.S., 2019. Vision zero in New York city. ITEA J. 86 (5), 18–21. https://safety.fhwa.dot.gov/zerodeaths/vz_nyc/fhwasa19007.pdf.

DoT, N.Y.C., 2021. NYC Streets Plan. https://www.nyc.gov/html/dot/downloads/pdf/nyc-streets-plan.pdf.

DoT, N.Y.C., 2022. New York City Automated Speed Enforcement Program. https://www.nyc.gov/html/dot/downloads/pdf/speed-camera-report.pdf.

Elvebakk, B., 2015. Paternalism and acceptability in road safety work. Saf. Sci. 79, 298–304. https://doi.org/10.1016/j.ssci.2015.06.013.

Eriksson, L., Bjørnskau, T., 2012. Acceptability of traffic safety measures with personal privacy implications. Transport. Res. F Traffic Psychol. Behav. 15 (3), 333–347. https://doi.org/10.1016/j.trf.2012.02.006.

Farrell, W., 2018. Predominately Black Neighborhoods in D.C. Bear the Brunt of Automated Traffic Enforcement. https://www.dcpolicycenter.org/publications/predominately-black-neighborhoods-in-d-c-bear-the-brunt-of-automated-traffic-enforcement/.

Ferenchak, N.N., Marshall, W.E., 2021. Bicycling facility inequalities and the causality dilemma with socioeconomic/sociodemographic change. Transport. Res. Transport Environ. 97 (June), 102920 https://doi.org/10.1016/j.trd.2021.102920.

Ferrier, K., Shahum, L., Gag, L., Thompson, S., 2017. Vision , Strategies , Action : Guidelines for an Effective Vision Zero Action Plan. December. https://visionzeronetwork.org/roadmapforaction/.

Fischel, W.A., 2001. Why are there NIMBYs?'. Land Econ. 77 (1), 144–152. https://doi.org/10.2307/3146986.

Fox, J., Shahum, L., 2017. Vision Zero Equity Strategies for Practitioners. Vision Zero Network. https://visionzeronetwork.org/wp-content/uploads/2017/11/VisionZero_Equity_FINAL.pdf.

Golub, A., Hoffman, M., Lugo, A., Sandoval, G., 2016. Introduction: creating an inclusionary bicycle justice movement. In: Golub, A., Hoffman, M., Lugo, A., Sandoval, G. (Eds.), Bicycle Justice and Urban Transformation: Biking for All? Routledge.

Gordon, B.A., 2019. Vision Zero Is the Wrong Goal. https://jalopnik.com/vision-zero-is-the-wrong-goal-1837376396.

