

## Spatial inequalities and media representation of cycling safety in Bogotá, Colombia<sup>☆</sup>

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### ABSTRACT

While there has been sustained growth in cycling as an urban mean of transport over the last two decades, it has often been accompanied by an increase in traffic crashes and deaths involving cyclists (Broe et al., 2017; Loreta et al., 2016). Many of the recommendations proposed to reduce such negative consequences rely primarily on individual behavioural changes or segregating infrastructure; however, the positive impacts of such actions are not yet proven (Dozza, 2017; Shinar et al., 2018). While these actions are certainly necessary, it has been proposed that more collective and long-standing changes in policy, education and law can be even more beneficial for cycling safety (Jacobsen, 2003; Marqués and Hernández-Herrador, 2017). Research considering social, spatial and economic disparities and their relation to urban cycling is very scarce within cycling studies and has the potential to benefit cycling safety by expanding its underlying understanding (Brown, 2016). Additionally, qualitative approaches such as the analysis of media representations of cycling safety events have only recently started attracting attention from researchers (Macmillan et al., 2016). Furthermore, there is a clear disproportion between research about cycling safety undertaken in Europe, Oceania and North America when compared to the rest of the world – in particular, Latin America. While debates around transport and inequalities are prevalent in Latin American cities, limited attention has been paid to cycling. In this study, through the analysis of secondary data and media coverage of traffic crashes involving cyclists in Bogotá, Colombia, it is proposed that cycling safety research can benefit from including analysis of social, economic and spatial inequalities as well as media representation. Preliminary results show that spatial inequality in cycling safety is expressed in at least three ways: disparities in cycling infrastructure allocation by city planners; concentration of traffic crashes resulting in cyclists' deaths in low income areas; and disproportion in media coverage of cyclists' deaths in traffic according to their locations.

### 1. Introduction

Promoting cycling as a mode of transport is widely accepted as a desirable aim for cities around the world. The positive impacts of cycling upon health, the environment and traffic congestion are widely recognized, and supported by research (Handy et al., 2014). However, while there has been sustained growth in urban cycling worldwide in the last two decades, this growth has often been accompanied by an increase in traffic crashes and deaths involving cyclists (Broe et al., 2017; Beck et al., 2017; Johan de Hartog et al., 2010). In 2013 in the European Union, cyclists represented more than 6% of all deaths in road traffic crashes and such deaths have decreased by only 9%, compared to an 18% decrease in deaths of other road users from 2010 to 2013 (Loreta et al., 2016). Additionally, in cities like London and San Francisco there have been recent increases in deaths and injuries in cycling traffic crashes

(Thompson et al., 2016). In Latin America, lack of both sufficient research and quality data makes the scale of cycling injuries and deaths difficult to determine, although recent studies and reports suggest that the problem may be even more worrying, with cities like Bogotá, México and Santiago reporting increased frequency of cycling-related deaths in the past decade (Carvajal et al., 2020).

According to our review of the literature, both government and academic recommendations to reduce cycling crashes often rely primarily on individual behavioural changes or segregating infrastructure; however, the actual expected positive impacts of such actions are not yet proven, as cycling crashes continue to rise in many cities (Dozza, 2017; Shinar et al., 2018). While these actions are certainly necessary, perspectives like Safety in Numbers (SiN) – more cyclists in the streets mean safer cycling in general – propose that more collective and long-standing changes in policy, education and law can

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be even more beneficial for cycling safety (Jacobsen, 2003; Marqués and Hernández-Herrador, 2017). Although research considering social, spatial and economic disparities and their relation to urban cycling is very scarce, these perspectives have the potential to benefit cycling safety by expanding the underlying understanding of how inequalities affect the urban experience (Brown, 2016; Olsen et al., 2017). Consequently, this study proposes that cycling safety research can benefit from including the analysis of social, economic and spatial inequalities (Costes, 2014; Purcell, 2014).

There is also a notable imbalance between the research about cycling safety in the Global South -especially in Latin America- and that conducted in Europe, North America and Oceania. Keeping in mind the particularities of Latin American cities such as income and spatial inequalities, the problem is not only about representation, but also about a lack of consideration of spatial and socioeconomic aspects when analysing cycling. In the wider field of transport studies, some work has been done from this perspective (Blanco et al., 2018; Hackl, 2018), but active travel is still largely unexplored (Mosquera, 2016; Rinaldi, 2014). At the same time, while debates around other modes of transport and inequality are prevalent in Latin American cities (Duarte, 2016; Verlinghieri and Venturini, 2018), not enough attention has been paid to cycling. In this paper, it is proposed that this dialogue could be beneficial to understanding cycling safety in these understudied contexts and other unequal urban environments.

Accordingly, this study will focus specifically on the case of Colombia's capital, Bogotá. This is a city that is often used as an international example of good cycling-related policy and urban planning due to the presence of hundreds of kilometres of bicycle infrastructure and the invention, 40 years ago, of the *ciclovía*, which consists of closing off main streets for the exclusive use of cyclists on Sundays (Montero, 2018; Torres et al., 2013; "WHO | Global status report on road safety," 2018). The widespread use of bicycles among its citizens (it currently has the highest amount of daily bicycle commutes in Latin America) could also be considered as confirmation of that perception (Ríos et al., 2015). However, problems of unconnected, damaged or non-existent infrastructure in many parts of the city, along with high levels of pollution and insecurity, show a different picture (García, 2018). Among the difficulties faced by cyclists in these challenging conditions, cycling safety is the most worrying, as cyclists' deaths have been on the rise for several years (Cámara de Comercio de Bogotá-Universidad de Los Andes, 2016; Secretaría distrital de Movilidad de Bogotá, 2015). With cyclists representing 5.5% of traffic-related deaths, the city nearly doubles the 3% average in the Americas and almost triples the average in the United States (2.2%) (Organización Mundial de la Salud/Organización Panamericana de la Salud, 2016).

Understanding that cycling safety is a complex problem that requires a multidisciplinary approach (Lovell et al., 2016), this research is based on geographical analysis and archival review, one of the less explored methodologies in the field that, however, has shown potential for developing an understanding of how the public's perception of cyclists can affect perceived blame and preferred solutions for traffic safety in countries like the UK and Australia (Boufous et al., 2016; English and Salmon, 2016; Macmillan et al., 2016; Goddard et al., 2019). Using the most widely distributed newspaper in the city, *El Tiempo*, as a source, all the accounts of traffic events resulting in cyclists' deaths or injuries between the years 2002 and 2017 were mapped and compared against other spatial data from Bogotá, such as socioeconomic status (SES) and cycling infrastructure, in order to understand the patterns of cycling safety across different areas and classes. Additionally, content analysis was used to examine the way crashes involving cyclists are reported in this newspaper.

