Chapter 26

Precautions and Responses

Andrew Newton, Anastasia Loukaitou-Sideris, Hugo d'Arbois de Jubainville, Dengkai Huang, Jordana K. Norgaard, and Reka Solymosi

Abstract

This chapter aims to explore the use of precautionary behaviors by public transit users. It distinguishes between two types of precautionary behavior: avoidance and risk management strategies. Following a literature review on precaution nary behaviors, the chapter draws data from five of the cities examined earlier in this book – Guangzhou (China), London (UK), Los Angeles (USA), Paris (France), and Vancouver (Canada) to examine how student riders in these cities respond to the risk of victimization in transit environments. This is followed by a discussion of the findings, conclusions, and an overall assessment of the findings.

Keywords: sexual harassment, place and time avoidance, risk management

Introduction

This chapter aims to explore the use of precautionary behavior by public transit users. We do not provide a definition of "precautionary behavior" as this is a subjective view of a public transit user. Instead, the response to the following question is viewed as indicative of this: "Do you feel the need to take precautionary behavior on public transit?"

We draw data from five of the cities examined earlier in this book – Guangzhou (China), London (UK), Los Angeles (USA), Paris (France), and Vancouver (Canada) – with the following aims:

- To explore the use of precautionary behavior on public transit by bus and rail users across the five cities.
- To examine the use of risk management and avoidance strategies across the five cities by mode of travel, gender, frequency of travel, feelings of safety when traveling, and prior victimization.
- To investigate what factors are predictive of precautionary behavior across both bus and rail travel.

The chapter is structured as follows. First, a literature discussion is arranged in three parts: (1) studies and theories of precautionary behavior across public space in general, in response to perceived risk of crime; (2) attempts to classify and categorize the different types of precautionary behavior in public space; and (3) consideration of precautionary behavior explicitly within the context of specific public transit user groups. Following this is a presentation of the research methodology used, which is divided into three sections relevant to the identified research questions. These include a descriptive analysis of the number and percentages of respondents who stated they used precautions when traveling on public transport. This is then examined across two classifications of precautionary behavior: avoidance techniques and risk management. Finally, we use logistic regression to identify predictor variables of those who are more likely to use precautionary behavior on public transit. We discuss and interpret the findings of the analysis and present the limitations of the study. The final section offers a conclusion including policy recommendations and suggested future research.

Overview of Literature

This section of the chapter is structured in three thematic areas. The first is a discussion of the literature and theory around precautionary behavior as a reaction to experiences of or perceived levels of victimization in public space, which may or may not include public transit. Following on from this is a discussion of previous studies outlining two factors: the key types of strategies and mechanisms used to safeguard against crime and victimization, and a brief review of previous classification schemes developed for different types of precautionary behavior in public space. The final section of this chapter is a discussion of the variation in precautionary behavior by different types of victims, considering the specific needs and experiences of students and females. In each of these three sections, attempts are made to draw out some of the unique characteristics of precautionary behavior specific to public transit systems, from precautions taken in public space more generally.

Precautionary Behavior and Crime

Explanations of precautionary behavior as a response to perceived risk of or actual experiences of crime generally identify some combination of: (i) determinants of fear of crime including neighborhood or situational conditions, psychological factors, and life circumstances, and (ii) the behavioral responses; for example, modified behavior such as a change in journey times or place avoidance, or management of risk strategies aimed at increasing protection such as

attending self-defense classes or carrying personal attack alarms (Riger et al., 1982). Considering precautionary responses to fear, a key empirical study is by Jackson and Gray (2010), who distinguish between functional and dysfunctional behavior, finding that some precautions taken by people both make them feel safer and do not impact negatively on their quality of life. They subsequently argue that:

> *In such circumstances, "fear" might be better viewed as a natural and functional defense against crime involving straightforward adaptations and behaviors: a socially beneficial activity that allows individuals to exert control over perceived risks, encouraging them to behave in a responsible fashion* .Gray et al., 2010, p79

Contrary to the argument of crime as a social ill, this suggests that some (functional) behavior may comprise a natural and positive defense against crime (Doran and Burgess, 2012). A question this raises is the extent to which precautionary behavior on public transit can be considered functional (and potentially positive) or dysfunctional (and potentially negative and reducing the quality of life).

Barjonet et al. (2010) explore the adaptive nature of human behavior, suggesting that in certain situations a degree of risk can be accepted or perhaps tolerated, but when this level of risk becomes non-tolerable, humans will, if possible, modify or adapt their behavior. Therefore, mobility is "tinkered with" to find an acceptable level of travel risk, for example by modifying journey times or avoiding certain places. They argue, however, that adaptive processes are limited, elasticity is not incommensurable, and if constraints weighing on travel are too strong, then a journey may still be made despite fear. Hindelang et al. (1978) and Cohen and Felson (1979) identify how lifestyles and routine activities dictate the daily activities undertaken by persons. However, a consequence of this is that constraints exist which restrict the extent to which people can adopt avoidance strategies to travel.

Skogan and Maxfield (1981) articulate how social norms and socio-economic positions restrict the extent to which travel behavior can be modified, such as requirements to live and work, the resources to use alternative forms of transport such as hiring private transport, or the legal requirements of having a driving license. Therefore, any consideration of modified travel behavior must consider such constraints on activity. These have been articulated elsewhere, for

example the notion of obligatory (those that must be performed in all but extreme circumstances) and discretionary (pursued by choice) routine activities (LeBeau, 2002; Tompson and Bowers, 2015).

