

LGBTQI+ safety perceptions in transit environments

Vania Ceccato^{a,*}, Gabriel Gliori^a, Catherine Sundling^b

^a Urban and Community Safety Research Group - UCS, Department of Urban Planning and Environment, KTH Royal Institute of Technology, Stockholm, Sweden

^b Department of Social Sciences, Södertörn University, Sweden

ARTICLE INFO

Keywords:

Queer
Railway
Transmobilities
Daytime
Public transportation
Public space

ABSTRACT

This article seeks to investigate the nature of safety perceptions of train travellers, focusing on the experiences of transgender and gender-nonconforming individuals of the environments of railway stations and the way to them. This study makes use of descriptive statistics and binary logistic regression with a dataset specially tailored from a safety survey collected in 2022 in Southern Sweden. Large variations of travellers' safety perceptions are found in relation to the time of day and across transit environments, regardless of gender or any other individual attributes or characteristics relating to their particular trips. Previous victimisation impacts safety for all groups, but travellers fear crimes that are not common in transit situations. Women are more likely to be fearful, but the most fearful of all are women who identify themselves as LGBTQI+ /other. Such a pattern is not found in men, who declare themselves to be the safest of all travellers. The implications of these results are explored both in terms of future research questions and practical implications.

1. Introduction

A 22-year-old was verbally and physically attacked. A video recording shows an unidentified person yelling anti-gay slurs at the victim and assaulting them (NYC, USA¹).

Couple is target of homophobia in São Paulo subway (São Paulo, Brazil²).

A lesbian is raped and stoned to death a day before starting her new job (Soweto, South Africa³).

Queer individuals (Queer is an umbrella term for the LGBTQI+ group, namely lesbian, gay, bisexual, transgender, queer, or questioning) are more exposed worldwide to discrimination, crime, and violence than the rest of the population in public spaces (Angeles and Robertson, 2020a; Lubitow, Abelson & Carpenter, 2020; Świder & Winiewski, 2016). As the above quotes show, transit environments in particular (e.g., on the way to a bus stop, on the platforms of train stations, or during the trip, inside the wagons) are common scenarios of discrimination and crime against LGBTQI+ people. Although much has been written about discrimination and violence against queer people (Mallory, Hasenbush & Sears, 2015; Ventimiglia, 2011), the international empirical evidence

on transit environments is limited (but see, for instance, Nourani et al. (2020), Lubitow et al. (2017)), in particular, in other contexts outside large cities. Research shows that public spaces in rural contexts can be difficult places for queer people (Hartal & Bar Tzedek, 2023). Current research on travellers often uses small samples, limiting broader conclusions. This study is unique because it surveys public railway users across three east-to-west routes and 47 stations in 28 Swedish municipalities, covering both rural and urban areas. By focusing on a diverse range of public railway users across multiple routes and municipalities in Sweden, it provides valuable insights that can inform future transportation policies and improve service delivery in both rural and urban contexts.

This study examines safety perceptions of LGBTQ+ individuals and how their concerns about crime in transit environments affect their safety and their daily routines. The study assesses the variation of these travellers' safety perceptions, examining how queer people differ in terms of victimisation and safety perceptions from other travellers.

The research questions are:

1. How many travellers are victimised during their trip and how do they differ in terms of individual characteristics?

* Corresponding author.

E-mail address: vania.ceccato@abe.kth.se (V. Ceccato).

¹ <https://edition.cnn.com/2022/04/03/us/subway-attack-anti-gay/index.html>

² <https://www.youtube.com/watch?v=CmgE8Xolms4>

³ <https://www.mambaonline.com/2017/05/15/74057/>

2. Do LGBTQI+ individuals feel less safe than others during the day and night? Are there differences in safety perceptions between women and queer women or between men and queer men? Are there differences between urban and rural contexts?
3. What are the most common precautionary measures taken by LGBTQI+ individuals during their trip? What are the most frequent recommendations suggested by travellers to improve safety in transit environments?

We adopt the term transmobilities (Lubitz et al., 2017) to support the analysis and illustrate how transgender and gender non-conforming individuals experience gender in ways that shape their mobility in relation to public transportation. Transmobility represents a progressive paradigm shift in public policy aimed at transforming policies from gender-neutral to gender-inclusive (Singh, 2023). Transmobilities provides a comprehensive framework for analysing safety among LGBTQI individuals by embracing the complex dynamics and intersections between types of individual characteristics as well as how individuals and society navigate and negotiate mobility in an increasingly interconnected world. Transmobilities integrate the physical, social, economic, and digital dimensions of mobility, recognising that modern transportation and communication systems are interconnected and constantly evolving. In this paper, we consider how mobility shapes identities, social contacts, victimisation, and fear and how these, in turn, influence daily mobility patterns. Moreover, we examine how spatial factors (e.g., stations conditions surrounding land use) and social factors (e.g., socio-economic status, people's gender) influence crime and victimisation patterns. This aligns with the transdisciplinary approach of transmobilities, which considers multiple dimensions of mobility. Finally, we also make recommendations, which means practitioners and policymakers can use our results or this framework to develop strategies that address issues such as inequality in victimisation, safety perceptions as one dimension of sustainability. Transmobility encourages a critical examination of power dynamics within mobility systems which is relevant for understanding the vulnerabilities of the LGBTQI+ and gender non-conforming individuals, which are the focus in this study.

Sweden constitutes an interesting object of study. On the one hand, in this country, equal rights and opportunities regardless of sexual orientation, gender identity or gender expression are fundamental rights of the individual (Bränström & van der Star, 2013; Swedish Government, 2021; Wilson, 2019). On the other hand, figures show that LGBTQI+ individuals are still disproportionately discriminated against and victimised (Brottsförebyggande, 2017). By bringing in evidence from travellers in the Swedish context, a contribution is made to a field of research devoted to gendered mobility scholarship that encompasses a range of theories on both large-scale movements of people and daily patterns of movement that are highly dominated by North American literature (Hannam, Sheller & Urry, 2006; Hanson, 2010).

This article is composed of six sections. We discuss the literature on fear in transit environments. Then we frame the current study, and we follow this with the results and discussion of our empirical study. The article ends with conclusions and recommendations for research and policy.

2. Theoretical background

2.1. Definitions in transit safety

Feeling safe throughout the trip means a trip free of crime and other incidents that trigger fear and other negative feelings. Whilst fear is an emotion of alarm or dread caused by the expectation of danger (Warr, 2000), fear of crime is an emotional reaction of anxiety or dread associated with crime or its symbols (Ferraro, 1995). Although it is assumed that increased crime rates (more victimisation, more crime) would impact perceived safety, empirical studies rarely confirm this causal relationship. This is because fear of crime pertains more to the fear of

becoming a victim rather than the actual likelihood of victimisation (Hale, 1996). Victimisation by crime refers to the experience of an individual or group being subjected to criminal acts that cause harm or loss, including physical, psychological (e.g. emotional), or financial damage, such as assault, robbery, theft, fraud, and vandalism (Fattah, 1991).

In this study, we use the term 'safety perceptions' in transit as a general concept of 'declared perceived safety' for passengers along the trip. Thus, perceived safety can be high when an individual feels safe or low when an individual feels fearful or feels unsafe. In the next sections, we discussed these concepts in more detail. Previous research has shown that although there is a long tradition in the methodological study of fear of crime that acknowledges various dimensions of 'fear,' including cognitive aspects (such as risk perception) and emotional aspects (such as feeling afraid), very often these terms are used under the umbrella term "poor safety perceptions."

Despite the longstanding tradition in transportation sciences of differentiating between "security" for crime and victimisation and "safety" for traffic accidents, we choose to use the term "safety" throughout this article. Our reasons are as follows: 1) Extensive literature (e.g. Ceccato, Gaudalet and Graf, 2022; Loukaitou-Sideris, 2014; Vera-Gray, 2018; Whitzman et al., 2009) employs "safety" to denote transit safety, individual's safety. 2) The term "safety" is frequently associated with "user's safety", irrespective of whether the threat arises from accidents (Chi, Chang & Tsou, 2006), crime (Abenzoza et al., 2018), self-inflicted violence (Uittenbogaard & Ceccato, 2015). 3) Both the UN and WHO use "safety" in many official documents in this context (World Health Organization, 2016; UN-Habitat, 2019). 4) Recent literature on transitions and sustainability (e.g., Mapar et al., 2017) also adopts "safety" as a synonym for "security" due to its interdisciplinary nature, recognising that these dimensions often overlap.