In order to develop that analysis, we first present an overview of the literature about cycling safety, highlighting research that goes beyond individual and infrastructural contributions to cycling safety and addresses inequalities in transport, as well as reflecting on how the Global South is generally under-represented. Then, the case of Bogotá is presented, focusing on its urban design, main statistics in cycling safety, contradictions with its "cycle friendly discourse" and cartographic and statistical evidence of spatial inequalities in cycling infrastructure and cycling safety. Afterwards, an analysis of the way the main newspaper in Bogotá has covered cyclists' deaths in particular and

cycling safety in general between 2002 and 2017 is presented, highlighting the way responsibilities among road users are assigned. Finally, a conclusion about the relevance of the methods and the case used to understand cycling safety in this and other contexts is presented.

## 2. Literature on cycling safety: methodologies, perspectives and the North-South divide

### 2.1. Methodology

In conducting the review of the literature, over 250 peer-reviewed publications were reviewed and classified by their methodologies and the perspective of their recommendations to improve cycling safety. Key terms chosen included *cycling safety*, *bicycle safety*, *cycling accidents*, *bicycle accidents*, *cycling crashes* and *bicycle crashes*.<sup>1</sup> It was found that in general, authors agree that it is necessary to have a wider set of research methods, better sampling, more variables, more longitudinal studies and greater geographical diversity to effectively contribute to cycling safety (Buehler and Dill, 2016).

The most common sources used by researchers were published statistics and aggregated data, as they are powerful tools to identify trends or spot correlations that are not evident from field observation. Most of the reviewed articles relied on these to justify their research questions and to raise awareness about the importance of their topics (Fishman and Schepers, 2016; Vanparijs et al., 2016). Additionally, surveys, often self-reported and web-based, are one of the most common research strategies used, as they are a relatively easy and inexpensive way to gather information about cyclists' perceptions and behaviours (Gopinath et al., 2016). Although surveys raise questions about representation, at the moment and with limited funding for active travel research, they continue to be a common choice for researchers (Huemer, 2018; Lahmann et al., 2018). More in-depth studies of individual behaviours such as naturalistic observations (equipping bicycles with cameras (Hamann and Peek-Asa, 2017; Zangenehpour et al., 2016) and sensors (Dozza and Fernandez, 2014; Johnson et al., 2010) to record user behaviours in a way that does not affect the natural development of that behaviour) are gaining popularity as actual crash data for vehicles other than cars is rarely available (Petzoldt et al., 2017). Alternatively, crowdsourced data, for example, from Strava Metro, has been increasingly used by researchers and even policymakers to localize and understand general trends in cycling, although it is still in development and issues about representativity in terms of class have been raised (Chen et al., 2017; Jestico et al., 2017).

In contrast, some researchers like Lovell et al. (2016) consider that statistics and naturalistic or crowdsourced strategies alone are not enough and call for the more multidisciplinary and simpler approach of asking cyclists about how they feel on the road, as it "has great potential for improving understanding of the social and geographical factors associated with both perceived and actual risk" (p. 291). In that sense, methodologies like interviews and archival research, closer to the social sciences, are not yet very common in the field of cycling safety but have potential to expand the understanding of the problem. Interviews have been used for the in-depth analysis of bicycle crashes in general (Beck et al., 2016); the study of specific crashes like bike-truck conflicts or those involving elderly people (Boele-Vos et al., 2017; Richter and Sachs, 2017); to test the Safety in Numbers effect, mentioned in the next section (Fyhri et al., 2017); to compare cycling use and infrastructure between two cities (Lois et al., 2016); and to understand cycling-related injuries (Gopinath et al., 2016). Compared to other methodologies, interviews can be a useful tool to develop a deeper understanding of the cycling experience and, although much of the data appears to relate to individual interpretations, interviews can also help

<sup>1</sup> As one of the main interests behind this literature review is traffic, there are some lines of study that will not be considered, such as the literature concerned only with the medical consequences of collisions (Gopinath et al., 2016) (Amoros et al., 2010; Ekman et al., 2001) and other research like Twisk et al. (2017), which focuses on non-traffic events such as bicycle mounting and dismounting accidents.

understand general perceptions about cycling and traffic from different users of the road. A similar objective can be achieved with archival methods and newspaper reviews, which are sources that have started to be more common in recent years and can be used to explore the commonly overlooked topic of the media and public's perception of cyclists (English and Salmon, 2016; Macmillan et al., 2016). In order to develop this perspective, archival research has been chosen in this study as a way to understand perceptions about cyclists and other road users' actions and responsibilities in cycling safety.

## 2.2. Perspectives

A second aspect analysed by this review, and closely related to the question about responsibilities of road users in terms of cycling safety, are the recommendations given by authors as results of their research. A significant portion of these recommendations are limited to individual behavioural changes, such as the use of helmets and conspicuous clothing, avoiding drinking alcohol and cycling, respecting traffic signals, etc. (Huemmer, 2018; Lahrmann et al., 2018). The most common methodology used by researchers under this perspective is surveys, although articles with recommendations from an individual point of view can also be a result of naturalistic strategies (Nygårdhs et al., 2018), interviews (Boele-Vos et al., 2017), reviews of already published statistics (Airaksinen et al., 2018) and even simulations (Silvano et al., 2016). Although crash risk is understood as the interaction of at least 3 elements (road users, vehicles, and infrastructure), this individual perspective tends to give responsibility only to individual cyclists. As shown in further sections, prejudices, negative media coverage and the apparent feasibility of specific individual behavioural changes compared to large-scale transformations might explain the focus on cyclists' responsibility, as evidence seems to point in a different way.

For example, Poulos et al. (2017) show that 72% of near misses for cyclists involved motor vehicles, and researchers in Hungary found that cyclists were not responsible in the vast majority of traffic incidents (99.6% of 7889 cases) (Glász and Juhász, 2017). Additionally, cyclists' individual "good" behaviours, such as wearing a helmet, did not appreciably reduce severe injuries or deaths in cycling crashes, and "bad" behaviours like listening to music, exceeding speed limits and having "road anger" were not found to have a significant effect on producing crashes (Dagher et al., 2016; Puchades et al., 2017; Silvano et al., 2016; Stelling-Konczak et al., 2017). In that sense, some of the research that has tried to measure the effect of individual behaviour changes has not always had the most encouraging results. For instance, Hoglund (2017) finds that good behaviours like vigilance and cautiousness will not guarantee the absence of traffic incidents for a cyclist. These results should not be interpreted as encouragement for cyclists to be imprudent or careless, or as "proof" of cyclist's superior morality. On the contrary, it should challenge the reasoning behind recommendations that focus solely on individual behaviour, especially on the more vulnerable users of the road. For example, Cushing et al. (2016) propose a new way to see traffic conflicts and responsibility that focus not on human error but places responsibility on road planners.