Several studies identify persons who they consider as "transit captives" – namely riders who have no other transport option but public transit (Beimborn et al., 2003; Smith, 2008; Ceccato, 2014; Vanier and d'Arbois de Jubainville, 2018; d'Arbois de Jubainville, 2019). Indeed, transit users can be viewed as two distinct groups: "choice users" who select the transit service they view as superior; and "captive users" who only have one travel mode option. In the above studies, captives tend to be young persons, females, the elderly, those with disabilities, and those of low income (or often an intersection of these user types). D'Arbois de Jubainville (2019) identified from national victimization surveys in France that 46% of transit captive users who feel unsafe cannot develop avoidance behaviors because they have no other transport option. Beyond this, there are cases when travel journeys cannot be modified, and the most extreme version of avoidance is avoidance of travel. Although a small proportion, there are users who declare being too afraid of being robbed or assaulted to use public transit (Noble et al., 2017; Heurtel, 2018).

Therefore, some key considerations here are whether precautionary behavior on public transit is functional or dysfunctional, and to what extent the user's ability to use precautionary strategies is constrained or restricted. When precautionary behavior on public transit is functional and unconstrained, it may be considered a positive and natural response to crime. However, when precautionary activity is dysfunctional and likely socio-economically constrained, this is more likely to negatively impact a person's mobility and quality of life. As stated by Atkins (1990),

> *many people find it impossible to avoid situations and conditions they consider to be risky. They must either endure fear when travelling or else be restricted in their participation in various activities. Either way they must limit their lifestyle: personal freedom is being constrained* (Atkins, 1990, p. 114).

Classifications of Precautionary Behavior

There have been several attempts to classify the different types of behavior which can be considered a reaction or response to perceived or actual experiences of crime. DuBow et al. (1979) identify five reactions to crime in the literature, although these are not restricted to public space. These include avoidance, personal and home protective behavior, insurance behavior, communicative behavior, and participatory action with others. Of those, avoidance, personal protective and participatory action can be considered most applicable to public spaces, and more explicitly, public transit. Insurance may be taken against travel disruption or cancellation, for example, but is rarely (if ever) taken as a precaution to crime or victimization on public transit. While communicative behavior (talking about crime) may be a response to overcoming traumatic experiences of victimization, it would not be considered a precautionary response. The two most prominent responses encountered in the public transit precautionary behavior literature are, thus, avoidance and protection. DuBow et al. (1979) identify a further number of avoidance behaviors. Those most relevant to public transit are spatial, temporal, situational, activity specific avoidance, and transportation (mode) choices.

The public transit literature identifies avoidance strategies as the typical behavior in response to perceived risk of crime (Riger et al., 1982; Atkins, 1990; Skogan, 1990; Woolnough, 2009; Yavuz and Welch, 2010; Loukaitou-Sideris, 2014; Stark and Meschik, 2018). Warr (1990) highlights how avoidance behavior is typically temporal avoidance (traveling at certain times, often during daylight hours) or spatial avoidance (avoiding locations perceived as very high risk). Riger et al. (1982) suggest that precautionary behavior can be distinguished into avoidance activity and risk management. Atkins (1990) argues that the risk management activity can be characterized as more positive action, whereas avoidance is perhaps a negative response to fear of crime. Doran and Burgess (2012, p. 9) argue that the "structural constraints and role obligations dictated by lifestyles and routine daily activities may circumscribe people's ability to use precautionary tactics such as avoidance behaviours" and that in these situations "people are more likely to adopt protective measures, such as carrying a weapon, learning self-defense techniques". It appears that protective measures are more likely to be carried out by transit captives and those with more constraints on their travel choices. Thus, one could argue in such situations these are perhaps not a positive action, and indeed, may reflect more dysfunctional precautionary behavior.

Much of the above literature on precautionary behavior to crime is drawn from studies of users in public space. Thus, some key questions are: to what extent precautionary behavior on public transit mirrors that of more general public space; and, can precautionary behavior be identified that is unique to public transit environments? Condon et al. (2007) explore victimization surveys and in-depth interviews with female public transit users and highlight precautions related to avoidance, protection, attitude, clothing, and awareness. They suggest that some precautions can be classified as specifically transit-related, for example choosing one's position on the platform or on the transit vehicle or sitting close to a driver. However, some other precautions are reflective of general public space, for example not being alone after dark, dressing in a certain way, or watchfulness. Clearly there are lessons that can be identified from precautionary behavior in public space including both avoidance and risk management, but for our purposes it is necessary to consider these in the context of public transit systems.

Precautionary Behavior by Specific Transit User Groups

As this chapter is focused on student users, we looked for studies discussing student precautionary behavior. However, there is a paucity of studies on this topic, and those that have been carried out tend to focus on (college/university) campus behavior rather than students in public transit settings. Precautionary behaviors identified include avoidance (of areas with poor lighting or dense shrubbery, and not going out alone) and risk management (self-protection devices) (Wilcox et al., 2007; Jennings et al., 2007; Woolnough, 2009; Mellgren et al., 2018). The first two studies also examine gender differences, finding that precautionary behavior is more frequent amongst female college students on campus.

The majority of studies into the precautionary behavior carried out by public transit users is focused on women, exemplified by Loukaitou-Sideris (2009). As she argues:

> *Regardless of being rooted in real or only perceived danger, fear has some significant consequences for women and leads them to use precautionary measures and strategies that affect their travel patterns. These range from the adoption of certain behavioral mechanisms when in public to choosing specific routes, modes, and transit environments over others to completely avoiding particular transit environments, bus stops and railway platforms, or activities (e.g., walking and bicycling) that are deemed as more unsafe for women* (p557).

The behaviors identified include use of alternative transport modes, such as taxi when financially viable, restricting use to daylight hours or not traveling at all, or only traveling with spouses or friends (Loukaitou-Sideris, 2014). Scholars find that females use these precautionary behaviors to a greater extent than males, and furthermore contend that some behavioral adjustments are distinct to the needs of women. Several empirical studies support the finding that women use precautionary behavior more than men, including Yavuz and Welch, 2010 and Doran and Burgess, 2012.