Safety perceptions of travellers are a function of characteristics of individuals and the situational circumstances where they spend time. In other words, individuals express *dispositional fear*, here fear is characterised as a trait, and *situational fear*, described as fear as a temporary state (Gabriel & Greve, 2003). The former highlights variations between individuals in their predisposition to feel fear, (age, gender) while the latter pertains to the momentary experience of fear (Kappes, Greve, & Hellmers, 2013), but they mutually influence each other.

Among travellers, women, older adults, individuals from ethnic minority backgrounds, LGBTQI+ community members, individuals with disabilities, and those facing economic disadvantages tend to express elevated levels of fear of crime when compared to the general population (Box, Hale, & Andrews, 1988; Smith & Pain, 2008). Other individual factors that affect safety are not only the frequency of use of public transportation, which leads to more or less familiarity with a particular environment, but also the length of trips as well as previous victimisation (Hale, 1996). While young people are statistically more at risk of being victimised, older and/or disabled individuals tend to be more fearful. The seriousness of the crime is also relevant when it comes to measuring its impact (Jackson & Gouseti, 2012).

The situational fear is determined by the environmental conditions of the transit route. The interior design of trains as well as the physical and social environment of the train stations, as well as the way to or from them, all have an impact on the risk of victimisation and how we perceive these transit environments (Sundling & Ceccato, 2022; Ceccato et al., 2022). These reviews show that the factors that influence the perceived safety of users in station environments are a lack of lighting, surveillance, open environments, and/or social characteristics, such as station violence, overcrowding in the area, disrespectful behaviour from others (people under the influence of alcohol, gangs, etc.), or that few or no other people are present. Sarker, Currie, and Reynolds (2024) found that fear of being subjected to crime and anti-social behavior in public transport has increased after the COVID-19 pandemic. In a recent study executed during the pandemic, the service hour, the proximity, and the frequency attributes of transportation were important to explain

passengers' satisfaction with the quality of the public transport service while the temperature and the cleanliness factors were not. The authors recommended further research on the cost and improvements of security attributes of public transportation service providers (Ismael, Esztergár-Kiss & Duleba, 2023). The consequences of fear can affect travel, both in the short term and in the long term. Examples of short-term consequences are being constantly on guard while long-term consequences are, for example, avoiding travelling at certain times of the day or avoiding certain places.

2.2. LGBTQI+ and gender non-conforming individuals

Transgender and gender non-conforming individuals often experience harassment, which undermines their access to safe public transportation (Lubitow et al., 2017). Drawing from 25 interviews with transgender and gender non-conforming individuals in a case study in the US, the study finds that gender minorities experience frequent harassment while engaging with the public transport system. Similarly, evidence from the Global South shows that sexual violence does differ among members of the LGBTQI+ community (female gender non-conforming individuals being more exposed to sexual harassment than all other travellers, including male gender non-conforming individuals (Nourani et al., 2020)). The interactions of LGBTQI+ status with ethnicity and socio-economic status are also reported in the current international transit literature. Using an intersectional lens, authors suggest that this framework represents a specific form of non-hegemonic mobility, whereby multiple forms of oppression impact the movements, behaviours, and emotions of transgender and gender non-conforming transport users. The fear of crime in public spaces acts negatively on the participation of travellers in socio-economic activities (Ceccato & Loukaitou-Sideris, 2020). Besides social factors, this fear is largely supported by spatial elements, such as the perception of the built environment, especially transit environments (Ceccato, 2017; Orozco-Fontalvo et al., 2019; Santoro et al., 2020). Yet, empirical research focusing on LGBTQI+ and gender non-conforming individuals and transit environments is still rare in the international literature.

2.3. Temporal and spatial contexts of safety of LGBTQI+ travellers

Research has demonstrated that it is more likely that travelers feel safer during the day than in the evening and at night (Warr, 1990). Daytime and night-time can have different effects on transit safety, and several studies have already explored this topic (Racehorse et al., 2015; Ceccato & Loukaitou-Sideris, 2020). Previous research suggests that daytime and clear weather increase safety due to better visibility and people's daily routine activities. For instance, Walton and Sunseri (2010) found that weather influences decisions to walk from/to public transportation, but walking was not impeded by factors such as distance or fear of crime. Nighttime and adverse weather reduce visibility, increase vulnerability, and lower public presence, heightening anxiety and fear of crime. Social factors and past experiences also influence perceptions (Ferraro, 1995, Warr, 1990, Sreetheran & Van Den Bosch, 2014). Yet, most of these environmental factors interact with the individual characteristics of travellers.

Less known is how transit environments in different country contexts affect victimisation and safety perceptions of travellers and in particular LGBTQI+ travellers. Large cities are often taken for granted as inclusive spaces, yet they may also be at the top of the rank of statistics of violence against LGBTQI+ people, if an absolute number of cases is considered. Recent research suggests a more nuanced picture of those living in rural areas as they can more easily negotiate their identity (Hartal & Bar Tzedek, 2023). Small rural communities can surely be restrictive towards queer people, but others can be inclusive and welcoming – or they can be both at the same time (for a review, see Abraham and Ceccato (2022)). On top of this rural-urban divide, some evidence in Sweden shows that the internet and social media help young people navigate in

society, being a source of knowledge and community, and making it easier for them to come out as LGBTQI+ people regardless of their local context, either urban or rural. Unfortunately, public safety still adopts static, heterosexist notions of men and women – a “tyranny of gender” (Angeles & Robertson, 2020b) that is said to disadvantage LGBTQ+ people, intersex, and trans populations (Doan, 2007).

3. Research design

3.1. The case study

Together with the Swedish Transport Administration, we selected a number of railway lines that served as case studies to further identify which characteristics of the station environment most affect passenger safety. Size, location, and contexts were used as criteria for selection of the stations. Altogether, the three lines serve approximately 64,000 passengers a day, which, according to the Swedish Transport Administration, is a rough estimate of an annual average day per station (Trafikverket, 2009).

3.1.1. Definitions

In this study, we adopt the words ‘woman’ and ‘man’ for individuals whose gender identity or expression aligns with the societal expectations or norms associated with their assigned sex at birth. These respondents put a cross next to “woman” or “man” in the survey, but not next to the LGBTQI+, non-binary, or other alternatives. Those who identify with other groups regarding gender identity in the survey were included in the category “Gender non-conforming individuals” and are those whose gender identity or expression does not align with the traditional societal expectations or norms associated with their assigned sex at birth. Gender non-conforming people may identify as transgender, but not all do. Some may have a gender identity that is fluid or outside a binary identity (e.g., gender-queer, non-binary, gender-fluid) or may simply express themselves in ways that challenge traditional gender roles without necessarily identifying as a different gender. The term queer and LGBTQI+ includes a diverse spectrum of gender identities and expressions that may not fit within the binary understanding of male and female. For details, see Appendix 1.

We had to adapt/aggregate the initial gender categories in the survey to carry out the statistical analysis. We assume that those who, for example, only answer “woman” are both heterosexual and cis. We are aware that there may be situations where a (trans)woman can perceive herself as hetero-bi or homosexual, which we may have missed in this particular category. In the modelling section in particular, travellers who define themselves for example as “woman and lesbian”, were included in the category “Woman + LGBTQI+/Other”. Those whose genders are non-conforming and did not identify themselves as women or men would be included in the group “Non-binary/LGBTQI+/Other”. Despite our aggregation, the estimated proportion of the population that is queer is between 5 and 7 per cent, which is similar to the estimated amount for this group from other sources (Seto et al., 2010).

3.1.2. The survey with transit passengers

The database for this study was collected through (1) a web survey and (2) a paper survey approved by the Swedish Ethical Review Authority. Conducted between May and November 2022, the survey comprised 32 questions. The paper survey was distributed onboard trains to passengers traveling by train. The other way of collecting data was through a web-based survey via the Crowdsignal platform (<https://crowdsignal.com/>). For more details about these independent surveys, see Ceccato et al. (2024a).

During fieldwork inspections in the summer of 2022, posters and cards were set up to advertise the survey by featuring a QR-code that linked directly to it. It was also shared in Facebook groups by municipalities and other various organisations. Moreover, we participated in radio programs to promote the research project and encourage people to

complete the survey.

The survey began with introductory questions regarding which station the passenger uses, their frequency of use and their travel times. This was followed by questions about experiences of victimisation in transit environments, feelings of fear, and safety precautions. The survey concluded with the respondent's recommendations for improvements and background information, including gender, age and ethnicity among other. The sample was calculated so the results could be statistically broken up according to line, station size, gender, age and time of day. A total of 3,407 survey responses were collected. The results from the survey were compiled in data files and tables. Only surveys with a 90 per cent response completion were included in the results. Of the total valid responses, 163 identify themselves as LGBTQI+, non-binary individuals or other, about 5 per cent of the sample. [Table 1](#) shows the characteristics of the sample.