Greenfield, J., 2017. Study: Concerns about Profiling Are a Barrier to Biking in Communities of Color' *StreetsBlogChicago*. http://chi.streetsblog.org/2017/01/25/study-concerns-about-profiling-are-a-barrier-to-biking-in-communities-of-color/.
Hansson, S.O., 2018. How to perform an ethical risk analysis (eRA). Risk Anal. 38 (9), 1820–1829. https://doi.org/10.1111/risa.12978.
Haupt, W., 2023. Policy diffusion, policy transfer, and policy mobilities revisited: a call for more interdisciplinary approaches in human geography. Geography Compass 17 (5), e12688. https://doi.org/10.1111/gec3.12688.
Hoffmann, B.M., 2019. The Case against Law Enforcement in Vision Zero. https://medium.com/vision-zero-cities-journal/the-case-against-law-enforcement-in-vision-zero-ed3ec1b8bfa2.
Hoffmann, M.L., Lugo, A.E., 2014. Who is "world class"? Transportation justice and bicycle policy. Urbanities 4 (1), 45–61. http://www.anthrojournal-urbanities.com/docs/urbanities_n6.pdf#page=47.
Hokstad, P., Vatn, J., 2008. Ethical dilemmas in traffic safety work. Saf. Sci. 46 (10), 1435–1449. https://doi.org/10.1016/j.ssci.2007.10.006.
Hysing, E., 2021. Responsibilization: the case of road safety governance. Regulation & Governance 15, 356–369. https://doi.org/10.1111/rego.12288.
Jones, M.M., Bayer, R., 2007. Paternalism and its discontents: motorcycle helmet laws, libertarian values, and public health. American Journal of Public Health 97 (2), 208–217. https://doi.org/10.2105/AJPH.2005.083204.
Jones, P., Lucas, K., 2012. The social consequences of transport decision-making: clarifying concepts, synthesising knowledge and assessing implications. J. Transport Geogr. 21, 4–16. https://doi.org/10.1016/j.jtrangeo.2012.01.012.
Karner, A., Golub, A., 2019. Assessing the equity impacts of a transportation investment program. In: Lucas, K., Martens, K., Di Ciommo, Floridea, Dupont-Kieffer, Ariane (Eds.), Measuring Transport Equity. Elsevier, pp. 277–290. https://doi.org/10.1016/B978-0-12-814818-1.00018-4.
Keegan, S., 2016. CityViews : We Need the NYPD Out of Vision Zero. https://citylimits.org/2016/07/26/cityviews-we-need-the-nypd-out-of-vision-zero/.
Kim, J., 2016. Roadway intersection characteristics and pedestrian-vehicle collisions: are they related? J. Transport Health 3 (2), S75. https://doi.org/10.1016/j.jth.2016.05.025.
Kim, Elizabeth, 2019. Grand Street Business Owners Want L-Pocalypse Bike Lane Turned Back into Parking, vol. 3, pp. 111–118. October. https://gothamist.com/news/grand-street-business-owners-want-l-pocalypse-bike-lane-turned-back-into-parking.
Kraus, S., Koch, N., 2021. Provisional COVID-19 infrastructure induces large, rapid increases in cycling. In: Proceedings of the National Academy of Sciences of the United States of America, vol. 118, pp. 1–6. https://doi.org/10.1073/pnas.2024399118, 15.
Kristianssen, A.-C., 2023. Establishing vision zero in New York city – the story of a pioneer. In: Björnberg, K.E., Hansson, S.O., Belin, M.Å., Tingvall, C. (Eds.), The Vision Zero Handbook: Theory, Technology and Management for a Zero Casualty Policy. Springer Nature. https://doi.org/10.1007/978-3-030-23176-7_20-1.
Kristianssen, A.C., Andersson, R., Belin, M.Å., Nilsen, P., 2018. Swedish Vision Zero policies for safety – a comparative policy content analysis. Saf. Sci. 103 (November 2017), 260–269. https://doi.org/10.1016/j.ssci.2017.11.005.
Lee, D.J., 2018. Delivering Justice: Food Delivery Cyclists in New York City, vol. 273. ProQuest DissertationsandTheses. https://academicworks.cuny.edu/cgi/viewcontent.cgi?article=3854&context=gc_etds.
Liakopoulos, M., 2000. Argumentation analysis. In: Bauer, M., Gaskell, G. (Eds.), Qualitative Researching with Text, Image and Sound. https://doi.org/10.4135/9781849209731.