Several studies explore the precautionary strategies used by females in public space in different international contexts including in Turkey (Tandogan and Ilhan, 2016) and Sweden (Mellgren et al., 2018), and more specifically on public transit including in Mexico (Dunckel-Graglia, 2016), India (Lea et al., 2017), Nepal (Mishra and Lamichhane, 2018), Colombia and Bolivia (Kash, 2019), and Austria (Stark and Meschik, 2018). Precautions include avoidance, not traveling at night, not wearing clothes that might seem provocative, avoiding particular routes, intermodal stops and destinations, avoiding some travel modes, being accompanied by a man or even a dog, and avoiding poorly lit areas; and protection behavior which predominantly involves carrying repellents such as safety pins, pepper spray, keys, pocket alarm, flashlights, pocket knife, whistle, umbrellas, firearms, stones, hairspray, and cable wire. Additional risk management strategies include keeping mobile phones close at hand, pretending to engage in conversation on mobile phones, taking part in self-defense classes, and sitting near "trustworthy" persons. Scholars find that women who had experienced a "frightening situation" are also statistically more likely to engage in precautionary behavior (Stark and Meschik, 2018).

Doran and Burgess (2012) suggest that the higher levels of precautionary behavior exercised by females may be due to a reduced willingness to take risks. However, scholars guard against this (Lieber, 2008; Dunckel-Graglia, 2016; Gekoski et al., 2017) arguing that the internalization of gender-based fear, due to victim blaming and repetition, results in women perceiving precautionary behavior as a normal routine rather than precaution against victimization. At the same time, differing cultural and gender norms, particularly in countries where public space is regarded as a male domain, and gendered geographies can result in spatial inequality which can negatively impact women's social inclusion to public space, including public transit settings.

So far, we have reviewed some of the key literature on precautionary behavior seeking to extract its relevance for public transit use by students. In the next section, we discuss the methodology used in order to answer the outlined research objectives.

Methodology

This section is structured into three sub-sections which relate to the original research objectives. The first section presents a descriptive analysis of the number of responses to the question in the survey, "Do you feel it is necessary to take precautions on public transport?" This was a categorical question with 11 pre-defined possible answers for bus users and eight possible answers for rail users.[1] The first analysis is a descriptive discussion of the frequency of responses for both rail and bus, and this is further separated by gender (male and female). It is important to stress that users could select more than one response, thus there are often higher frequencies of precautionary behavior than then number of survey participants who reported the need to take precautionary action.

The second set of analyses compares the type of precautionary behavior taken. This was categorized into two groups based on the literature review, namely avoidance strategies and risk management techniques. Table 26.1 presents a classification guide, whereby all possible responses are allocated into each of these two categories. While there may be some debate as to the appropriateness of classifying one strategy to a particular category or other, this was an initial attempt to compare risk management with precautionary action.

Table 26.1. Classification of precautionary behavior.

Precautionary Behavior	**Classification**
Traveling only during daytime	Avoidance
Always traveling with someone else	Avoidance
Avoiding particular bus lines	Avoidance
Avoiding particular bus stops	Avoidance
Waiting for transit only at well-lit places	Avoidance
Waiting for transit only if other people are around	Avoidance
Sitting close to the driver	Risk management
Dressing in a certain way	Risk management

Precautionary Behavior	Classification
Not wearing jewelry	Risk management
Not carrying purses, wallets	Risk management
Carrying a weapon, an object to defend yourself	Risk management

The use of precautionary behavior was explored across a range of transit user characteristics for both rail and bus users including gender, frequency of travel, feelings of safety, and prior victimization. For feelings of safety, responses of "always" and "often" feeling safe were reclassified as "safe," while responses of "sometimes," "rarely," and "never" feeling safe were classified as "unsafe." For frequency of travel, the responses "everyday," "5–6 days per week," and "3–4 days per week" were categorized as "frequent," while "1–2 days per week" and "less than once per week" were categorized as "non-frequent." The variable "prior victimization" reflected a positive response to the question, "Have you experienced physical sexual harassment or assault on the bus/rail transit?"

The third methodological task was the development of a model, using binomial logistical regression to test possible predictor variables of precautionary behavior. Due to the structure of the questionnaire, this analysis was carried out independently for bus users and rail users (different regression models). The dependent variable was the answer to the question, "Do you feel it necessary to take precautions on public transit? (Y/N)." Based on the literature, the following variables were selected as independent variables: gender, age, LGBTQI status, ethnicity, average trip length, bus/rail frequency (days per week bus/rail is used), safe day (feelings of safety during the day), safe night (feelings of safety during the night), and prior victimization.

Findings

This section presents results of the analysis of the precautionary behavior of public transit users across the five selected cities. The purpose is to explore the extent to which precautionary behavior is consistent or different across the five cities. It is important to note that there was considerable variation in the number of respondents who took part in the survey, and variation in the data capture method (from online to paper-based questionnaires). Details of the methodologies followed are described in each of the individual city case study chapters presented earlier in the book.

Table 26.2 summarizes the percentage of respondents per city who felt it necessary to take precautions on public transit. This figure ranges from 36% of survey participants in Guangzhou to 85% of participants in Vancouver, which shows considerable variation across cities. There is limited variation between transport modes (bus and rail) with a slightly higher percentage of rail riders (61%) taking precautions than bus riders (58%); with the exceptions of Paris and Vancouver, these figures were consistent across transport mode. Comparing by gender, it is evident that higher percentages of female survey participants took precautions on the bus and train systems than male participants in all five cities.

Table 26.2. The number and percentage of respondents who felt it necessary to take precautionary behavior on public transit in Guangzhou, London, Los Angeles, Paris, and Vancouver.

City	**Rail**			**Bus**		
	Female	**Male**	**Total**	**Female**	**Male**	**Total**
Guangzhou	84 (43%)	67 (37%)	155 (40%)	76 (41%)	48 (29%)	129 (36%)
London	44 (69%)	16 (37%)	62 (56%)	42 (72%)	28 (62%)	72 (60%)
Los Angeles	92 (69%)	34 (39%)	128 (57%)	153 (66%)	58 (44%)	216 (56%)
Paris	398 (77%)	57 (43%)	459 (70%)	229 (63%)	29 (35%)	259(58%)
Vancouver	189 (80%)	27 (48%)	223 (74%)	200 (85%)	33 (58%)	242 (80%)
Overall	807 (70%)	201 (40%)	1027 (61%)	700 (65%)	196 (40%)	918 (58%)

Note: Percentage figures represent percentages within gender and mode

Figures 26.1 and 26.2 demonstrate the range of precautionary behaviors carried out across all five cities by bus and rail users respectively.