3.2. Methods

The survey includes questions regarding travellers' fear of crime, which constitutes the dependent variable in the modelling using logistic regression. We asked them: "When travelling by train, do you often feel afraid of being exposed to the following?" (A list of crime types followed divided up according to whether the respondents are at the station, on the way to the station, or on the train—if the respondent answered "yes" to any of these = 1, otherwise = 0). In addition to other individual factors, we also asked about previous victimisation using the question: "In the past 5 years, have you experienced or witnessed any of the following on the train, at the station, or on the way to/from the station? (followed by a list of crime types)". According to the international literature, previous victimisation is a good predictor of fear. For instance, [Skogan \(1987, 135\)](#) shows that "victimisation affects both fear-related attitudes and behaviour in a clear and consistent manner", see also similar findings in [Rountree and Land \(1996\)](#) and [Ceccato, Langefors and Näsman \(2021\)](#). Then we ask for recommendations, "Can you indicate which of the following could make your journey by train safer? (A selection of 16 items constituted the alternatives.)

The survey data was initially collected and later imported into Excel. Subsequently, the data was transferred to IBM SPSS Statistics version 28.0.1.1, a statistical software package, for comprehensive analysis. In addition, Geographic Information Systems (GIS) were employed to map relevant land use, incorporating variables that provided insights into the demographic and socio-economic characteristics of the areas where stations were located, such as income and age by DeSO areas, the smallest unit of analysis in Sweden. It is important to notice the sample size ($N = 163$ of LGBTQI+ individuals).

During the data quality assessment, it was observed that a few variables had a response rate lower than the average. This discrepancy affected the analysis by reducing the number of observations available for those specific variables. Considering the extensive array of variables and our goal to create concise models, we first employed exploratory data analysis and hypothesis testing methods, including frequency distributions, cross-tabulation and correlation analysis. These techniques were employed to identify a subset of variables that would effectively capture the attributes of both travellers and stations and would be added to the logistic regression model. We have opted to present the results of

Table 1
The characteristics of the sample¹.

Gender identity/orientation (N = 3,407)	Count	Percentage
Women	2,076	60.9 %
Men	1,168	34.3 %
LGBTQI+ Women	50	1.5 %
LGBTQI+ Men	27	0.8 %
Non-binary/LGBTQI+/Other	86	2.5 %
	3,407	100 %

the modelling in terms of odds ratio. A limitation of this choice is that it is assumed that the event is rare. Although violence is a relatively rare event in general, we are aware that research indicates that members of this community often experience higher rates of victimisation and related fears compared to the general population. Although we do not have evidence for Sweden, it might be that the odds ratio may be overestimated when events are not rare. To ensure that multicollinearity was not present, a set of variables was omitted from the model. All independent variables were assessed by undergoing bivariate correlation testing, which revealed significant correlations ($r \geq 0.6$) of a few independent variables (e.g., ethnic background and income levels). This means that even if we wanted to control for ethnicity and income levels in the same model, we had to choose only one variable. In the logistic regression models, where we utilised a binary dependent variable representing 'being fearful' (coded as 1), we employed a significance level of 5 per cent. If a statistically significant result was achieved, we reported the corresponding probability value (p-value). In the next section, we report the results. For a description of the variables, see [Appendix 1](#).

4. Results

4.1. Patterns of safety perceptions in transit

Of 3,407 respondents, 34.4 per cent reported that they are afraid of being subjected to crime while in transit. The cross-table results show that LGBTQI+ people were more fearful than any other group. As many as 46.5 per cent of queer people declare often feeling afraid of being exposed to crime, 39.2 per cent of women, while only 24.1 per cent of men experienced fear of crime (Chi-Square=84.05, $df = 2$, $p < 0.001$). [Table 2](#) shows the difference between individuals who identify as LGBTQI+, non-binary or other heterosexual women and heterosexual men in terms of victimisation and fear. If a passenger has previously experienced victimisation in transit settings, it affects their sense of safety. However, the impact varies depending on the traveller and the type of crime. Out of the respondents who participated in the survey, 13.8 per cent reported experiencing victimisation in transit within the past five years. Those who are more victimised tend to declare that they are more fearful (68.5 per cent of victims are fearful compared to 29.7 per cent of those who are non-victimised; Chi-Square=277.68, $df=1$, $p < 0.001$). We also found that LGBTQI+ people were more victimised than any other group (22.4 per cent from this group were victimised compared to 13.0 per cent of the rest; Chi-Square=11.48, $df = 1$, $p < 0.001$).

While most travellers are slightly more fearful of property crime (theft and robbery, 24.6 per cent) the most common crimes against travellers are threats, hate crimes, sexual harassment, violence, and aggressive panhandling ([Table 3](#) and [Fig. 1](#)). However, people who identify as LGBTQI+ feared stalking (28.9 per cent), unlawful threats or hate crimes (26.4 per cent), and sexual harassment the most (25.8 per cent). For men, in contrast, sexual harassment and stalking were ranked at the bottom, but theft was at the top (17.1 per cent). Women's fear is also of theft (24.2 per cent), followed by sexual harassment (23.5 per cent), violence (23.2 per cent) and stalking (23.1 per cent).

Declared fear levels vary throughout the journey. More people tend to experience fear at the station or on the way to/from it, whereas they generally feel safer when they are on the train – both during daytime and night-time ([Fig. 2](#)). As expected, people feel significantly safer when travelling during daytime. Notably, there are evident differences between women and men in their safety perceptions. About 41.5 per cent of females and 24.4 per cent of males reported that they sometimes or always feel unsafe during their journeys. Yet, LGBTQI+ individuals still feel more unsafe during the day when compared to the rest of the respondents, with 44.4 per cent expressing occasional feelings of a lack of safety during daytime journeys, in contrast to 35.4 per cent of the total men and women group (Chi-Square=5.19, $df = 1$, $p = 0.023$). The

Table 2

The difference between individuals who identify as LGBTQBI+, non-binary or other and heterosexual women, heterosexual men in terms of victimisation and fear.

	LGTBQBI+, non-binary or other	Hetero women	Hetero men	Chi-square	p
Victimisation	N = 161	N = 2,031	N = 1,142		
Victim to crime	22 %	15 %	10 %	23.99	0.000
Victim to crime (incl. aggressive panhandling)	32 %	23 %	22 %	8.01	0.018
Victimised on the way to the station	15 %	10 %	7 %	14.39	0.001
Victimised at the station	13 %	9 %	7 %	6.56	0.038
Victimised on the train	14 %	8 %	5 %	17.21	0.000
Victim to theft	7 %	4 %	5 %	4.21	0.122
Victim to robbery	2 %	0 %	1 %	12.14	0.002
Victim to violence	5 %	2 %	3 %	9.35	0.009
Victim to threat or hate crime	13 %	3 %	4 %	39.79	0.000
Victim to sexual harassment	9 %	7 %	1 %	58.80	0.000
Victim to stalking	12 %	7 %	2 %	44.44	0.000
Victim to aggressive panhandling	19 %	14 %	17 %	9.56	0.008
Fear	N = 159	N = 2,029	N = 1,139		
Fear of crime	47 %	39 %	24 %	84.05	0.000
Fear of crime on the way to the station	35 %	29 %	14 %	95.44	0.000
Fear of crime at the station	36 %	28 %	17 %	61.47	0.000
Fear of crime on the train	25 %	17 %	10 %	38.04	0.000
Fear of theft	25 %	24 %	17 %	22.44	0.000
Fear of robbery	23 %	21 %	16 %	15.48	0.000
Fear of threat or hate crime	26 %	18 %	13 %	26.20	0.000
Fear of violence	24 %	23 %	17 %	17.77	0.000
Fear of sexual harassment	26 %	24 %	5 %	191.17	0.000
Fear of stalking	29 %	23 %	6 %	152.72	0.000

disparities between the groups are most prominent while on the train (26.5 per cent versus 15.8 per cent; Chi-square=12.29, df = 1, p < 0.001) and at the station (39.2 per cent versus 28.7 per cent; Chi-square=8.00, df = 1, p = 0.005). Interestingly, there is no significant difference between the groups in safety perception while on the way to the station during the daytime.

Table 3

Transit crime¹ by type and during a trip for LGBTQBI+ individuals: On board train, on the way to/from station and at the station.