Built environment-oriented research, the second most common after the individual perspective, considers that investing in cycling facilities, zoning or general urban planning is the most effective way to improve cycling safety. In this group, one of the most common answers to traffic crashes involving bicycles is the segregation of road users (Methorst et al., 2017; Richter and Sachs, 2017). Notwithstanding, some researchers consider that this is not enough (Beck et al., 2016) and that integration rather than segregation should be the aim (Prati et al., 2017). Cushing et al. (2016), for example, are sceptical about infrastructure alone and call to attention the fact that there is no conclusive research showing that cycling infrastructure is considerably safer than streets, as danger is often increased at intersections. This means that new ways to measure not only the quantity (linear kilometres) but also the quality (type/connectivity) of cycling infrastructure are needed (Osama and Sayed, 2016). Additionally, other aspects of the built environment need to be taken into account, such as trip origin and destination locations, route characteristics and land use (Amoh-Gyimah et al.,

2016; Feng, 2016). In that sense, as well as with the over-focus on individual behaviour, infrastructure itself cannot be the whole answer; more complex and innovative ways to define, understand and measure cycling safety are needed and there is some research already pointing in that direction.

The majority of the scarce research about cycling safety produced before the year 2000 tended to be very descriptive and there was not necessarily much debate among cycling safety researchers (Nyberg et al., 1996; Oström et al., 1993). However, this changed when two debates within cycling safety studies emerged: the "Bikeway Controversy" (Pucher, 2001) and the "Helmet Controversy". Toward the end of the 1990s, some experts started challenging two ideas that are still prevalent in literature today: that bikeways reduce the number of cycling crashes and that helmets help reduce head injury in cyclists (see for example, (Komanoff, 2001)). This evolved into a debate that can be tracked in papers, editorials and letters until today (Constant et al., 2012; Dagher et al., 2016). In this context, Jacobsen's (2003) article *Safety in numbers: more walkers and bicyclists, safer walking and bicycling* seemed to be more provocative than those preceding it with its apparently simple premise. Many publications have been motivated by the attempt to prove or contest this premise during the last 15 years (Marqués and Hernández-Herrador, 2017; Osama and Sayed, 2016). Additionally, recent research has had a more critical approach to the concept. Fyhri et al. (2017), for example, pointed to the contrary effects on safety produced by the influx of inexperienced and risk-taking cyclists, and Thompson et al. (2016) proposed that the rise in cycling deaths in cities where the number of cyclists is expanding means that the Safety in Numbers effect still needs to be better understood and that the mechanisms behind it are not yet fully identified. This is especially accurate for cities like Bogotá where, as explained in the next section, there has been a recent growth in numbers and not necessarily in safety.

If individual behaviours, infrastructure and a theory about collective behaviour can only give partial answers to the most urgent questions in cycling safety literature, there is a gap to be filled. Part of this work is being done through interviews and archival work by researchers mentioned in the previous section, which shows the role of perceptions of and about different road users. For example, research in London found that between 1992 and 2012, cycling trips doubled while cyclist fatalities portrayed on media increased 13-fold (Macmillan et al., 2016). Media coverage can be not only disproportionate, but even discouraging for cyclists when it is too negative (English and Salmon, 2016). The important role of perception in cycling safety is often overlooked but is useful to set the context in which cyclists commute every day, especially to identify the most common perceptions about them that may have an impact on the way other road users and the cyclists themselves behave. As we show later, media coverage is often not reflective of the actual size and spatial distribution of the problem.

Another line of research filling the gap left by individual and infrastructural perspectives is that which results in recommendations about policy and education. Authors like Cushing et al. (2016) advise going beyond traffic segregation by combining infrastructure, law enforcement, education and initiatives to encourage cycling in line with the "Vision Zero" policy, inspired by Swedish legislation.<sup>2</sup> These authors timidly mention the possibility of discouraging car use "only if desirable", while other authors are more open about the benefits of traffic-calming measures, auto-free zones and disincentivizing car use (Buehler and Pucher, 2017). This is also advised by Schepers et al. (2017), who highlight the importance of establishing road hierarchy and keeping large traffic-calmed areas when explaining Dutch success in cycling safety. In terms of education, Cushing et al. (2016) advise teaching bicycle users to act and be treated as though they "have all of the rights and all of the duties applicable to the driver of any other vehicle (p. 2178)", while other authors recommend mandatory traffic education in schools and stricter driver training and licensing (Buehler and Pucher, 2017).

In a field like cycling safety, where research usually focuses on very specific, practical and demonstrable cases of study, debates around theory, culture and policy help broaden the perspectives and understanding of the

<sup>2</sup> Visit Swedish government official site for more: <http://www.welivevisionzero.com/>.



problem. As shown in previous paragraphs this is a necessary task as some concepts around individuals and their interactions with the built environment go unchallenged in much of the literature, and socioeconomic aspects are rarely considered in recommendations. Furthermore, long-term policies and structural traffic changes have been proven to have a positive impact on cycling safety and, as the focus is on collective rather than individual behaviour, they open a dialogue with other perspectives within transport studies that are both more collectively-oriented and also more common in regions of the world where cycling safety has rarely been studied.

### 2.3. North-South division

In a situation that is not exclusive to cycling studies, there is a substantial difference between the amount of research produced about Europe, North America, Australia and New Zealand when compared to that from Asia, Africa and Latin America. This means that the majority of the empirical evidence about cycling safety is based on data from a limited number of cities with a specific set of regional characteristics. In this sense, more geographic diversity is needed to fully understand the phenomenon (Feng, 2016; Osama and Sayed, 2016). The few publications available, although valuable, suffer from a lack of other studies in similar contexts with which to compare and discuss results; something more achievable in cities with a large tradition of cycling studies like London or Amsterdam. Some of the few examples of cycling safety studies in the Global South are those of Hernandez-Vega et al. (2017) for Costa Rica, Bacchieri et al. (2010) for Brazil, Feng (2016) for China, Schepers (2013) for India and Damsere-Derry and Bawa (2018) for Ghana. After reviewing literature about transport, poverty and inequality, however, there are some contrasting trends to those identified in relation to cycling safety research. For instance, there is greater geographical diversity and even a clear focus on the Global South, especially on Latin America.

Although transport and inequalities have been researched for decades in the Global North, and the 2003 UK government report 'Making the connections' about transport and social exclusion was a key driver for research, active travel and specifically cycling has not usually been addressed from a socioeconomic perspective (Brown, 2016; Olsen et al., 2017). Thus, there is not general agreement about the relationship between income and engagement in active travel, as some studies report that lower income populations rely more upon active travel, while others conclude the opposite (Chriqui et al., 2017). Additionally, there is not a general consensus on how to define the phenomena included in the intersection between transport and inequality. One of the earliest examples of articles in this area defines the problem as "inequity and disadvantage in public transport" for the case of Sydney (Stone, 1987). Lau Cho-Yam (1998), labels it as "mobility inequality" instead and Grieco (2015) as "whether the benefits and costs of transport and travel services (mobility) and the spatial organisation of facilities and services (accessibility) are equally and equitably distributed in a society or community" (p. 82). In that sense, Grieco (2015) proposes a "social sustainability of urban mobility"; or as explained by Hackl (2018), a "mobility equity", which has the goal of achieving "freedom to be mobile in empowering ways, and the just regulation of mobility regimes" (p. 155).