Figure 26.1 about here
Figure 26.2 about here

Types of Precautionary Behavior by Transport Mode

Figures 26.3a and 26.3b compare the precautionary behavior taken by bus users and rail users respectively.[2] It is evident that for most cities, there are more avoidance strategies taken than risk management strategies, which suggests the default may actually be to avoid travel at certain times. The only area where this trend was reversed was Guangzhou with a higher proportion of risk management strategies. Passengers were prepared to use more risk management on the bus compared to the rail network. Reasons for this are not obvious in the available data and should be explored in future research. These patterns can be observed consistently across both modes of travel.

Figure 26.3a about here
Figure 26.3b about here

Types of Precautionary Behavior by Transport Mode and Gender

In order to explore this further, precautionary behavior was examined by mode and gender. We found that higher levels of precautionary behavior were carried out by females, and generally, with the exception of Guangzhou, there were more avoidance strategies than risk management strategies across both the female and male groups. When examining this across the entire sample (all five cities) a chi square test revealed no significant statistical differences between gender and types of precautionary behavior for bus travel.

This analysis was repeated for rail users. Again, it is evident that there were more users who used precautionary behavior, except for Guangzhou. A further chi square analysis found a statistically significant difference between precautionary behavior type and gender on rail travel. A visual inspection of this identified that males took more avoidance strategies than might have been expected, and females took more risk management strategies overall than expected.

Types of Precautionary Behavior by Transport Mode and Travel Frequency

Comparing across all five cities, most students who took precautions indicated they used more avoidance than risk management strategies on the bus. The exception was Guangzhou. Patterns between frequent and non-frequent users appeared consistent. A chi square analysis revealed there was no significant difference between journey frequency and types of precautionary behavior for bus riders across all compared cites. A comparison of observed and expected values revealed there were more avoidance strategies used by frequent travelers than expected. A very similar pattern appeared on the rail network. A chi square analysis reveals there was a statistically significant difference between frequent and non-frequent rail travelers and type of precautions used. An examination of observed and expected values revealed that frequent rail travelers use avoidance strategies more than non-frequent ones, and they use less risk management strategies than would be expected, and this was statistically significant.

Types of Precautionary Behavior by Transport Mode and Feelings of Safety

An additional variable identified in the literature relevant to precautionary behavior was feelings of safety during day or night. Due to limited space, we present here our findings solely for "on vehicle" travel (bus and rail), although questions were asked in the survey also about waiting for buses and trains and walking from/to stops. For all cities both during the daytime and at nighttime, student riders employed more avoidance strategies than risk management strategies. However, a chi square test showed no significant differences between users who felt unsafe during the day and during the nighttime, and the types of precautionary behavior they use. The results were similar across both modes of transport, and the chi square test suggests no significant difference in the use of precautionary behaviors.

Types of Precautionary Behavior by Transport Mode and Prior Victimization

How might prior victimization from sexual assault or harassment influence the use of precautionary behavior? Comparing the use of precautionary behaviors for non-victims and victims in all cities, we found that most riders (regardless of prior victimization) used more avoidance strategies. The exception was Guangzhou, where more non-victims used risk management strategies, but more victims used avoidance strategies. A chi square test across cities found, however, no statistically significant difference. A similar picture emerged for the rail network.

Analysis of Predictor Variables for Avoidance and Risk Management Strategies

We conducted a logistical regression aiming to identify predictor variables of precautionary behavior. Again, due to the format of the questionnaire the analysis was split by transport mode. For this model, the binary variable, "Do you feel the need the take precautions on public transport? (Y/N)" was used as the dependent variable, and nine independent variables were selected as possible predictor variables.

For bus travel, the logistic regression model was statistically significant. The model explained between 11% and 16% of the variance in precautionary behavior. Significant predictor variables were gender, frequency of bus travel, and feelings of safety at night. For rail travel, the logistic regression model was also statistically significant and explained between 11% and 16% of the variance in precautionary behavior. Significant predictor variables were frequency of travel and feelings of safety at night. The independent variables used in the regression models and significance scores are presented in Tables 26.3 and 26.4 in the Appendix.

Table 26.3 Logistic regression: Predictors of bus riders' precautionary behavior

	B	**S.E.**	**Wald**	**df**	**Sig.**	**Exp(B)**
Gender	−.602	.148	16.530	1	**.000**	.548
Age	−.280	.206	1.835	1	.176	.756
LGBTQI	.403	.215	3.503	1	.061	1.496
Ethnicity	−.053	.062	.730	1	.393	.948
Bus duration	.101	.087	1.356	1	.244	1.106
Bus frequency	.260	.073	12.769	1	**.000**	1.297
Safe day	−.332	.142	5.465	1	.019	.718
Safe night	−.285	.101	7.984	1	**.005**	.752
Bus victimization	−.098	.140	.488	1	.485	.907
Constant	.921	.695	1.758	1	.185	2.512

Table 26.4 Logistic regression: Predictors of rail riders' precautionary behavior.