	Total		Onboard train		Way to/from station		At station
Aggressive panhandling	20.5 %	Threat or hate crime	9.3 %	Aggressive panhandling	13.0 %	Aggressive panhandling	14.9 %
Threat or hate crime	18.6 %	Sexual harassment	9.3 %	Violence	11.2 %	Threat or hate crime	13.7 %
Violence	17.4 %	Theft	6.8 %	Threat or hate crime	10.6 %	Violence	13.0 %
Sexual harassment	16.8 %	Aggressive panhandling	6.2 %	Theft	9.3 %	Sexual harassment	11.2 %
Theft	14.3 %	Stalking	5.6 %	Sexual harassment	8.7 %	Theft	5.6 %
Stalking	11.8 %	Violence	5.0 %	Stalking	8.1 %	Stalking	6.2 %
Robbery	5.0 %	Robbery	1.9 %	Robbery	2.5 %	Robbery	3.1 %
Safety perception ²	46.5 %		24.5 %		34.6 %		36.5 %
N _{LGTBQBI} victimisation=161							
N _{LGTBQBI} safety perception=159							

¹ Question used: In the past 5 years, have you experienced or witnessed any of the following on the train, at the station, or on the way to/from the station? (followed by a list of crime types)

² Question used: When you travel by train, do you often feel afraid of being subjected to the following? (followed by a list of crime types)

In the evenings or nights, 71.0 per cent of women and 62.0 per cent of LGBTQBI+ individuals indicate that they sometimes feel unsafe in transit environments. In contrast, only 41.9 per cent of men report such feelings (Chi-Square=179.70, df=2, p < 0.001). There are no significant differences when comparing the men and women group with the LGBTQBI+/Non-binary group in terms of the overall journey during night-time. Nevertheless, when examining specific segments of the journey, differences emerge once more when they are on board the train. Here, 48.9 per cent of LGBTQBI+ individuals sometimes or always feel unsafe on board the train, compared to 38.0 per cent of men and women (Chi-square=6.83, df=1, p = 0.009). However, no significant differences were found between the two groups when they are at the station or on their way to the station during night-time.

Furthermore, around half of all women and LGBTQBI+ individuals described feeling unsafe in the vicinity of the train station, whereas only 28.4 per cent of men reported the same thing (Chi-Square=154.26, df = 2, p < 0.001). Among the various locations within the train station, the pedestrian underpass or overpass to the platform emerged as the most fear-inducing place, with 44.4 per cent of women and queer individuals feeling unsafe there. The parking area ranked as the second most worrying place, with 18.9 per cent of respondents expressing fear in that

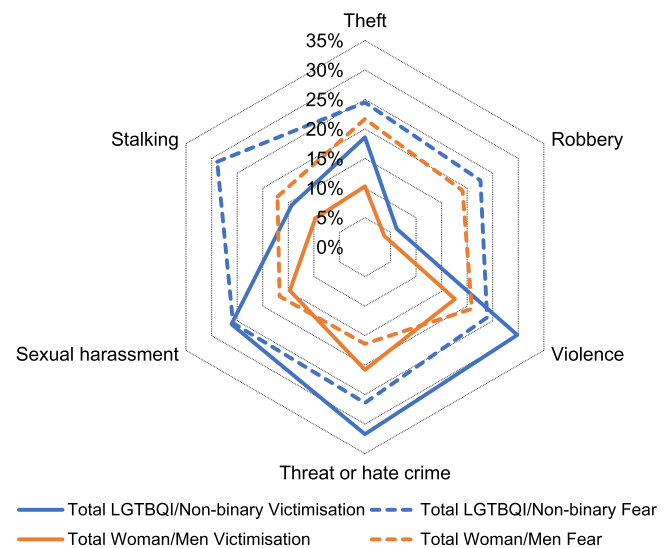


Fig. 1. Travellers' victimisation⁸ and fear⁹ by types of crimes and gender status.

⁸ Question used: In the past 5 years, have you experienced or witnessed any of the following on the train, at the station, or on the way to/from the station? (followed by a list of crime types)

⁹ Question used: When you travel by train, do you often feel afraid of being subjected to the following? (followed by a list of crime types)

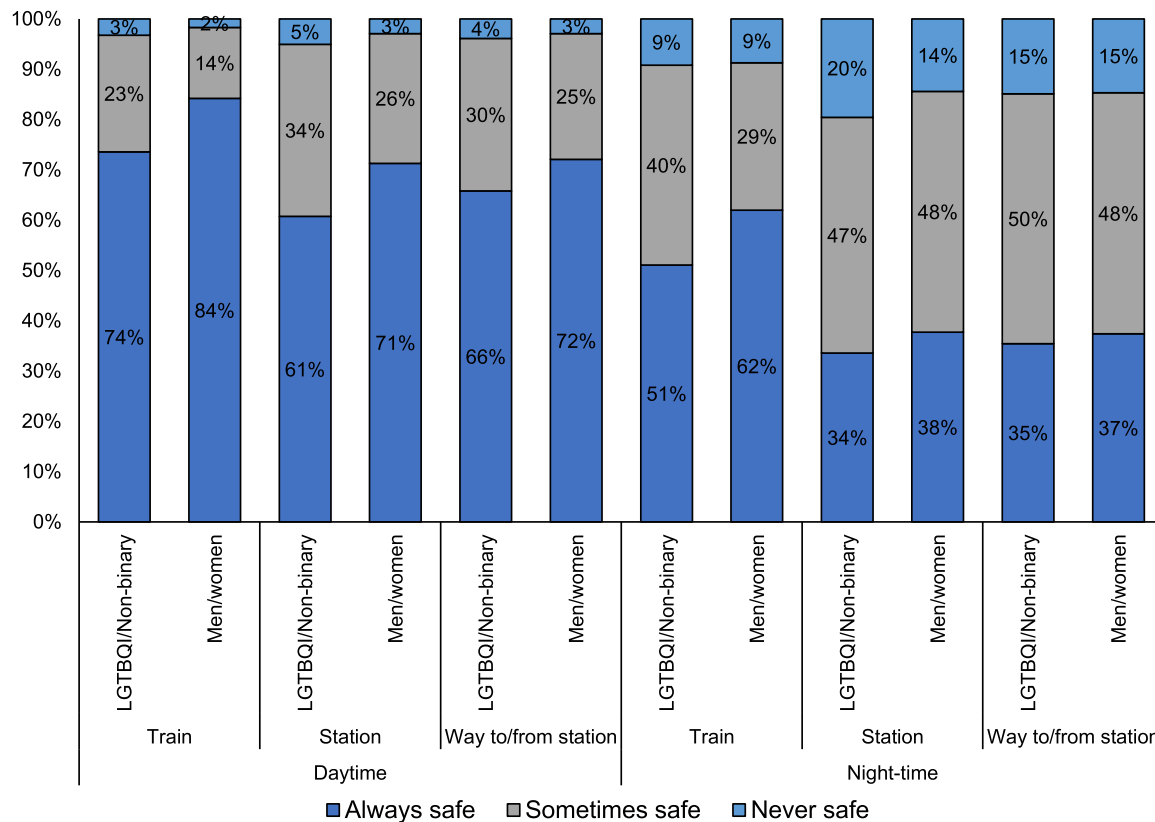


Fig. 2. Travellers' safety perception daytime and night-time on the train, at the station, and on the way to/from the station.¹⁰
¹⁰ Question used: 6a/6b. Do you feel safe during the day/evening when you...? Are on the train, are at the station, are on the way to/from the station. Choices: Always, Sometimes, or Never

location. While on board the train, the most common crimes are threats or hate crimes and sexual harassment, on the way to/from the station, they are aggressive panhandling and violence. At the station, the more common crimes are threats or hate crimes, violence, and aggressive panhandling (Table 3).

While victimisation rates and overall safety perceptions did not significantly differ between LGBTQI+/Non-binary individuals residing in urban or rural settings, there were notable differences regarding particular types of concerns. For instance, urban residents expressed heightened concerns about encountering unpleasant smells during train travel compared to their rural counterparts (Chi-square=3.79, df=1, p = 0.052). On the other hand, those residing in rural areas expressed heightened fears of terrorist attacks while at the station (Chi-square=11.09, df=1, p < 0.001). More interestingly, differences in safety precautions were also noticeable among the LGBTQI+/Non-binary respondents. Those living in rural areas demonstrated a higher tendency to avoid certain stations, particularly during night-time (Chi-square=3.72, df = 1, p = 0.054). For more details about safety of women in rural-urban contexts, see Ceccato et al. (2024b). Conversely, LGBTQI+/Non-binary individuals in urban areas were more inclined to avoid certain people while traveling by train, even during daylight hours (Chi-square=5.19, df = 1, p = 0.023). Because the sample is small for LGBTQI+/Non-binary travellers, we will not further explore the rural-urban dimensions for this group in the modelling section presented below.