In Latin America, for the case of Montevideo, Hernandez (2018) approaches the problem as a matter of access to urban opportunities and specifically as the social distribution of public transport accessibility to jobs and education, using the term of "uneven mobilities". For Buenos Aires, Blanco and Apaolaza (2018) use the more neutral term of differential mobility, and define it as "both as a condition and a consequence of socio-territorial inequality" (p. 83). These authors use the term mobility with the intention of conveying "a wider and more complex universe that includes motorized and non-motorized trips performed on a daily basis, but also the subjective dimensions associated with them" (p. 77). This opens the door for including studies about cycling from these perspectives and methodologies usually applied in other regions, as we attempt in this research.

Although interest and research regarding the links between mobility and economic inequality or poverty are growing, there are not many

examples of studies relating specifically to the territorial or spatial aspects of inequality. An example is Rinaldi (2014) for the case of Argentina and Mosquera (2016) for the city of Cali in Colombia. Rinaldi emphasizes the importance of grassroots activists and advocates in the development of a cycling culture that can fight back against what he calls "road inequity", defined as a lack of opportunities for participation from active travellers in the design of transport policy. Mosquera, based on secondary sources and interviews, characterizes transport inequities between motorized and non-motorized vehicles as struggles for road space and as an urban class conflict. It is interesting how from the more neutral language used by other authors talking about transport inequality in general, these authors give the problem a more political and activist perspective. This opens the debate around cycling being usually depicted as an option, or a decision that lays the responsibility solely on the individual, sometimes hiding the fact that for many people this activity comes more from necessity than from choice. As spatial and other kinds of inequalities are growing in many European cities (Cassiers and Kesteloot, 2012), improving research about cycling in the Global South, where transport and inequality literature is more consolidated, is not only a matter of representation, but also a useful strategy for understanding cycling safety's future in the Global North.

### 3. Bogotá's spatial inequalities and their impact on cycling safety

Media accounts and official data about cycling crashes resulting in deaths suggest that in a highly socially and economically segregated city like Bogotá, there is not an even distribution of traffic events along the different city districts and between different social classes; a phenomenon which is not mentioned in cycling safety literature. The concept of spatial inequality refers to an economic and social polarization between two or more areas (Cassiers and Kesteloot, 2012). At the local level, it is often expressed in the separation and agglomeration of rich and poor neighbourhoods, as well as in inequities in the access to transport and other urban services. The process of increasing those spatial inequalities is often defined as "peripheralization" and "marginalization" (Kühn, 2013). In the next section, we use this concept to understand Bogotá's disparities in cycling infrastructure allocation by city planners and the concentration of traffic crashes resulting in cyclists' deaths in low income areas in Bogotá.

#### 3.1. Cycling in Bogotá

Colombia's capital city is recognized globally as bike-friendly and is considered an example for policies that effectively promote cycling, being acknowledged as the most cycle-friendly city outside of Europe by the renowned Copenhagenize Index in 2019.<sup>3</sup> In the last two decades there have been great changes in policy and infrastructure toward promoting cycling, and it currently ranks as the Latin American city with the greatest number of commutes by bike with over 800,000 a day.<sup>4</sup> Since the 1990s, bicycles started to be considered traffic, at least by law, and appeared as an integral part of urban planning. The first cycle paths were also built at this time, which helped Bogotá gain its global reputation. *Ciclovía*, the weekly closure of some of the city's main roads on Sundays for recreative cycling, walking and skating, is a key contributor to this status, as it can attract up to a million people on a regular Sunday (Montero, 2018).

However, the current cycle network is not particularly accommodating to most cyclists, many of whom cycle to work under dangerous or difficult conditions. The more than 500 km of cycle lanes claimed by the council to be functioning in Bogotá may appear extensive; however, it is a geographically large city with a growing population that currently stands at over 8 million people (Secretaría Distrital de Planeación, 2017). From north to south it is more than 30 km long and encompasses a geographic area of 33 km from south to north and 16 km from east to west (see Fig. 1). Many of the cycle paths are built on sidewalks and can be very dangerous

<sup>3</sup> See <https://copenhagenizeindex.eu/>.

<sup>4</sup> Data retrieved from Bogotá's Council Official Website. <https://bogota.gov.co/mi-ciudad/movilidad/bogota-capital-mundial-de-la-bici>.



Fig. 1. Map of Bogotá's cycling infrastructure, made by the authors using Google Earth and based on shapefiles found at Bogotá's Council open data service: <https://datosabiertos.bogota.gov.co/dataset/red-biciusuarios-bogota-d-c>. (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

to pedestrians. Additionally, almost half of the infrastructure needs serious repairs.<sup>5</sup> It is not only cycle-exclusive infrastructure that has problems, however, as roads tend to be narrow and traffic-heavy and laws are not necessarily protective for cyclists. Furthermore, the number of cars has doubled in the last ten years and traffic jams and pollution have reached historic highs.<sup>6</sup> All of this is reflected in the worrying number of cycling traffic crashes that resulted in over 1200 cyclists' deaths and more than 20,000 injuries in the past two decades, figures that are especially concerning considering that underreporting is common.<sup>7</sup>

Bogotá's international status as an example for cycling policy and its alarming statistics in terms of cycling safety can only coexist in a sharply divided city. In spatial terms, there is a high contrast between the wealthy northeast and the rest of the city, which varies between lower middle class and poor neighbourhoods (see Fig. 2). This spatial inequality was institutionalized in 1994, when Colombia adopted a stratification system based on housing characteristics and access to services, with the objective of creating subsidies through public utility bills. Although Socioeconomic Status (SES) is not an exact reflection of class, it is closely related to it and provides a useful indicator of the quality of the urban environment. SES is ranked on a scale from 1 to 6, where 1 and 2 include people usually considered poor, 3 and 4 are lower and upper middle class, respectively, and 5 and 6 include people considered wealthy. This division is reflected in conditions

<sup>5</sup> Redacción Bogotá, (April 19, 2018). *El Espectador*. Retrieved from: <https://www.elespectador.com/noticias/bogota/el-49-de-las-ciclorutas-estan-en-mal-estado-personeria-de-bogota-articulo-750954>.

<sup>6</sup> Redacción Bogotá, *El Espectador*, (March 23, 2018). Retrieved from: <https://www.elespectador.com/noticias/bogota/declaran-alerta-amarilla-por-calidad-del-aire-en-bogota-articulo-746132>.

<sup>7</sup> There is not a general agreement on this data; however, expert Carlos Felipe Pardo's (New Urban Mobility Alliance) crosschecking of National Institute of Legal Medicine and Forensic Sciences and Secretariat of Mobility records is the closest to an accurate figure.

experienced by cyclists, as in the periphery of the city's infrastructure, safety, traffic and even pollution are worse than in the wealthier areas.<sup>8</sup> The city's segregated nature also dictates the flows of its citizens' daily travels as people from the low income and densely populated peripheries undertake daily travel to and return from the north-eastern areas of the city, where the highest levels of employment density are found (Guzman and Bocarejo, 2017).