Lugo, A.E., 2013. CicLAvia and human infrastructure in Los Angeles: ethnographic experiments in equitable bike planning. J. Transport Geogr. 30, 202–207. https://doi.org/10.1016/j.jtrangeo.2013.04.010.
Lugo, A., 2015. UNSOLICITED ADVISE FOR VISION ZERO. http://www.urbanadonia.com/2015/09/unsolicited-advice-for-vision-zero.html.
McAndrews, C., 2013. Road safety as a shared responsibility and a public problem in Swedish road safety policy. Sci. Technol. Hum. Val. 38 (6), 749–772. https://doi.org/10.1177/0162243913493675.
McAndrews, C., Beyer, K., Guse, C., Layde, P., 2017. Linking transportation and population health to reduce racial and ethnic disparities in transportation injury: implications for practice and policy. International Journal of Sustainable Transportation 11 (3), 197–205.
Mendoza, A.E., Wybourn, C.A., Mendoza, M.A., Cruz, M.J., Juillard, C.J., Dicker, R.A., 2017. The worldwide approach to vision zero: implementing road safety strategies to eliminate traffic-related fatalities. Current Trauma Reports 3 (2), 104–110. https://doi.org/10.1007/s40719-017-0085-z.
Michael, J.P., Wells, N.M., Shahum, L., Bidigare-Curtis, H.N., Greenberg, S.F., Xu, T., 2021. Roadway safety, design & equity: a paradigm shift. J. Transport Health 23, 101260.
Michael, J.P., Shahum, L., Paniati, J.F., 2022. Adoption of safe systems in the United States. In: Björnberg, K.E., Hansson, S.O., Belin, M.Å., Tingvall, C. (Eds.), The Vision Zero Handbook: Theory, Technology and Management for a Zero Casualty Policy. Springer Nature. https://doi.org/10.1007/978-3-030-23176-7_19-1.
Morse, S., 2015. Policing and safe streets where are the planners? The Seventh Generation. http://www.plannersnetwork.org/wp-content/uploads/2015/02/PPM_Winter2015_MORSE.pdf.
National Safety Council, 2017. Undercounted Is Underinvested: How Incomplete Crash Reports Impact Efforts to Save Lives. https://www.nsc.org/getmedia/88c97198-b7f3-4acd-a294-6391e3b8b56c/undercounted-is-underinvested.pdf.
Nihlén Fahlquist, J., 2006. Responsibility ascriptions and vision zero. Accid. Anal. Prev. 38 (6), 1113–1118. https://doi.org/10.1016/j.aap.2006.04.020. Epub 2006 Jul 28. PMID: 16876759.
Nihlén Fahlquist, J., 2009. Saving lives in road traffic—ethical aspects. Journal of Public Health 17, 385–394.
NYC Mayor's Office of Operations, 2021. Vision Zero - Year Seven Report. https://www.nyc.gov/assets/visionzero/downloads/pdf/vision-zero-year-7-report.pdf.
Observations, Pedestrian, 2016. Safer Streets : Design Is Better than Enforcement. https://pedestrianobservations.com/2016/09/28/safer-streets-design-is-better-than-enforcement/.
Pesantez, N., 2018. DOT Presents New Plan at Town Hall for Skillman, 43rd Avenues, about 120 Parking Spaces Still to Be Eliminated' *Sunnyside Post*. https://sunnysidepost.com/dot-presents-new-plan-town-hall-skillman-43rd-avenues-120-parking-spaces-still-eliminated.
Petro, J., Ganson, L., 2011. Vision Zero: How Safer Streets in New York City Can Save More than 100 Lives a Year. http://transalt.org/sites/default/files/news/reports/2011/Vision_Zero.pdf.
Rebentisch, H., 2018. A policy and spatial analysis of vision zero: process and equity in three US cities. In: A Thesis Submitted in Partial Fulfillment of the Requirements for the Degree B.A. In Geography. Department of Geography, McGill University.
Rebentisch, H., Wasfi, R., Piatkowski, D.P., Manaugh, K., 2019. Safe streets for all? Analyzing infrastructural response to pedestrian and cyclist crashes in New York city, 2009–2018. Transport. Res. Rec. 2673 (2), 672–685. https://doi.org/10.1177/0361198118821672.
Ruijer, Erna, Porumbescu, Gregory, Porter, Rebecca, Piotrowski, Suzanne, 2023. Social equity in the data era: a systematic literature review of data-driven public service research. Publ. Adm. Rev. 83 (2), 316–332. https://doi.org/10.1111/puar.13585.