4.2. Modelling travellers' safety perceptions

Tables 4-6 show that the results of the multivariate modelling for travellers' safety perceptions confirm that previous victimisation has a strong impact on safety perceptions of travellers. Table 4 shows that travellers who were previously victimised in transit are almost five times

Table 4
Traveller's fear of crime.³

		Y= Fearful=1. otherwise. 0	(a) Fear of crime (total) N _{fear} =885. N _{tot} = 2,307			
			OR	C.I. 95 %	Sig.	
<i>Individual characteristics</i>	Woman		1.842	1.468	2.216	<.001
	All LGBTQI+/Non-binary/Other		2.643	1.084	3.985	<.001
	Young (under 18)		1.171	1.495	2.270	0.394
	Reduced mobility		1.201	1.680	4.158	0.398
	Frequent traveller (4-7 days/w)		1.332	0.815	1.681	0.008
	Travel during night-time		1.632	0.785	1.836	<.001
<i>Station characteristics</i>	Victim of crime		4.947	1.079	1.644	<.001
	Restaurant/Café		0.581	1.349	1.974	<.001
	Tunnel		1.792	3.749	6.527	<.001
	Poor illumination		1.319	0.471	0.717	0.005
	Lack of staff		2.661	1.448	2.218	<.001
	Nagelkerke R Square		0.245			

OR = Odds ratio, CI = Confidence interval, Sig. = p-value, statistically significant at the 5 % level at most.

³ Question used: When you travel by train, do you often feel afraid of being subjected to the following? (followed by a list of crime types)

as likely to declare that they feel unsafe (p < 0.001) than those who were not victimised. Similarly, those travel during evenings or night-time are 1.6 times as likely to declare that they feel unsafe (p < 0.001) than those who do not. Among other individual characteristics, those travellers who identify as LGBTQI+/Non-binary/Other run a 2.6 times higher likelihood of feeling unsafe than the rest of the sample. Table 5 shows that women who identify as LGBTQI+ individuals are more than three times as likely to declare fear of crime at the station and more than

Table 5

Logistic regression results of Y = Women’s fear of crime at the station (a), Fear of crime on the way to the station (b) and fear of crime on the train (c).⁴

Y= Fearful=1. otherwise. 0		(a) Fear of crime (at station) N _{fear} =645. N _{tot} = 2,307			(b) Fear of crime (on way to station) N _{fear} =656. N _{tot} = 2,307			(c) Fear of crime (on train) N _{fear} =373. N _{tot} = 2,307					
		OR	C.I. 95 %	Sig.	OR	C.I. 95 %	Sig.	OR	C.I. 95 %	Sig.			
<i>Individual characteristics</i>	Woman	1.602	1.279	2.007	<.001	2.123	1.689	2.668	<.001	1.632	1.241	2.147	<.001
	Woman + LGBTQI+/Other	3.211	1.696	6.081	<.001	1.861	.995	3.480	.052	2.255	1.177	4.319	.014
	Non-binary/LGBTQI+/Other	1.311	.572	3.007	.522	2.222	1.020	4.840	.045	2.028	.845	4.870	.114
	Young (under 18)	1.240	.848	1.813	.268	1.243	.851	1.814	.261	1.778	1.187	2.664	.005
	Reduced mobility	1.216	.783	1.888	.384	1.057	.679	1.647	.805	1.444	.893	2.335	.134
	Frequent traveller (4–7 days/w)	1.196	.956	1.498	.118	1.231	.985	1.537	.067	1.056	.810	1.377	.686
<i>Station characteristics</i>	Travel during night-time	1.430	1.164	1.757	<.001	1.725	1.405	2.118	<.001	1.711	1.333	2.196	<.001
	Victim of crime	4.606	3.545	5.985	<.001	3.637	2.806	4.715	<.001	3.472	2.643	4.562	<.001
	Restaurant/Café	.663	.530	.829	<.001	.568	.456	.707	<.001	.804	.619	1.045	.103
	Tunnel	1.837	1.450	2.328	<.001	2.002	1.580	2.538	<.001	1.470	1.112	1.943	.007
	Poor illumination	1.342	1.093	1.647	.005	1.515	1.237	1.856	<.001	1.363	1.072	1.732	.011
	Lack of staff	2.829	2.298	3.482	<.001	2.278	1.857	2.794	<.001	2.251	1.759	2.880	<.001
	Nagelkerke	0.229				0.223				0.162			

OR = Odds ratio. CI = Confidence interval. Sig. = p-value. statistically significant at the 5 % level at most.

⁴ Question used: When you travel by train, do you often feel afraid of being subjected to the following? (followed by a list of crime types)

Table 6

Logistic regression results of Y = Men’s fear of crime at the station (a), Fear of crime on the way to the station (b) and fear of crime on the train (c).⁵

Y= Fearful=1. otherwise. 0		(a) Fear of crime (at station) N _{fear} =645. N _{tot} = 2,307			(b) Fear of crime (on way to station) N _{fear} =656. N _{tot} = 2,307			(c) Fear of crime (on train) N _{fear} =373. N _{tot} = 2,307					
		OR	C.I. 95 %	Sig.	OR	C.I. 95 %	Sig.	OR	C.I. 95 %	Sig.			
<i>Individual characteristics</i>	Man	.585	.466	.734	<.001	.447	.354	.563	<.001	.568	.430	.750	<.001
	Man + LGBTQI+/Other	1.983	.790	4.976	.145	2.380	.950	5.963	.064	2.267	.787	6.528	.129
	Non-binary/LGBTQI+/Other	.782	.346	1.767	.554	1.022	.477	2.190	.956	1.196	.509	2.809	.681
	Young (under 18)	1.325	.911	1.926	.140	1.284	.883	1.869	.191	1.873	1.256	2.791	.002
	Reduced mobility	1.210	.780	1.876	.395	1.049	.673	1.634	.834	1.428	.883	2.311	.146
	Frequent traveller (4-7 days/w)	1.220	.976	1.526	.081	1.240	.993	1.548	.057	1.074	.825	1.399	.595
<i>Station characteristics</i>	Travel during night-time	1.454	1.184	1.786	<.001	1.746	1.422	2.144	<.001	1.736	1.353	2.228	<.001
	Victim of crime	4.643	3.575	6.030	<.001	3.677	2.836	4.767	<.001	3.498	2.663	4.596	<.001
	Restaurant/Café	.656	.525	.819	<.001	.565	.454	.704	<.001	.796	.613	1.034	.088
	Tunnel	1.797	1.421	2.274	<.001	1.981	1.564	2.508	<.001	1.446	1.095	1.910	.009
	Poor illumination	1.362	1.110	1.671	.003	1.530	1.249	1.874	<.001	1.374	1.081	1.747	.009
	Lack of staff	2.781	2.261	3.420	<.001	2.255	1.839	2.766	<.001	2.215	1.733	2.833	<.001
	Nagelkerke	0.223				0.223				0.160			

OR = Odds ratio. CI = Confidence interval. Sig. = p-value. statistically significant at the 5 % level at most.

⁵ Question used: When you travel by train, do you often feel afraid of being subjected to the following? (followed by a list of crime types)

double on the train compared to the rest. On the way to the station gender non-conforming individuals (non-binary) stands out as a significant factor, increasing the likelihood of being fearful by 2.2 times.

Heterosexual women, in general, are 1.8 times as likely to feel unsafe, especially on the way to the station, where they are more than twice as likely to feel unsafe. Additionally, in the rail-bound settings (the characteristics of the stations and the surrounding areas), travellers who use tunnels are up to twice as likely to feel unsafe than those who do not (p < 0.001). Travellers who experience a lack of staff at stations are 2.8 times as likely to feel unsafe at the station and 2.3 as likely on the way to/from the station and on the train. Another factor that also negatively affects safety is poor illumination, whereas restaurants and cafés have a reducing effect on fear levels.

Table 6 shows that compared to women, male travellers experience a reduction of 41 per cent in the odds of feeling fearful at the station, and they are 55 per cent less likely to feel fearful on the way to the station and 43 per cent less likely to feel fearful on the train during the trip. Men’s fear is highly related to previous victimisation. Those men who were previously victimised in transit are four to five times more likely to declare that they feel fearful (p < 0.001) than those who were not victimised at the station, on the way to the station or during the trip on the train. Male travellers who experience a lack of staff at stations are 2.8 times as likely to feel unsafe at the station and twice as likely on the way to/from the station or during their trip on the train. The environment of the station and on the way to the station also has an impact on men’s

fear. While the presence of a restaurant/café at the station reduces the odds of feeling fearful by nearly half, the presence of tunnels makes them nearly twice as likely to feel fearful, especially on the way to the station. Travelling during the night-time and poor illumination on the station also have a reductive effect on men’s safety, similar to the other groups.