In terms of infrastructure, Parra et al. (2018) show how different a cyclist's experience can be depending on the area of the city travelled through by assessing the distribution of cycling infrastructure and the average access distance to each neighbourhood. The results show that the median distance to the bicycle infrastructure network for all the neighbourhoods in the city was 444 m. However, when compared with SES, great differences are seen between wealthy neighbourhoods, with a median distance of 315 m; and poor neighbourhoods, with a median of 1062 m. It is important to note that for practical reasons, the researchers decided to not include neighbourhoods in terrains with a slope greater than 3%, which excludes some north-eastern wealthy neighbourhoods and the majority of the most southern quarter of the city, constituted by the poorest areas. As demonstrated by Parra et al. (2018) and as shown in Fig. 2, the cycling infrastructure network is extensive and covers large areas of the city; however, it is far more dense in the north-eastern area of the city and more scattered in the rest of the city, with large areas in the south having a total lack of cycle lanes. Additionally, north-western and western areas of the city are more densely populated than other areas and official figures have shown that cycling is more common in lower income areas, which disputes

<sup>8</sup> Redacción Bogotá, *El Espectador* (April 19, 2018). Retrieved from: <https://www.elespectador.com/noticias/bogota/el-49-de-las-ciclorutas-estan-en-mal-estado-personeria-de-bogota-articulo-750954>.



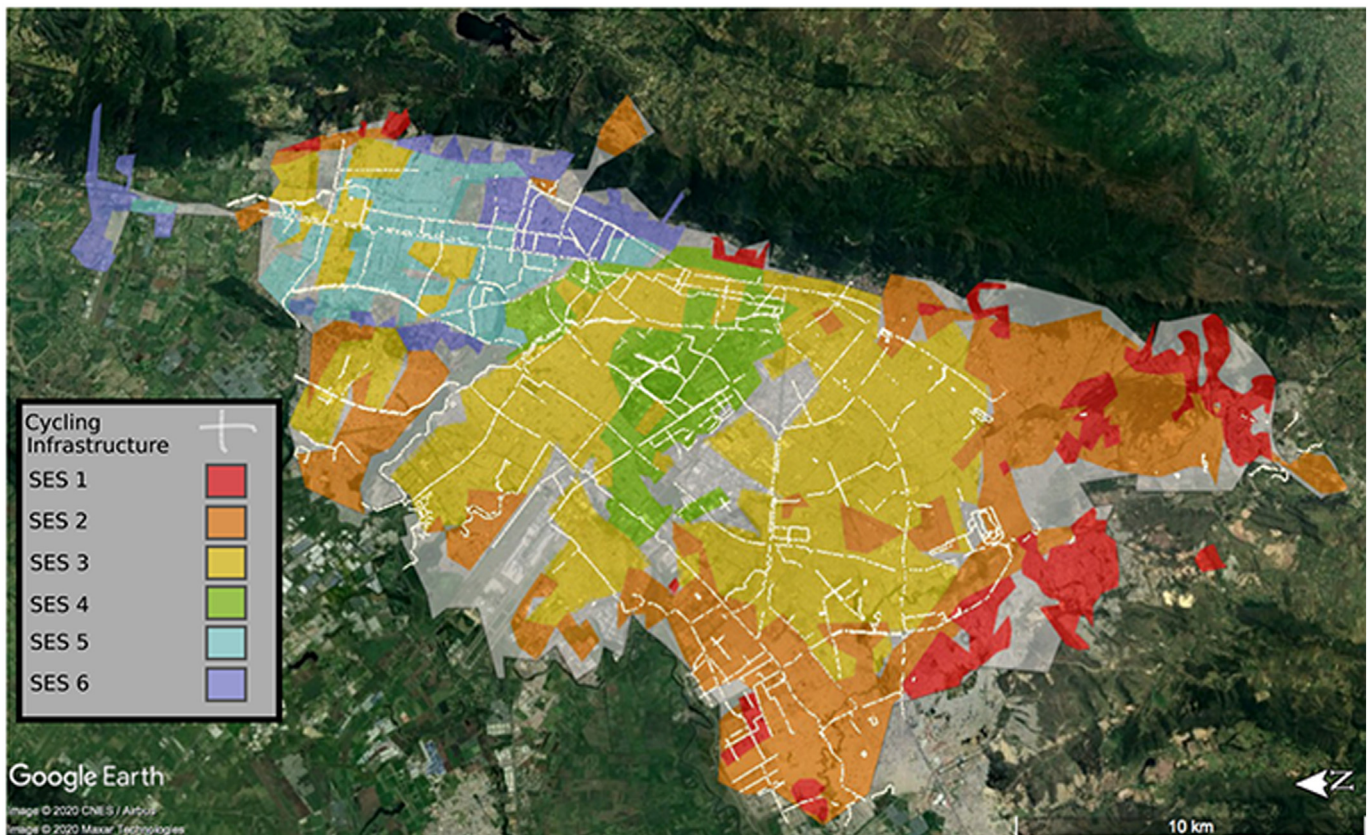


Fig. 2. Map of Bogotá's distribution of Socio Economic Status and cycling infrastructure, made by the authors using Google Earth and based on shapefiles found at Bogotá's Council open data service: <https://datosabiertos.bogota.gov.co/dataset?q=estratificaci%C3%B3n>.

the possibility of this infrastructure distribution being based on the potential number of users (Parra et al., 2018).

Given that there is an unequal allocation of cycling infrastructure, the next question is whether there is an equivalent distribution in cycling safety events throughout the city. In a recent publication, Carvajal et al. (2020) counted and analysed around 10,000 traffic collisions involving cyclists in Bogotá between 2011 and 2017, 358 of which resulted in a cyclist's death. The authors also identified high-risk areas where collisions with similar severity clustered, such as the western, south-western and south-eastern parts of the city. As mentioned before and shown in Fig. 3, these areas of the city often overlap with lower income neighbourhoods and sometimes with areas with lower cycling infrastructure density (Fig. 2). It is important to note that, although some of these areas in the west of the city are among the most densely populated, it is not enough to explain higher crash rates as the daily pendular movement of traffic implies that the same cyclists are also riding in wealthier areas of the city.

As explained, Bogotá's high levels of segregation and peripheralization have an impact on the way cycling safety experiences and crashes are distributed in the city. This impact is expressed mainly in two ways: the allocation of cycling infrastructure, which seems to benefit wealthier and not necessarily more populated areas of the city; and the distribution of traffic crashes involving cyclists, which cluster in areas with higher population volumes and lower income. These conditions make it significant that so many people, especially from lower income areas, regularly make long and potentially dangerous cycle journeys to work or to study; however, this is not necessarily a 'choice' as other transport options are often scarce and can take up to 10% of their monthly income and sometimes more than 3 h a day (Guzman and Bocarejo, 2017). It is therefore not surprising that necessity takes the form of sustainable travel in a city with a long-standing tradition of leisure cycling and a history of utilitarian everyday cycling among the working class (Torres-Barragan, 2015).