	B	**S.E.**	**Wald**	**df**	**Sig.**	**Exp(B)**
Gender	−.222	.139	2.528	1	.112	.801
Age	−.229	.211	1.180	1	.277	.795

	B	S.E.	Wald	df	Sig.	Exp(B)
LGBTQI	.352	.214	2.719	1	.099	1.422
Ethnicity	−.120	.064	3.568	1	.059	.887
Rail duration	.152	.082	3.434	1	.064	1.164
Rail frequency	.237	.073	10.605	1	**.001**	1.268
Safe day	.006	.146	.002	1	.969	1.006
Safe night	−.644	.124	27.174	1	**.000**	.525
Rail victimization	.026	.137	.036	1	.850	1.026
Constant	.450	.687	.430	1	.512	1.569

Discussion

It is evident that there was considerable variation between cities in terms of the percentage of respondents who felt the need to take precautionary behavior on public transit. Students in Guangzhou felt the need to take precautions much less than other cities. Further exploration is required here to understand if there is a cultural explanation. We note, however, that among all 18 cities, Guangzhou had the lowest level of victimization from sexual harassment among train riders and the third lowest level among bus riders (see Chapter 27). So it is probable that students in Guangzhou have higher feelings of safety on public transit in this city because of fewer harassment incidents.

We observed little variation between mode of transit and use of precautions, although in some cities (for example Vancouver) precautions were higher on the bus network, while in other cities (for example Paris) they were higher on the rail network. Further exploration is required to understand why particular modes are viewed as safer in different cities. There may also be a variation between above-ground and underground rail services. As expected in the literature, the percentage of females who used precautionary behavior was higher in all cities across all modes of transport. Again, there was considerable variation here between females in Guangzhou (41–43% taking precautions) and in Vancouver (80–85% taking precautions). In London and Vancouver, male bus users felt the need to take precautions at a rate higher than in other cities (29–44%). Therefore, consistent with the literature, there were differences identified between travel modes, but this varied by city.

It was generally found that avoidance strategies were more prominent than risk management strategies, with the exception again of Guangzhou. This pattern was consistent by gender, feelings of safety when traveling, frequency of use, and prior victimization. More risk management techniques were observed on the rail network than the bus. There were some significant differences identified: (1) between precaution type and gender on the rail network (males used more avoidance techniques than expected); and (2) between frequency of travel and precautionary behavior on both the rail and the bus networks (frequent users took more avoidance precautions than risk management). This may relate to the ability of frequent users to alter travel plans, or frequent users may feel more susceptible to risk based on everyday experiences. When compared to the findings of the logistical regression, there were some discrepancies to explore. For example, for both rail and bus travel, frequency of travel and feelings of safety at night were shown to be significant predictors of precautionary behavior. However, gender was only identified as significant on the bus network, which is perhaps surprising. This may relate to the nature of the two journeys and the perceived levels of protection on each mode of transport in the particular cities. There may also be limitations in how the two categories (avoidance and risk management strategies) have been constructed, as there are arguments as to whether some behaviors belong to one category or the other. For example, "waiting for transit only if other people are around" could be construed as a risk management strategy. Woolnough (2009) highlights the limitations of not having standardized measures of precautionary behavior, which might have a bearing on the results presented.

Furthermore, compiling and analyzing the result of all cities together for the regression model may mask some of the important variations observed in individual cities. A clear example here is in Guangzhou; perhaps differences and variations in the use of precautionary behavior should be explored across individual cities rather than all five cities together. The employment of only two classifications (avoidance and risk management) may also contribute to the loss of some of the nuances present in the data. It may be pertinent to explore individual precautionary actions on their own due to the variation this exhibits.

Conclusions and Recommendations

This chapter explored the use of precautionary behavior by public transit users across five cities, Guangzhou (China), London (UK), Los Angeles (USA), Paris (France), and Vancouver (Canada). While there was variation among these cities, in four out of the five cities over 55% of riders (for both rail and bus passengers) felt it was necessary to use some form of precautionary behavior; and in two of these cities this figure was over 70%. There was no clear mode of travel that riders viewed as requiring taking more or fewer precautions; this was higher for rail in three cities (most noticeably Paris) and higher for bus in the other two (most noticeably Vancouver).

When comparing precautionary behaviors, generally avoidance was viewed as a more popular choice than risk management, and this was experienced in four of the five cities, except for Guangzhou. When comparing frequency, gender, and feelings of safety on buses and trains, it was unsurprising that a greater percentage of female users, those who feel unsafe at nighttime, and those who travel more frequently take more precautions than male users, those who feel unsafe in daytime, and those who travel less frequently. An analysis of precaution type did reveal some statistically significant findings. On the rail network, males used avoidance techniques more than expected. On both bus and rail journeys, frequent users used more avoidance techniques than expected. Statistical differences in precautionary techniques were not found for prior victimization and feelings of safety. This analysis was considered across all cities, thus some variation between cities may mask statistical differences in precautionary behavior within individual cities. Finally, gender (on bus only and not rail), feelings of safety at nighttime (bus and rail), and frequency of travel (bus and rail) were shown to be significant predictor variables of use of precautionary behavior on public transport.

These findings should be placed in the context of the limitations of the study: the sample population was students and not the general population; the classifications of the 11 precautionary behaviors into “avoidance” and “risk management” may hide some important variations within the use of individual precautions; and some of the differences between the cities, be it for cultural, legislative, prevention measures, or other factors, might actually mask some additional statistical differences not revealed in this analysis. These limitations prompt us to suggest the following recommendations for further research.

- Follow-up interviews and focus groups should explore the reasons behind the use of different precautionary behaviors. This should be explored at a minimum by transport mode, frequency of travel, feelings of safety, and gender.
- Further analysis of the precautionary behavior should be carried out across the 11 precautionary behaviors identified, beyond the two classifications used in this analysis (avoidance and risk management).
- Analysis of precautionary behavior should be examined statistically at each of the cities (where sample size permits) to identify what differences exist in the use of precautionary behavior in each city. This should be done by classification (avoidance and risk management) and for each of the 11 precautionary measures.
- A key question to be explored in a future study is the extent to which public transit users use precautionary behavior exclusively in public transit environs, and to what extent this mirrors their behavior outside of the transit system. In other words, do they generally use precautions in their day-to-day life, and carry these onto the transit system, or do they add unique precautionary behaviors on public transit that they do not use elsewhere? Some of this is pertinent to the literature on the adaptive behavior of humans.
- More research is needed into the definitions and types of precautionary behavior to develop standard metrics for capturing this data more reliably for further analysis and comparison.