4.2.1. Travellers’ precautionary measures and recommendations for improvements

Women and people who identify as LGBTQI+ tend to take more precautions in comparison with the rest of respondents. In total, 85.1 per cent of the respondents take precautions during either daytime or night-time when using the train. For men, this number is 73.0 per cent, while for women it is 91.2 per cent and for LGBTQI+ people 89.4 per cent (Chi-square=177.50, df=1, p < 0.001). Naturally, people take more precautions during the dark times of the day (83.4 per cent) as opposed to during daytime (47.6 per cent). During the day, only 39.4 per cent of men took any precautions, and 65.6 per cent of LGBTQI+ people and 50.6 per cent of women (Chi-square=54.53, df=1, p < 0.001). During night-time, the difference between them is smaller. About two thirds of travellers are ‘being extra watchful’ (69.5 per cent in total) when travelling. Women and those who identify as LGBTQI+ preferred to a larger extent to have contact with someone on the phone while travelling, when compared with the rest of respondents (Chi-square=275.94, df=1, p < 0.001). Large disparities between the groups could also be found in the precaution ‘prefer travelling with someone else’, where over half of

both LGBTQI+ people and women preferred travelling in company, but only a quarter of men (Chi-square=194.48, $df=1$, $p < 0.001$). About half of women and the LGBTQI+ group preferred to stay in the station in places that they can be seen, while only a third of men took that precaution (Chi-square=167.49, $df=1$, $p < 0.001$). More than half of LGBTQI+ people try to look confident, while only a third of women and men (Chi-square=37.168, $df=1$, $p < 0.001$). About a fourth of LGBTQI+ people and women avoid certain stations or particular paths as compared to 20 per cent of men (Chi-square=26.69, $df=1$, $p < 0.001$) (half of women avoid trips at particular times as compared to a third of men). Women and LGBTQI+ individuals also avoid certain people or groups of people to a higher degree (Chi-square=109.59, $df=1$, $p < 0.001$). The only precaution that showed only very slight variations between the genders was 'avoid wearing jewellery'. Women and nearly a quarter of the respondents who identified as LGBTQI+ took five or more precautions, compared to less than ten per cent of men. In Table 7 the full list of safety precautions is shown including the differences between LGBTQI+, non-binary or other individuals, and heterosexual women and men.

Train passengers were invited to identify essential measures required to enhance the safety of train stations. They were presented with a comprehensive list encompassing both the physical and social aspects of the station environment, and were allowed to select multiple options from the list. The predominant suggestions put forth by train passengers circle around enhancing both formal and informal social control mechanisms at the stations. This primarily includes the desire for an increased presence of staff, the installation of CCTV cameras, an augmented police officer or security guard presence for station patrols, as well as the inclusion of help buttons both on trains and at stations. Interestingly, the fifth most critical aspect, as indicated by travellers, pertains to ensuring good-quality illumination at these stations. Approximately one-third of the suggestions highlight the need for better maintenance practices within the station environment. Additionally, there are other noteworthy issues brought up by passengers, such as the frequency of train services, the reduction of stops, and the provision of more comprehensive information for passengers about the trips and train services in general. Furthermore, passengers have also expressed the desire for new services to report problems during their journey, such as through mobile apps or dedicated call lines.

There are also notable disparities in the recommendations requested by different gender identities. Women and LGBTQI+ individuals generally requested more safety measures than men, reflecting their poor levels of perceived safety. For instance, 57.0 per cent of women wanted more staff at stations compared to 45.5 per cent of men (Chi-square=38.92, $df=2$, $p < 0.001$). They also more frequently requested a train host and better illumination (43.6 per cent and 43.8 per cent vs. 35.6 per cent; Chi-square=19.56, $df=2$, $p < 0.001$). Additionally, 39.3 per cent of women and 38.1 per cent of LGBTQI+ individuals wanted help buttons on trains, compared to 20.8 per cent of men (Chi-square=113.87, $df=2$, $p < 0.001$), and 37.7 per cent of women and 36.9 per cent of LGBTQI+ individuals wanted help buttons at stations, compared to 20.0 per cent of men (Chi-square=106.36, $df=2$, $p < 0.001$). An app for reporting problems was also much more requested by women and LGBTQI+ individuals (Chi-square=52.13, $df=2$, $p < 0.001$). In Table 8 all the recommendations are listed divided by gender identity/orientation.

5. Discussion of results

Our findings show that victimisation and fear expressed by travellers are not homogenous, neither according to the crime type nor the types of railway users. Out of 3,407 respondents to our survey, one-sixth were victimised in transit, while a third declared feeling afraid of being a victim of crime. Fear of crime in transit also varies across different transit environments from home to the station, and over time, evening time is perceived as less safe. These general trends may be slightly

Table 7

The differences in safety precautions taken between individuals who identify as LGBTQI+, non-binary or other and heterosexual women and men.⁶

Safety precaution	LGBTQI+, non-binary or other <i>N</i> = 151	Hetero women <i>N</i> = 1,945	Hetero men <i>N</i> = 1,029	Chi-square	<i>p</i>
Any safety precaution	89 %	91 %	73 %	177.50	0.000
Any safety precaution evening or night-time	87 %	90 %	71 %	183.18	0.000
Any safety precaution morning or daytime	66 %	51 %	39 %	54.53	0.000
Being extra watchful	74 %	77 %	56 %	140.53	0.000
Avoiding certain people or groups of people	66 %	70 %	51 %	109.59	0.000
Staying where people can see me	47 %	54 %	29 %	167.49	0.000
Prefer travelling with someone else	54 %	52 %	25 %	194.48	0.000
Avoid travelling certain times	39 %	49 %	34 %	21.51	0.000
Having contact with someone on phone	44 %	46 %	15 %	275.94	0.000
Placing myself close to someone	33 %	41 %	18 %	168.70	0.000
Trying to look confident	52 %	37 %	29 %	37.168	0.000
Avoiding certain stations	28 %	29 %	19 %	40.74	0.000
Avoiding certain trains or routes	24 %	27 %	19 %	26.69	0.000
Taking a detour to/from the station	23 %	24 %	14 %	41.06	0.000
Avoid wearing certain clothing	22 %	20 %	11 %	43.42	0.000
Avoid wearing jewelry	19 %	17 %	14 %	4.95	0.084
Avoid wearing a handbag	14 %	16 %	9 %	32.85	0.000
Carrying a weapon (i.e. pepper-spray)	17 %	7 %	6 %	23.46	0.000

⁶ Question used: Indicate which of the following statements about safety/unsafety apply to you when traveling by train during the day or evening (followed by a list of safety precautions)

different depending on the types of transit users, as discussed below.

Corroborating previous literature, the study shows that women who identify as LGBTQI+ people are more likely to feel fearful in transit than the rest of the respondents (Nourani et al., 2020), while men who identify as LGBTQI+ do not show the same pattern of fear. This is triggered by differences in victimisation. The types of crimes that LGBTQI+ people fear (unlawful threats or hate crimes, sexual harassment) are not exactly the same as the ones that the rest of respondents are fearful of (thefts and robbery), which indicates differences in victimisation patterns among gender non-conforming individuals and other travellers. These findings are indications that transgender and gender non-conforming individuals have unequal access to safe and accessible public transportation, and policies prohibiting discrimination remain unenforced on urban public transit (Lubitow et al., 2017).

Table 8

Safety recommendations from individuals who identify as LGTBQI+, non-binary or other and heterosexual women and men.⁷

Recommendation	LGBTBQI+, non-binary or other N = 160	Hetero women N = 2,015	Hetero men N = 1,121	Chi- square	p
More staff at the station	51 %	57 %	45 %	38.38	0.000
Better maintenance	44 %	44 %	36 %	18.90	0.000
Better illumination	43 %	50 %	46 %	6.37	0.041
Digital timetable with RTI at all stations	41 %	47 %	32 %	66.42	0.000
Better signage	38 %	39 %	21 %	114.00	0.000
Better ticket information	36 %	38 %	20 %	106.46	0.000
Higher frequency	36 %	29 %	19 %	50.25	0.000
Fewer changes during the trip	36 %	46 %	42 %	8.41	0.015
A phone number to call for problems	35 %	42 %	39 %	4.22	0.121
A "help button" to get help on the train	32 %	29 %	33 %	5.92	0.052
A "help button" to get help at the station	30 %	25 %	24 %	2.99	0.224
A safety app to report problems	28 %	24 %	22 %	3.49	0.174
More police/guards patrolling the station	27 %	21 %	22 %	2.89	0.236
Train host on board the train	25 %	25 %	18 %	23.88	0.000
Cameras (CCTV) on the train	17 %	19 %	16 %	4.41	0.110
Cameras (CCTV) at the station	10 %	8 %	9 %	1.01	0.604

⁷ Question used: Indicate which of the following that could make your train journey safer (followed by a list of recommendations)

Our modelling findings show signs of interactions between individuals' predisposition to feel fear and the environment they spend time in (momentary experience of fear, Kappes et al., 2013). Factors such as a lack of staff, the presence of tunnels, and poor illumination had a negative effect on travellers' safety. Some of these factors were more important at the station than elsewhere during the trip, but as suggested by Gera and Hasdell (2023), this must be considered in combination with other socio-spatial factors and contexts that affect travellers' safety.