#### 4. Local media reporting of cycling safety

In this section, we analyse how these spatial inequalities have been reported in the most read newspaper in Bogotá, *El Tiempo*, and how cyclists' deaths and the responsibilities and mechanisms behind cycling safety are portrayed. Articles were accessed through the newspaper's electronically available news archive, which determined the timeframe of 2002–2018. Search words included *Bogotá*, *cycling safety*, *cycling accident*, *cyclists' death*, *traffic crashes* and other synonyms; and the resulting 160 articles were organized in a database with categories that include publication data, traffic event location details, socioeconomic aspects of actors involved, experts and activists consulted, reference to causes behind cycling safety and responsibility given to cyclists and other road users.

In the past decade, cycling safety went from being an almost non-existent phenomenon in media coverage to a common topic, worthy of special attention. For example, between the years 2002 and 2011, there were only two identified references to cycling safety, one about the death of a cyclist after being run over by a police officer in an SUV,<sup>9</sup> and another about the construction of cycle infrastructure.<sup>10</sup> In contrast, from the year 2011 on, the number of articles saw a substantial increase: from 9 in that year, to 19 in 2017 and over 30 in 2018. Although there are official records of cyclists dying in traffic at least since the early 2000s, we compared the few cases starting to be portrayed in *El Tiempo* in 2011 with the cases registered by Carvajal et al. (2020) until the year 2017 to find out how representative of the phenomenon media reporting is. In Fig. 4, locations of the cyclists' deaths reported by *El Tiempo* are shown as pins and compared with the clustering of cycling safety events reported by Carvajal et al. (2020). Although there is at least one case reported in the media in two of the riskier areas of the city, the patterns of crash occurrence and crash reporting seem to be

<sup>9</sup> *El Tiempo*, *La Bogotá invisible*, 28/04/2002.

<sup>10</sup> *El Tiempo*, *Amantes incondicionales del 'caballito de acero'*, 27/11/2005.



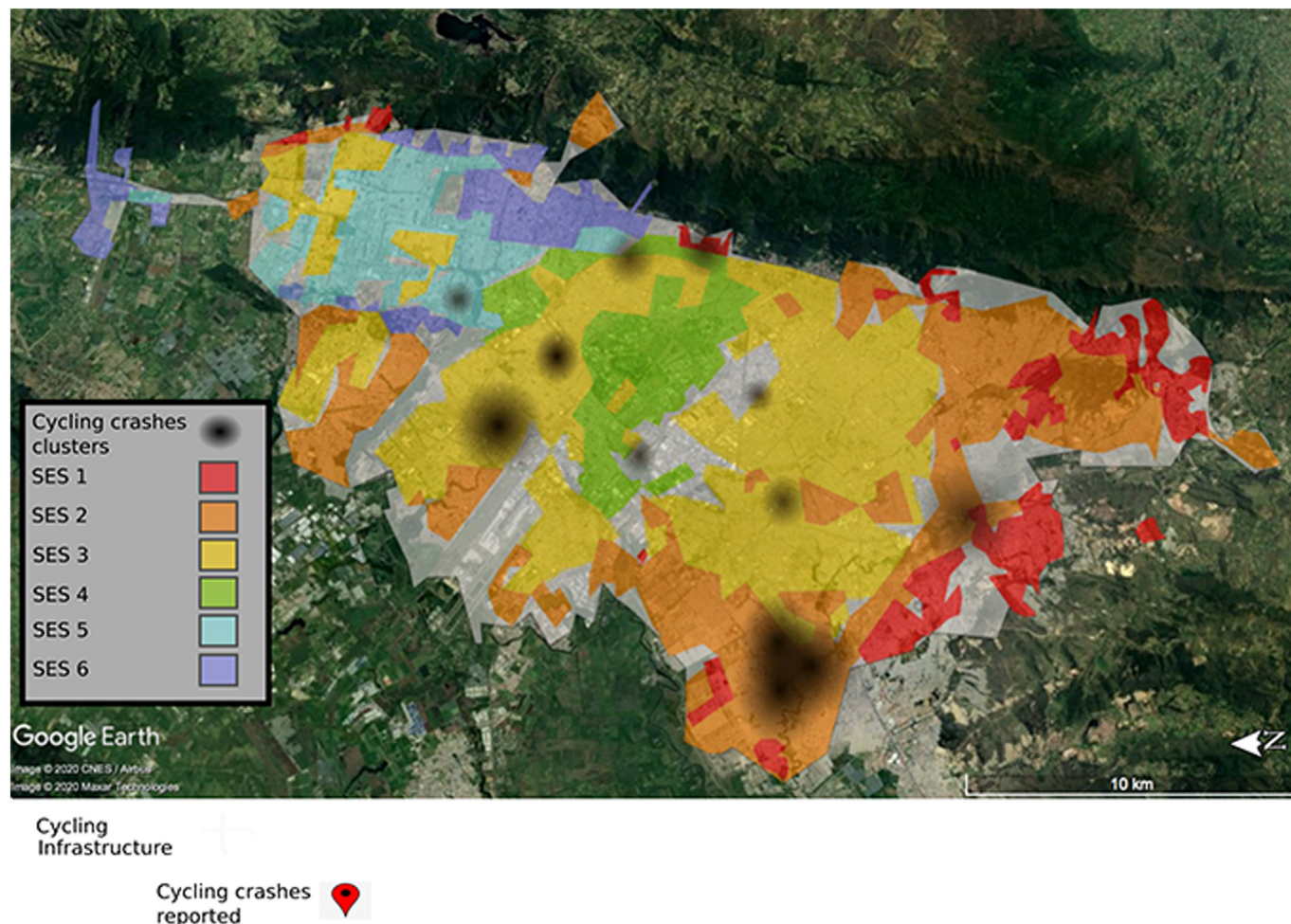


Fig. 3. Map of Bogotá's distribution of Socio Economic Status and clusters of crashes involving cyclists, made by the authors using Google Earth and based on maps published by Carvajal et al. (2020).

unrelated. As media coverage decisions are not necessarily driven by statistics but by perceptions of what is newsworthy, this dissonance is expected; however, the mechanisms behind such perceptions are not always clear. By analysing changes in the way media reports cycling safety we hope to make this perception more understandable.