Shahum, L., 2017. SAFE STREETS: INSIGHTS ON VISION ZERO POLICIES FROM EUROPEAN CITIES. German Marshall Fund of the United States. http://www.jstor.org/stable/resrep18873.
Stein, S., 2011. Bike Lanes and Gentrification', *Progressive Planning*, pp. 34–37. http://www.plannersnetwork.org/wp-content/uploads/2011/07/PNmag_Summer_Stein.pdf.
Taylor, Reich, et al., 2022. Protected Bicycle Lanes Protect the Climate: Measuring How Networks of Protected Bicycle Lanes Reduce Carbon Emissions, Transport Costs, and Premature Death', *ITDP and Cycling Cities* n.d. https://www.itdp.org/wp-content/uploads/2022/10/CC-EMBARGOED-OCT192023.pdf.
Theodore, N., 2013. Insecure Communities: Latino Perceptions of Police Involvement in Immigration Enforcement, vol. 1. Department of Urban Planning and Policy, University of Illinois at Chicago, Chicago, IL. https://core.ac.uk/download/pdf/71361919.pdf.
Tingvall, C., Haworth, N., 1999. Vision Zero - an ethical approach to safety and mobility. 6th ITE International Conference Road Safety & Traffic Enforcement: beyond, pp. 1–14. Melbourne, 6-7 September 1999.
Verlinghieri, E., Schwanen, T., 2020. Transport and mobility justice: evolving discussions. J. Transport Geogr. 87, 102798 https://doi.org/10.1016/j.jtrangeo.2020.102798.
Viola, 2015c. 'Staten Island Pedestrian Safety Action Plan', vols. 1–33. New York City Department of Transportation. May 2015.
Viola, 2019. 'Borough Pedestrian Safety Action Plan Vision Zero, Update. New York City Department of Transportation.
Viola, 2022. '*Pedestrian* Safety and Older New Yorkers. https://www.nyc.gov/html/dot/downloads/pdf/pedestrian-safety-older-new-yorkers.pdf.
Vlassenroot, S., 2011. 'The Acceptability of In-Vehicle Intelligent Speed Assistance (ISA) Systems: from Trial Support to Public support'Delft University of Technology. TRAIL Research School ; Ghent University. Faculty of Engineering and Architecture, Delft, The Netherlands ; Ghent, Belgium. http://hdl.handle.net/1854/LU-1889081.
Volker, J.M.B., Handy, S., 2021. Economic impacts on local businesses of investments in bicycle and pedestrian infrastructure: a review of the evidence. Transport Rev. 41 (4), 401–431. https://doi.org/10.1080/01441647.2021.1912849.
Who, 2018. Global Status Report on Road Safety 2018. World Health Organization, Geneva, 2018. https://apps.who.int/iris/bitstream/handle/10665/276462/9789241565684-eng.pdf.
Wild, K., Woodward, A., Field, A., Macmillan, A., 2018. Beyond 'bikelash': engaging with community opposition to cycle lanes. Mobilities 13 (4), 505–519. https://doi.org/10.1080/17450101.2017.1408950.
Wilson, K., 2021. 'Why U.S. Car crash reporting is broken'. Streetblog 1–9. https://usa.streetsblog.org/2021/07/20/why-u-s-car-crash-reporting-is-broken.
Woods, J.B., 2021. Traffic without the police. Stanford Law Rev. 73 (6), 1471–1549. https://heinonline.org/HOL/LandingPage?handle=hein.journals/stflr73&div=36&id=&page=.
Yanocha, Mawdsley, S., 2022. Making the Economic Case for Cycling. Institute for Transportation and Development Policy. https://www.itdp.org/wp-content/uploads/2022/06/Making-the-Economic-Case-for-Cycling_6-13-22.pdf.
Yin, Robert K., 2015. Case studies. In: Wright, James D. (Ed.), International Encyclopedia of the Social & Behavioral Sciences, second ed. Elsevier, pp. 194–201. https://doi.org/10.1016/B978-0-08-097086-8.10507-0.
Yin, R.K., 2018. Case Study Research and Applications: Design and Methods, sixth ed. SAGE Publications.
Zero Network, Vision, 2021. Re-thinking the Role of Enforcement in Traffic Safety Work: Our Role within Vision Zero. https://visionzeronetwork.org/re-thinking-the-role-of-enforcementin-traffic-safety-work-our-role-within-vision-zero/.