Lubitow et al. (2017) introduced the term *transmobilities* to illustrate how transgender and gender non-conforming individuals experience gender in ways that shape their mobility in relation to public transportation. In this study, there are several precautionary measures that travellers take when travelling by train, more commonly among women and LGTBQI+ individuals during the evening time than during the day. Stalking, discrimination, harassment, and crime against LGTBQI+ people are everywhere and change their behaviour. Threats to their safety are common, as illustrated previously and are highlighted by the quote below by a traveller in Sweden who avoids public places:

I dare not walk from the station into the village. Sometimes buses run, but it's rare. If there is no bus from the station, I opt out of the train altogether and take the car. I would wish surveillance of the car park and buses from the train station around the clock, not just in the morning etc. (LGBTQI person in Sweden).

Over half of both LGTBQI+ people and women preferred travelling in the company of someone else, but only a quarter of men did. Approximately half of women and LGTBQI+ individuals opted to remain in visible areas within the station, while only around a third of men

chose this precautionary measure. Over half of LGTBQI+ individuals made an effort to appear confident, whereas only about a third of women and men did the same. The context may matter for safety perceptions. Although victimisation rates and safety perceptions do not differ between LGTBQI+ or non-binary individuals residing in urban or rural settings, we found that there were differences in their safety precautions, such as avoidance of certain places among rural LGTBQI+/Non-binary individuals. In contrast, in urban areas, LGTBQI+/Non-binary individuals avoid certain people. Any conclusions that display differences between urban and rural environments regarding this group should be taken cautiously, given the relatively small sample.

The implications of these results highlight the need for a comprehensive approach to addressing the safety concerns of LGTBQI+ individuals in public spaces and transit systems. This includes both targeted policies and broader societal changes to create a safer and more inclusive environment for all individuals, regardless of their gender identity or sexual orientation. We will discuss these recommendations in the next section.

6. Conclusions and recommendations for research and practice

The purpose of this study was to investigate the nature of transit passengers' safety perceptions, focusing on transgender and gender-nonconforming individuals' experiences of the environments of railway stations and the way to them. Harassment and all types of violence in public places are everyday occurrences for individuals who identify themselves as LGTBQI+. This study makes use of data from a safety survey collected in 2022 in Southern Sweden. The study reveals that LGTBQI+ individuals, especially gender non-conforming women, have safety concerns that differ from those of the general population. While thefts and robberies are more common concerns for travellers in general, unlawful threats, hate crimes, and sexual harassment are more prominent fears for LGTBQI+ individuals. This indicates that their experiences and vulnerabilities in public spaces are distinct, highlighting the exclusionary character of existing transit infrastructure and revealing the boundaries of denied rights of LGTBQI+ individuals to access public spaces. Based on the findings of our study, it is recommended that priority be given to women and LGTBQI+/Non-binary/Other individuals, especially those who travel during the night-time. While recognising that solutions may require customisation for each specific environment, it is evident that travellers, including LGTBQI+ individuals, value their ability to contact someone in the event of an incident or simply having the assurance that such an option exists.

In big cities, public places are often regarded as inclusive spaces, paradoxically, they often occupy the unenviable pinnacle in statistics concerning acts of violence against LGTBQI+ individuals when one takes into account the sheer magnitude of reported cases. Victimisation rates and overall safety perceptions did not significantly differ between LGTBQI+ or non-binary individuals residing in urban or rural settings, however, given our sample limitations, there is a need to further investigate the potential impact of the context on the victimisation and safety of travellers.

One drawback of this study lies in our inability to include all the gender status categories originally intended in our survey, given the restricted response rate from each group. As a result, we were compelled to combine various individuals into a single category, effectively homogenising their identities, which is not an ideal situation. The implications of this limitation are significant, as it hinders our ability to gain a nuanced understanding of the distinct safety needs of different gender categories. Data permitting, future research should keep these gender categories apart to allow a more in-depth knowledge of LGTBQI+ people's safety needs. It should be noted that the results are based on the respondents' subjective interpretations. Thus, what is perceived as "often" feeling afraid can differ between respondents. Also, sometimes a rare event can be perceived to be more serious than an event happening more often. This aspect has not been addressed in the

present research.

For future research, it is suggested to include larger and more diverse samples of travellers to enhance the generalisability of the findings. In particular, research should focus on the impact of socio-demographic and/or cultural characteristics on victimisation and/or fear. Although the focus of the work was to examine the LGBTQI+ community, these other factors can eventually also have an impact on fear and/or victimisation, depending on the context. Moreover, the reproducibility of the results may vary across different countries and contexts. Although there is evidence that this group is both more victimised and experiences more fear than the general population (Nourani et al., 2020), cultural, social, and legal factors unique to each country can influence the levels of victimisation and fear experienced by the LGBTQI+ community. Additionally, exploring the relationship between fear of crime, fear of strangers, and other persons' antisocial behaviour, which is often not classified as a crime, could also provide valuable insights for research and help shape policies toward LGBTQI+ people's safety needs.

The fact that LGBTQI+ individuals fear threats, hate crimes, and sexual harassment implies that they are at a higher risk of being targeted for such incidents. This highlights the importance of addressing discrimination, bias, and violence directed towards this community and public transit authorities and policymakers should consider these findings when implementing transit safety policies. It is necessary to develop and enforce policies that specifically address hate crimes, harassment, and threats targeting LGBTQI+ individuals. This could include improved reporting mechanisms, the presence of staff and educational programmes to promote tolerance and inclusion. Previous research has shown that using police statistics to understand what happens in the stations can lead to misconceptions, given the fact that only major incidents of crime are reported to the police. Minor events of incivilities and/or public disorder or verbal harassment against travellers are not often reported to the police. These findings underscore the importance of systematically collecting and analysing data on victimisation and safety perception patterns among different demographic groups, including LGBTQI+ individuals. Such data can provide necessary information for targeted interventions and policies to address the specific safety needs of marginalised individuals.

Appendix 1. Adaptation of the gender subcategories from the survey

Women	Respondent identifies as a woman
Men	Respondent identifies as a man
Men + LGBTQI+/Other	Respondent identifies as a man and LGBTQI+/Other
Women + LGBTQI+/Other	Respondent identifies as a woman and LGBTQI+/Other
Non-binary/LGBTQI+/Other	Respondent identifies as non-binary and LGBTQI+/Other

References

- Abenoza, R. F., Ceccato, V., Susilo, Y. O., & Cats, O. (2018). Individual, travel, and bus stop characteristics influencing travelers' safety perceptions. *Transportation research record*, 2672, 19–28.
- Abraham, J., & Ceccato, V. (2022). Crime and safety in rural areas: A systematic review of the English-language literature 1980–2020. *Journal of Rural Studies*, 94, 250–273.
- Angeles, L. C., & Robertson, J. (2020a). Empathy and inclusive public safety in the city: Examining LGBTQ2+ voices and experiences of intersectional discrimination. *Women's Studies International Forum*, 78, Article 102313.
- Angeles, L. C., & Robertson, J. (2020b). Empathy and inclusive public safety in the city: Examining LGBTQ2+ voices and experiences of intersectional discrimination. *Women's Studies International Forum*. Elsevier, Article 102313.
- Box, S., Hale, C., & Andrews, G. (1988). Explaining fear of crime. *The British Journal of Criminology*, 28(3), 340–356.
- Bränström, R., & van der Star, A. (2013). All inclusive public health—what about LGBT populations? *The European Journal of Public Health*, 23(3), 353–354.
- Brottsförebyggande (2017). Hatbrottsstatistik. Från Hemsida. <https://www.bra.se/statistik/statistiska-undersokningar/hatbrottsstatistik.html>.

Consent for publication

Following approval by the Swedish Ethical Review Authority (Ref 2021-06393-01), data was collected between May and September 2022.

Availability of data and materials

The dataset is not available to be shared.