As mentioned, before 2011 there is no coverage in *El Tiempo* reporting cyclists dying in traffic. At the beginning of that year, there was a very simple description of the circumstances of the death of a cyclist who was not actually involved in a crash but fell from a bridge.<sup>11</sup> At this point, most of the reported accidents are not necessarily traffic-related in the sense of two or more vehicles colliding; rather, they focus on cases where unmaintained or poorly designed infrastructure, like a sewer hole with a missing cover or a dangerous bridge, resulted in a cycling safety issue.<sup>12</sup> However, from September–October 2011, a change was observed when a cyclist was run over by a car in a very wealthy area of the city<sup>13</sup> and less than a month later, a 12-year-old girl was killed by a truck while cycling,<sup>14</sup> sparking more detailed coverage by the newspaper. In these cases, references to socioeconomic status, place of residence and work, as well as the drama the victims' families experienced are described in detail. These high-profile cases, one due to the economic status of the deceased and the other by the victim's young age, may have put a topic under the spotlight that was not previously of interest to the media or the general public.

However, while traffic safety can benefit from receiving more coverage due to these cases, the focus on individuality and individual behaviour can also have negative consequences. A more detailed report was published later that year, portraying the tense relations between cyclists and pedestrians on the sidewalk of one of the main roads in the south of the city.<sup>15</sup> Although one cyclist explains how the nearest cycle infrastructure is not well designed and is often occupied by motorists, in several interviews with police officers and pedestrians, cyclists are portrayed as reckless and having no respect for vulnerable pedestrians such as elderly people. The best examples of this discourse are two articles published in 2017, dedicated exclusively to illustrating how cyclists are the opposite of careful, cultured and decent citizens; pairing them with people who use public transport without paying; and describing how cyclist collectives are responsible for educating cyclists.<sup>16</sup> As shown later, this tone is found very often in *El Tiempo* until September 2017, when cyclists, cycling activists and academics start having a bigger presence in the news and the phenomena began to be portrayed in a more comprehensive and balanced way.

The focus on cyclists' recklessness is part of a wider trend of understanding traffic safety as merely the sum of individual behaviours, as we stated in the literature review. It is interesting, for example, that in some cases cyclists, activists and experts are interviewed, often stating that the city council should guarantee a safer built environment for cyclists, and the newspaper instead decides to focus on individual behaviours. This is seen in an article entitled "Using dark clothes and lack of lights, the dangers of

<sup>11</sup> *El Tiempo*, Ciclista murió tras caer de puente en el suroccidente de Bogotá, 25/04/2011.

<sup>12</sup> *El Tiempo*, Un hombre sufrió doce fracturas al caer en una alcantarilla sin tapa, 15/07/2011.

<sup>13</sup> *El Tiempo*, Muere abogado que fue arrollado en La Séptima, 26/09/2011.

<sup>14</sup> *El Tiempo*, Volqueta atropelló a una niña de 12 años en la localidad de Suba.

<sup>15</sup> *El Tiempo*, Ciclistas invaden los andenes de la Autopista Sur con carrera 73.

<sup>16</sup> *El Tiempo*, Bienvenida seas, hipocresía, 14/05/2017 and Carta a un ciclista, 24/09/2017.





#### Cycling Infrastructure

Fig. 4. Map of Bogotá comparing *El Tiempo's* reports on crashes and involving cyclists and actual crashes as reported by Carvajal et al. (2020). Made by the authors using Google Earth and based on review of press archives.

cycling in the night”.<sup>17</sup> In this article, a council worker lay responsibility for safety on cyclists, quoting that there have been 659 accidents and 25 deaths because of cyclists’ “mistakes” like speeding and not stopping at red lights. There are several articles promoting the use of a helmet and explaining how it “saves lives”, as at the time it was considered as mandatory by the law.<sup>18</sup> Other solutions promoted to improve cycling safety are: not using earphones, using hand signals and looking at drivers straight in their eyes,<sup>19</sup> thinking about others on the road, stopping at red lights, being visible in the night, giving pedestrian priority, being polite with cars, being creative instead of violent with other users if there is a safety event, helping others, not “invading” non-cycling infrastructure and learning to share the road, not drinking or consuming any hallucinogens when cycling, and not overloading the bike.<sup>20</sup>

The discourse of individual behaviour is only contrasted with that of focusing on infrastructure to explain cycling safety. In 2012, some of the first reports attempting to understand the phenomenon start by denouncing the poor state of the city’s cycling infrastructure in the north part of the city<sup>21</sup> although an article from the same newspaper in the same year reports that the majority of fatalities concentrate in the south-west side of the city.<sup>22</sup> Both articles have in common that they acknowledge the existence of cycling infrastructure; however, they highlight the lack of maintenance and connectivity as the main obstacles for cyclists. According to an expert interviewed by the newspaper later that year, Bogotá is not ‘thought’ to be travelled by bicycle

as road infrastructure is not safe for cyclists and there are not parking options or access ramps.<sup>23</sup> The traditional debate within cycling safety around the use of helmets is addressed in one article in 2012, with cycling activists and experts agreeing that it should be optional as the problem is more related to other factors; according to the expert Carlos Pardo: “it is preferable to take action in the bicycle environment instead of inside the cyclists head”.<sup>24</sup> In that sense, Alejandra Rojas, Executive Director of Bogotá Road Prevention Fund, explains in an article from 2013 that the lack of investment in cycling infrastructure is the main driver behind the growth in cycling danger and that national educational campaigns have been important but are not enough.<sup>25</sup> Later, in 2016, an article written by an academic denounces that traffic accidents are the leading cause of death in the region north of Bogotá and that cycling infrastructure is just a fifth of the minimum kilometres/100000 persons recommended by the Interamerican Bank of Development.<sup>26</sup>

Apart from these isolated examples, Cycling activists started to have a more permanent presence in media coverage from September 2017, although they had been around for over a decade (Castañeda, 2019). This happened after several cyclists died in traffic in just two weeks, which led to cyclist collectives’ protests both online and on the streets, with some professional cyclists supporting their initiative.<sup>27</sup> The first of these demonstrations was held by 900 cyclists on a steep road that connects the city with a small town in the mountains and is often used by recreational and professional cyclists for training.<sup>28</sup> That same year, the National Cycling Forum, originally a

<sup>17</sup> *El Tiempo*, Usar ropa oscura y falta de luz, los peligros de la bici en la noche, 03/10/2014.

<sup>18</sup> *El Tiempo*, Un buen casco le salva la vida a un ciclista, 19/04/2013.

<sup>19</sup> *El Tiempo*, Señales para evitar accidentes en bicicleta, 09/05/2014.

<sup>20</sup> *El Tiempo*, Más ciclistas, más cultura, 03/11/2016.

<sup>21</sup> *El Tiempo*, En abandono se encuentran las ciclorrutas del norte de Bogotá, 31/08/2012.

<sup>22</sup> *El Tiempo*, Estos son los cruces mortales de las ciclorrutas bogotanas, 16/09/2012.

<sup>23</sup> *El Tiempo*, ‘Bogotá aún no está pensada para movilizarse en bici’: Experto, 11/10/2012.

<sup>24</sup> *El Tiempo*, Para montar en bicicleta, ¿el casco debe ser obligatorio?, 23/11/2012.