Lastly, several policy applications are evident from this study. It is clear from this research that bus and rail users use a range of precautionary strategies when traveling and navigating public transport. Gender is a clear driver of this, although not exclusively, for example on bus systems males use more avoidance strategies than expected. The finding that a large percentage of riders (60% overall) feel the need to take precautionary action suggests riders do not feel as safe as they should. These findings lead us to suggest the following policy recommendations.

- Policymakers and public transport operators should identify the precautionary tactics taken by transit users and design prevention measures that reduce the need for users to take precautions without reducing the patronage of public transit.
- Specific attention should be paid to those users who take avoidance strategies, especially females, frequent users, and those who feel unsafe at nighttime. We suggest

that these are the groups most likely to stop traveling if risk/fear becomes a barrier to travel, which might even outweigh their necessity to travel using public transit.

- While a relatively small percentage of respondents felt the need to carry weapons, and it was not explicit what constituted a weapon, we found that some riders carried weapons as a risk management tactic. Efforts should be addressed to reduce this need, and where possible to remove weapons from transit systems (even if for self-defense).

Overall, this research has identified that precautionary behavior is a key part of public transit travel for many bus and rail users, is perhaps not understood as well as it should be, and while some significant predictors have been established (gender, frequency, feelings of safety at night), they only explain about 11–16% of the model in terms of users feeling the need to take precautions. Further refinement of this model, supplemented by qualitative interviews/focus groups, should be used to enhance our knowledge of this phenomenon on public transport, and to distinguish whether this is “business as usual” for the people in public spaces, or they use specific strategies just for public transport

References

Atkins, S. T. (1990). Personal security as a transport issue: A state-of-the-art review. *Transport Reviews*, 10, 111–125.

Barjonet, P., Gezentsvey, P. and Mores, C. (2010). Perception des risques et choix du mode de transport. Approche conceptuelle et modélisation predictive. *Dans Flux*, 2010/3, 19–32.

Beimborn, E. A., Greenwald, M. J. and Jin, X. (2003). Accessibility, connectivity, and captivity: Impacts on transit choice. *Transportation Research Record*, 1835, 1–9.

Ceccato, V. (2014). Safety on the move: Crime and perceived safety in transit environments. *Security Journal*, 27, 127–131.

Cohen, L. E. and Felson, M. (1979). Social change and crime rate trends: A routine activity approach. *American Sociological Review*, 44, 588–608.

Condon, S., Lieber, M. and Maillochon, F. (2007). Feeling unsafe in public places: Understanding women's fears. *Revue française de sociologie*, 48, 101–128.

d'Arbois de Jubainville, H. (2019). *Sécurité dans les transports en commun: Le cas des usagers captifs*. La Note de l'ONDRP, 33. Paris: ONDRP.

Doran, B. J. and Burgess, M. B. (2012). *Putting fear of crime on the map: Investigating perceptions of crime using geographic information systems*. Springer Science & Business Media.

DuBow, F., McCabe, E. and Kaplan, G. (1979). *Reactions to crime: A critical review of the literature*. Washington, DC: Department of Justice, Law Enforcement Assistance Administration, National Institute of Law Enforcement and Criminal Justice.

Dunckel-Graglia, A. D. (2016). Finding mobility: Women negotiating fear and violence in Mexico City's public transit system. *Gender, Place & Culture*, 23, 624–640.

Gekoski, A., Gray, J. M., Adler, J. R. and Horvath, M. A. (2017). The prevalence and nature of sexual harassment and assault against women and girls on public transport: An international review. *Journal of Criminological Research, Policy and Practice*, 3, 3–16.

Gray, E., Jackson, J. and Farrall, S. (2010). Feelings and functions in the fear of crime: Applying a new approach to victimisation insecurity. *The British Journal of Criminology*, 51, 75–94.

Heurtel, H. (2018). *Victimation et sentiment d'insécurité en Île-de-France. Le rapport final de l'enquête 2017*. Paris: Institut d'Aménagement et d'Urbanisme d'Île-de-France.

Hindelang, M. J., Gottfredson, M. R. and Garofalo, J. (1978). *Victims of personal crime: An empirical foundation for a theory of personal victimization*. Cambridge, MA: Ballinger.

Jackson, J. and Gray, E. (2010). Functional fear and public insecurities about crime. *The British Journal of Criminology*, 50, 1–22.

Jennings, W. G., Gover, A. R. and Pudrzynska, D. (2007). Are institutions of higher learning safe? A descriptive study of campus safety issues and self-reported campus victimization among male and female college students. *Journal of Criminal Justice Education*, 18, 191–208.

Kash, G. (2019). Always on the defensive: The effects of transit sexual assault on travel behavior and experience in Colombia and Bolivia. *Journal of Transport & Health*, 13, 234–246.

Lea, S. G., D'Silva, E. and Asok, A. (2017). Women's strategies addressing sexual harassment and assault on public buses: An analysis of crowdsourced data. *Crime Prevention and Community Safety*, 19, 227–239.

LeBeau, J. L. (2002). The impact of a hurricane on routine activities and on calls for police service: Charlotte, North Carolina, and Hurricane Hugo. *Crime Prevention and Community Safety*, 4, 53–64.

Lieber, M. (2008). *Genre, violences et espaces publics: La vulnérabilité des femmes en question*. Paris: Les Presses de Sciences Po.

Loukaitou-Sideris, A. (2009). *How to ease women's fear of transportation environments: Cases studies and best practices*. San Jose, CA: Mineta Transportation Institute, Report 08-08.

Loukaitou-Sideris, A. (2014). Fear and safety in transit environments from the women's perspective. *Security Journal*, 27, 242–256.

Loukaitou-Sideris, A. and Fink, C. (2009). Addressing women's fear of victimization in transportation settings: A survey of US transit agencies. *Urban Affairs Review*, 44, 554–587.