CRediT authorship contribution statement

Vania Ceccato: Writing – review & editing, Writing – original draft, Validation, Supervision, Resources, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Gabriel Gliori:** Writing – review & editing, Writing – original draft, Visualization, Software, Methodology, Formal analysis, Data curation. **Catherine Sundling:** Writing – review & editing, Writing – original draft, Methodology, Funding acquisition, Conceptualization.

Declaration of competing interest

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

Funding

This research was funded by the Swedish Transport Administration (Trafikverket) in Sweden through the project “The effect of the station environment on crime and passenger safety, Swedish Transport Administration, 2021-2023”, TRV 2020/22903.

Acknowledgments

We are grateful for the support from our colleagues at the Swedish Transport Administration (Trafikverket), especially Charlotta Palmlund. Thank you also to all travellers who responded to our survey from May to November 2022.

- Doan, P. L. (2007). Queers in the American City: Transgendered perceptions of urban space. *Gender, Place & Culture*, 14, 57–74.
- Fattah, E. A. (1991). *Understanding criminal victimization: An introduction to theoretical victimology*. Prentice-Hall Canada.
- Ferraro, K. F. (1995). *Fear of crime: Interpreting victimization risk*. SUNY press.
- Gabriel, U., & Greve, W. (2003). The psychology of fear of crime. Conceptual and methodological perspectives. *The British Journal of Criminology*, 43, 600–614.
- Gera, K., & Hasdell, P. (2023). Learning from informal gendered mobilities: Towards a holistic understanding for experimenting with city streets. *Journal of Urban Mobility*, 4, Article 100061.
- Hale, C. (1996). Fear of crime: A review of the literature. *International review of Victimology*, 4, 79–150.
- Hannam, K., Sheller, M., & Urry, J. (2006). Mobilities, immobilities and moorings. *Mobilities*, 1, 1–22.
- Hanson, S. (2010). Gender and mobility: new approaches for informing sustainability. *Gender, Place & Culture*, 17, 5–23.
- Hartal, G., & Bar Tzedek, Y. (2023). Liberal LGBTphobia in rural spaces: Israeli lesbian and bisexual women's relationality. *Journal of Rural Studies*, 102, Article 103096.
- Ismael, K., Esztergár-Kiss, D., & Duleba, S. (2023). Evaluating the quality of the public transport service during the COVID-19 pandemic from the perception of two user groups. *European Transport Research Review*, 15, 5.
- Jackson, J., & Gouseti, I. (2012). Fear of crime: An entry to the encyclopedia of theoretical criminology. *Encyclopedia of Theoretical Criminology*, J. Mitchell Miller, ed., Wiley-Blackwell, Forthcoming.
- Kappes, C., Greve, W., & Hellmers, S. (2013). Fear of crime in old age: Precautious behaviour and its relation to situational fear. *European Journal of Ageing*, 10, 111–125.
- Loukaitou-Sideris, A. (2014). Fear and safety in transit environments from the women's perspective. *Security journal*, 27, 242–256.
- Lubitow, A., Abelson, M. J., & Carpenter, E. (2020). Transforming mobility justice: Gendered harassment and violence on transit. *Journal of transport geography*, 82, Article 102601.
- Lubitow, A., Carathers, J., Kelly, M., & Abelson, M. (2017). Transmobilities: mobility, harassment, and violence experienced by transgender and gender nonconforming public transit riders in Portland, Oregon. *Gender, Place & Culture*, 24, 1398–1418.
- Mallory, C., A. Hasenbush & B. Sears (2015) Discrimination and harassment by law enforcement officers in the LGBT community.
- Mapar, M., Jafari, M. J., Mansouri, N., Arjmandi, R., Azizinejad, R., & Ramos, T. B. (2017). Sustainability indicators for municipalities of megacities: Integrating health, safety and environmental performance. *Ecological Indicators*, 83, 271–291. <https://doi.org/10.1016/j.ecolind.2017.08.012>
- Nourani, F., Antonello, S. L., Govone, J. S., & Ceccato, V. (2020). Women and LGBTI youth as targets: Assessing transit safety in Rio Claro, Brazil. *Crime and Fear in Public Places* (pp. 176–193). Routledge.
- Orozco-Fontalvo, M., Soto, J., Arévalo, A., & Oviedo-Trespalcacios, O. (2019). Women's perceived risk of sexual harassment in a Bus Rapid Transit (BRT) system: The case of Barranquilla, Colombia. *Journal of Transport & Health*, 14, Article 100598.
- Racehorse, V. J., Zhang, G., Sussman, A., Jian, A., & Parker, T. (2015). Bus rapid transit system deployment for high quality and cost-effective transit service: a comprehensive review and comparative analysis. *IET Intelligent Transport Systems*, 9, 175–183.
- Rountree, P. W., & Land, K. C. (1996). Perceived risk versus fear of crime: Empirical evidence of conceptually distinct reactions in survey data. *Social forces*, 74, 1353–1376.
- Santoro, P., Harkot, M., Loukaitou-Sideris, A., Ceccato, V., Sundling, C., Romero-Torres, J., & Agrawal, A. W. (2020). Intersectionality of transit safety. *Transit Crime and Sexual Violence in Cities: International Evidence and Prevention*.
- Sarker, R., Currie, G., & Reynolds, J. (2024) Exploring Increases in Rider Personal Safety Concerns (Fear of Crime and Anti-Social Behavior) Since Covid-19 as a Major Driver of Post-Pandemic Transit Avoidance. Available at SSRN 4777804.
- Seto, M. C., Kjellgren, C., Priebe, G., Mossige, S., Svedin, C. G., & Långström, N. (2010). Sexual coercion experience and sexually coercive behavior: A population study of Swedish and Norwegian male youth. *Child Maltreatment*, 15, 219–228.
- Singh, S. 2023. Trans-mobility: Moving beyond gender binaries in mobility.
- Skogan, W. G. (1987). The Impact of Victimization on Fear. *Crime & Delinquency*, 33, 135–154.
- Smith, S. J., & Pain, R. (2008). Critical geopolitics and everyday fears. In *Fear of crime* (pp. 57–70). Routledge-Cavendish.
- Sreetheran, M., & Van Den Bosch, C. C. K. (2014). A socio-ecological exploration of fear of crime in urban green spaces—A systematic review. *Urban Forestry & Urban Greening*, 13, 1–18.
- Sundling, C., & Ceccato, V. (2022). The impact of rail-based stations on passengers' safety perceptions. A systematic review of international evidence. *Transportation research part F: traffic psychology and behaviour*, 86, 99–120.
- Swedish Government. (2021). *Handlingsplan för hbtqi-personers lika rättigheter och möjligheter*. Arbetsmarknadsdepartementet. <https://www.regeringen.se/contentassets/93e20976982b4d798400b20ac57a966f/handlingsplan-hbtqi-221031.pdf>.
- Świder, M., & Winiewski, M. (2016). *Situation of LGBT Persons in Poland 2015-2016 REPORT*, 165. Warszawa.
- Trafikverket (2009). Uppskattningar av passagerarflöde per årsmedeldygn (ÅMD). 58.
- Uittenbogaard, A., & Ceccato, V. (2015). Temporal and spatial patterns of suicides in Stockholm's subway stations. *Accident Analysis & Prevention*, 81, 96–106.
- UN-Habitat (2019). Safer Cities Programme. https://fukuoka.unhabitat.org/programmes/detail04_01_en.html (accessed 14 February 2020).
- Ventimiglia, N. (2011). LGBT selective victimization: Unprotected youth on the streets. *JL Soc'y*, 13, 439.
- Vera-Gray, F. (2018). *The right amount of panic: How women trade freedom for safety*. Policy press.
- Walton, D., & Sunseri, S. (2010). Factors influencing the decision to drive or walk short distances to public transport facilities. *International Journal of Sustainable Transportation*, 4, 212–226.
- Warr, M. (1990). Dangerous situations: Social context and fear of victimization*. *Social Forces*, 68, 891–907.
- Warr, M. (2000). Fear of crime in the United States: Avenues for research and policy. *Criminal justice*, 4, 451–489.
- Whitzman, C., Shaw, M., Andrew, C., & Travers, K. (2009). The effectiveness of women's safety audits. *Security Journal*, 22, 205–218.
- Wilson, A. (2019) LGBT travel index puts Sweden top, and warns against some popular destinations. (2024, September 5). The Guardian. <https://www.theguardian.com/travel/2019/nov/22/lgbt-travel-index-puts-sweden-top-and-warns-against-some-popular-destinations>.
- World Health Organization. (2016). *Ethical and safety recommendations for intervention research on violence against women: building on lessons from the WHO publication putting women first: ethical and safety recommendations for research on domestic violence against women*. World Health Organization.