<sup>25</sup> *El Tiempo*, Cada 15 horas se registra un muerto por accidente vial en Bogotá, 13/02/2013.

<sup>26</sup> *El Tiempo*, Primera causa de muerte violenta en Sabana Centro, 14/11/2016.

<sup>27</sup> *El Tiempo*, Rigoberto Urán se une a la manifestación de los ciclistas colombianos, 15/09/2017.

<sup>28</sup> *El Tiempo*, Cerca de 900 ciclistas protestaron en la vía Patios- La Calera, 17/09/2017.



citizen initiative, started receiving governmental support and cycling safety was chosen as its central topic.<sup>29</sup> Additionally, experts and academics received increasing newspaper coverage and their opinions widened, to some extent, the traditional individual scope held by media. One example is an interview with Ricardo Montezuma, who explains how the phenomenon of cyclists dying in traffic has to be understood beyond individual behaviour and as a complex matter that includes all road users' behaviours, especially public transport drivers and motorists, as well as policies that aim to reduce speed limits.<sup>30</sup> A series of articles sponsored by the National Agency for Traffic Safety set an interesting contrast in the opinions about the purpose of cycling collectives: on the one hand, the journalist explains how these groups exist to educate cyclists in terms of safety and citizen behaviour; on the other, actual members of the collectives consider themselves as trying to avoid "road conflicts" that already exist, due to traffic not being designed for people.<sup>31</sup>

After this and other demonstrations led by cyclists received media attention, the council announced that it would take action and set a shock plan that included improving traffic signals and fixing unconnected cycle infrastructure, as well as measures focused on cyclists such as a new edition of the *Cyclists' Manual*.<sup>32</sup> This shows that it is not only the media that focuses on individuals as the council's campaigns and actions tend to go in the same direction. The publication of the *Cyclist's Manual*, for example, shows a growing interest in this road user but also focuses solely on individual behaviours.<sup>33</sup> The National Agency for Road Safety followed the same line in a series of sponsored reports published in the newspaper, stating that, "road safety does not depend on infrastructure or luck; instead, it depends mainly on behaviour, following the norms and vehicle maintenance".<sup>34</sup> The city's Secretary of Transport took the same approach, saying that "the problem [traffic safety] is about attitude, about having an aggressive attitude".<sup>35</sup>

This focus on changing individual behaviour, specifically reckless cyclist behaviour, contrasts with the council's discourse in many ways over the past three years. On the one hand, Mayor Enrique Peñalosa, well known for building some of the city's first cycling infrastructure in his previous term a decade ago, uses a very cycle-friendly terminology, addressing drivers directly and indicating that cyclists have the same right to use the road as they do.<sup>36</sup> On the other hand, the council that he leads has been attempting to portray the city as the World's Capital of the Bicycle, spending on numerous publicity campaigns and celebrating the good image Bogotá has internationally as a cycle-friendly destination. Unfortunately, at the same time, cycling safety is a growing concern for media and citizens; therefore, these claims are met with scepticism by activists, experts and even other government entities. In a report focusing on the environmental benefits that cycling brings to the city, several experts agree that this is a triumph of the people who cycle despite the poor state of cycling infrastructure and not thanks to its length, as the council advertises.<sup>37</sup> As this article was being written, Bogotá's council, experts and cyclists are debating whether Bogotá should be called the World's Capital of the Bicycle or the World's Capital of Dead Cyclists, as public protests and mortality rates continue to rise.<sup>38</sup>

## 5. Conclusions

As shown in this research, there is a vast literature in cyclist safety that has been growing in the past two decades. However, there are still some gaps that need to be filled in order to make research results more relevant outside of the Global North and to have a better understanding of the phenomena itself. Firstly, the use of interdisciplinary methodologies, especially

qualitative strategies of research and analysis, are necessary to understand cycling safety in its complexity and diversity as socioeconomic, cultural and representation aspects are as important as the behavioural and infrastructural ones, which have attracted most of the academic attention. Secondly, there is a disproportionate amount of research focused on the Global North, when the deterioration of cycling safety is a global problem and there are perspectives, methodologies and experiences in one side of the world that can help understand present and future phenomena in the other. One example developed here is the interest in understanding the role of inequality in transport, which is better developed in Latin America, for example, while research on active travel has better development in European research.

In this research we used geographical analysis and archival review of online press to analyse the case of Bogotá, a Global South city, with an international reputation of being cycle friendly, but with deep disparities in the experiences of its cyclists according to their location and class. By doing so, we attempted to show how spatial inequality in cycling safety is expressed in at least three ways: disparities in cycling infrastructure allocation by city planners; concentration of traffic crashes resulting in cyclists' deaths in low income areas; and disproportion in media coverage of cyclists' deaths in traffic according to their locations. Additionally, we establish that the academic focus on individual behaviour and infrastructure to explain cycling safety is also found on media and in official council's communications. As it has been proposed by Macmillan et al. (2016) for London and Boufous et al. (2016) for Australia, media can play a role in shaping cycling safety concerns, behaviours and policy agenda setting and it is important that different points of view are contrasted. In that sense, including the diverse voices of activists and experts can bring a new perspective to a familiar problem. Additionally, both researching and reporting a complex phenomenon such as cycling safety needs to go beyond focusing on individual cases and behaviours as this can blur out the fact that certain groups and areas of a city are much more vulnerable to its negative consequences and are probably not being positively impacted by improvements in other areas of the city or the city's reputation in general.

## CRediT authorship contribution statement

**Camilo Alfonso Torres-Barragan:** Methodology, Formal analysis, Writing - original draft. **Caitlin D. Cottrill:** Conceptualization, Resources, Writing - review & editing, Supervision. **Mark Beecroft:** Conceptualization, Resources, Supervision.

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<sup>29</sup> *El Tiempo*, Seguridad vial depende también del comportamiento de todos, 26/07/2017.

<sup>30</sup> *El Tiempo*, Ciclistas muertos, un mal regional, 17/09/2017.

<sup>31</sup> *El Tiempo*, Colectivos en el país que trabajan por educar a los bicisuarios, 26/07/2017.

<sup>32</sup> *El Tiempo*, Distrito busca salidas para la seguridad de los ciclistas en Bogotá, 17/09/2017.

<sup>33</sup> *El Tiempo*, Lanzas un manual para bicisuarios, 09/11/2014.

<sup>34</sup> *El Tiempo*, Seguridad vial depende también del comportamiento de todos, 26/07/2017.

<sup>35</sup> *El Tiempo*, 'El problema es de actitudes, es de tener una actitud agresiva', 24/09/2017.

<sup>36</sup> *El Tiempo*, Fallece otro ciclista en accidente de tránsito en Bogotá, 13/09/2017.

<sup>37</sup> *El Tiempo*, Más de 1.200 toneladas de CO2 se evitan al año gracias a las bicis, 24/09/2017.

<sup>38</sup> *El Espectador*, ¿Capital mundial o mortal de la bici?, 28/03/2019.

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