Mellgren, C., Andersson, M. and Ivert, A. K. (2018). “It happens all the time”: Women’s experiences and normalization of sexual harassment in public space. *Women & Criminal Justice*, 28, 262–281.

Mishra, D. and Lamichhane, J. (2018). Experience of sexual harassment in public transport among female health science students: A cross sectional study of Kathmandu, Nepal. *Journal of Manmohan Memorial Institute of Health Sciences*, 4, 20–32.

Noble, J., Jardin, A., Robert, P. and Zauberman, R. (2017). *Insécurité et victimations dans les transports en commun franciliens. Exploitation des données de 8 enquêtes Victimation et sentiment d’insécurité en Île-de-France (1998–2014) de l’Institut d’Aménagement et d’Urbanisme de la Région*. Guyancourt: CESDIP.

Riger, S., Gordon, M. T. and LeBailly, R. K. (1982). Coping with urban crime: Women’s use of precautionary behavior. *American Journal of Community Psychology*, 10, 369–386.

Skogan, W. (1990). *Disorder and decline: Crime and spiral of decay in American neighborhoods*. New York: Free Press.

Skogan, W. G. and Maxfield, M. G. (1981). *Coping with crime: Individual and neighborhood reactions* (p. 272). Beverly Hills, CA: Sage Publications.

Smith, M. J. (2008). Addressing the security needs of women passengers on public transport. *Security Journal*, 21, 117–133.

Stark, J. and Meschik, M. (2018). Women’s everyday mobility: Frightening situations and their impacts on travel behaviour. *Transportation Research Part F: Traffic Psychology and Behaviour*, 54, 311–323.

Tandogan, O. and Ilhan, B. S. (2016). Fear of crime in public spaces: From the view of women living in cities. *Procedia Engineering*, 161, 2011–2018.

Tompson, L. A. and Bowers, K. J. (2015). Testing time-sensitive influences of weather on street robbery. *Crime Science*, 4, 8.

Vanier, C. and d’Arbois de Jubainville, H. (2018). *Le sentiment d’insécurité dans les transports en commun: Situations anxiogènes et stratégies d’évitement*. Grand Angle, 46. Paris: ONDRP.

Warr, M. (1990). Dangerous situations: Social context and fear of victimization. *Social Forces*, 68, 891–907.

Wilcox, P., Jordan, C. E. and Pritchard, A. J. (2007). A multidimensional examination of campus safety: Victimization, perceptions of danger, worry about crime, and precautionary behavior among college women in the post-Clery era. *Crime & Delinquency*, 53, 219–254.

Woolnough, A. D. (2009). Fear of crime on campus: Gender differences in use of self-protective behaviours at an urban university. *Security Journal*, 22, 40–55.

Yavuz, N. and Welch, E. W. (2010). Addressing fear of crime in public space: Gender differences in reaction to safety measures in train transit. *Urban Studies*, 47, 2491–2515

Figure 26.1: Types of precautionary behaviors taken by *bus* users in the five cities

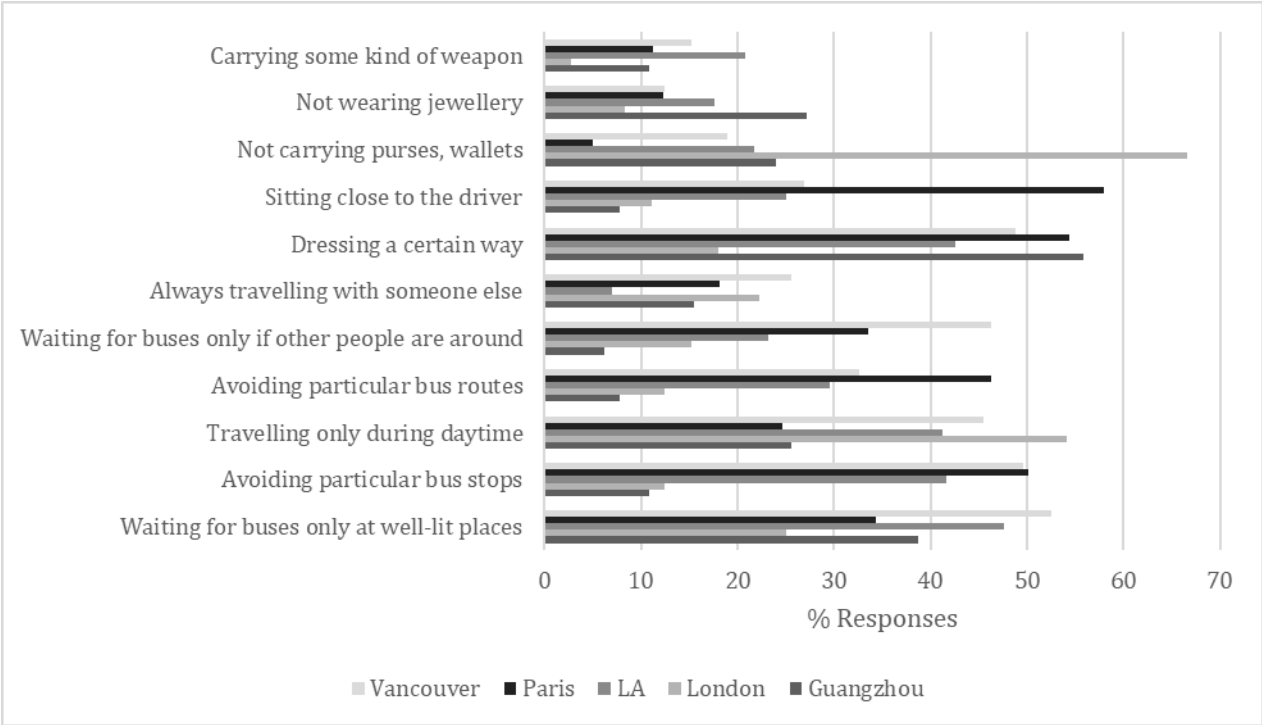

Figure 26.2: Types of precautionary behaviors taken by *rail* users in the five cities

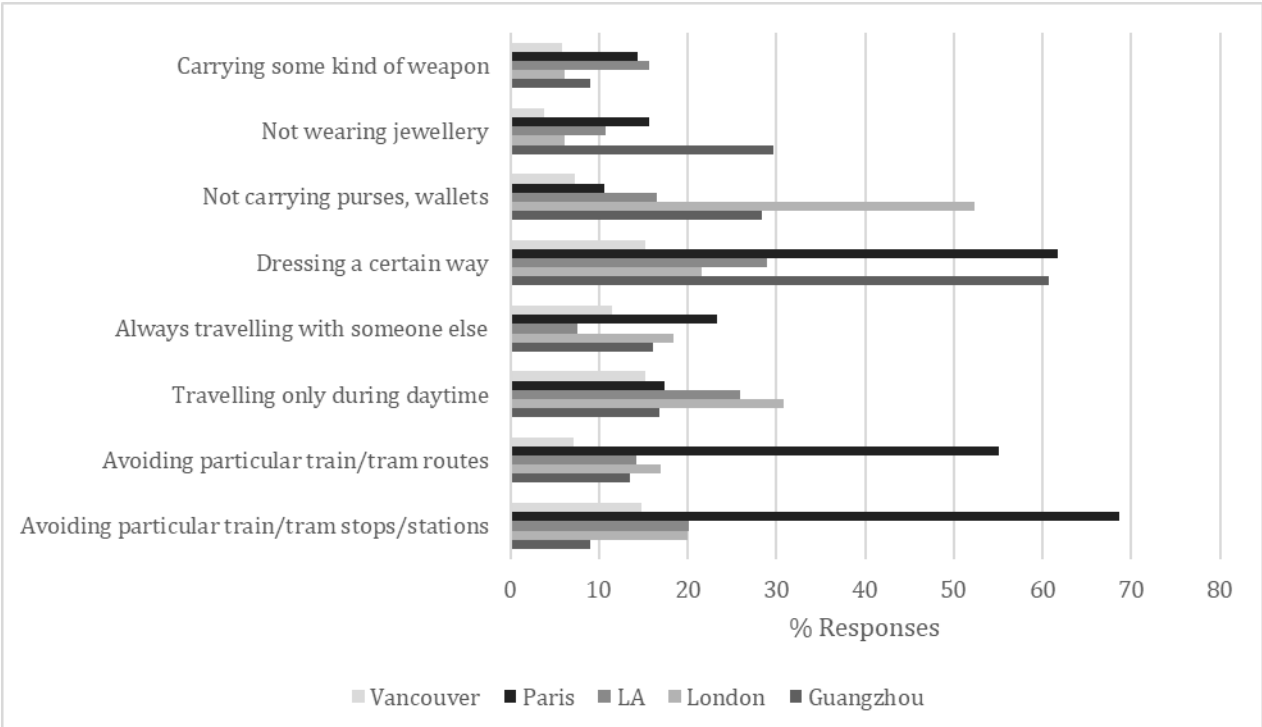

Figure 26.3a: Avoidance and risk management behaviors by bus users in the five cities

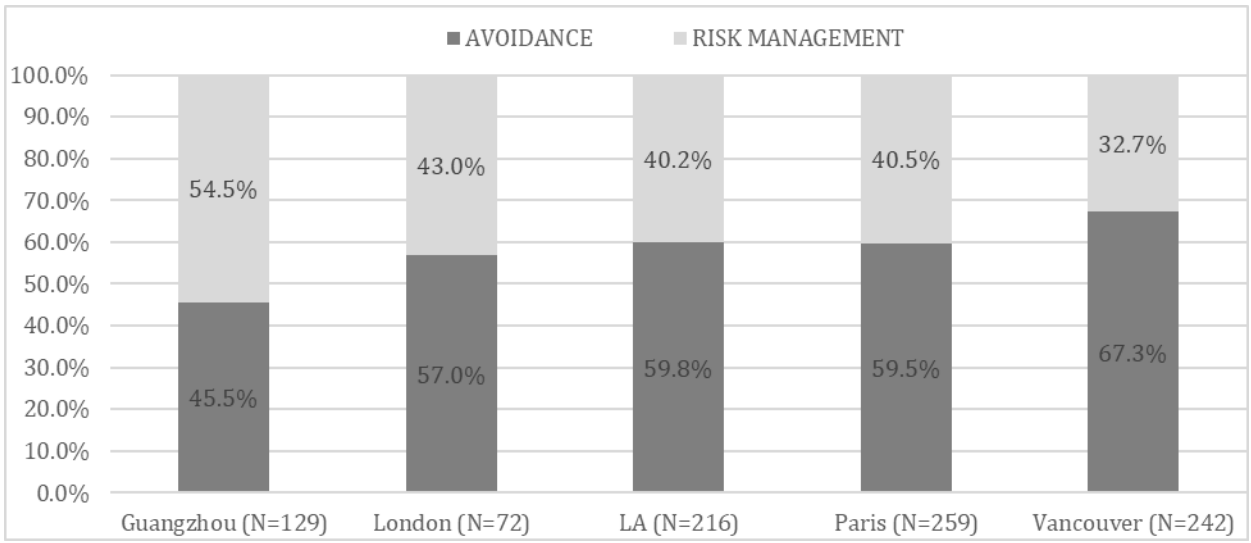

Figure 26.3b: Avoidance and risk management behaviors by rail users in the five cities

[1] A variable labelled "other" was also included in the survey as a possible response but this received only a few responses, and it was not included in the analysis presented here.

[2] An important factor is that users were able to report multiple precautionary behaviors, thus one person could potentially have even ticked all 11 behaviors listed in the survey. The N is the number of respondents who reported taking at least one precaution.