Cycling in Paris: An Evaluation of the Perception of Safety

by

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ABSTRACT

Cycling is increasingly recognized as a healthy and sustainable mode of transportation, and many cities integrate this mode in their inter-modal plan. Paris wants to become a 100% cycling city by 2026. However, feeling unsafe is still the main factor preventing people from cycling. Understanding factors of a low perception of cycling safety is the key to a successful bicycle policy. In this thesis, I compare the difference between cycling perception of safety in Paris and the bike crash location. I collected bike crashes' location and environment between 2005 and 2017 in Paris, created an online questionnaire, interviewed participants who experienced bike crash and proposed them to draw to grasp the emotional aspect of factors influencing the cycling perception. Several infrastructural and personal factors have been highlighted at the district level of analysis of Paris.

Keyword : Perception of cycling safety, Paris, bicycle policies, bike crash, facilities

CHAPTER 1: INTRODUCTION AND CONTEXT

1.1 Introduction

Cycling is increasingly recognized as a healthy and sustainable mode of transportation, and many cities integrate this mode in their inter-modal plan. Paris is one of them. In October 2021, the city announced its plan to become a 100% cycling city by 2026 through its *2021-2026 Plan Vélo*, estimated at €250 million ("Un nouveau plan vélo pour une ville 100 % cyclable" n.d.). This plan is a set of policies and initiatives aimed at increasing the bicycle network, improving its security and promoting bicycle use. With the 2024 Olympic Games in the loop, the City's stated objective is to have 15% of the internal displacements for the Olympic Games on bike – an important increase considering that the actual bike modal share in Paris is below 6%. In 2017, the *Baromètre des villes cyclables* released a study showing that the perception of low safety among bicyclists remains the main reason for not using a bike ("Baromètre des villes cyclables," n.d.). Understanding the factors influencing the perceptions of safety among bicyclists in Paris is important for improving the city's bicycling infrastructure and promoting safer bicycling practices.

In this thesis, I conduct a case study of Paris to analyze how the cycling perception of safety is aligned with the reality of danger for cyclists. To conduct this analysis, I created an online questionnaire targeting people living in Paris, interviewed participants who experienced bike crash and proposed the drawing to participants of the survey to grasp the emotional aspect of factors influencing the cycling perception. I also collected bike crashes' location and environment that occurred in Paris between 2005 and 2017 from the French Interior Ministry. I gathered demographic data from the *Institut National de la Statistique et des Études Économiques* and *l'Atelier Parisien d'Urbanisme* as well as road and bike lanes networks for the purpose of the maps. I incorporate these five datasets to compare the location of roads perceived as safe or unsafe with roads prone to bike crashes, so as to understand what factors influenced cyclists the most in their perception of safety. Using quantitative and qualitative methods, I was able to determine what characteristics are most commonly seen in the typical Parisian cyclist involved in crashes, to identify possible trends.

1.1.1 Thesis aim and research questions

My primary aim is to evaluate the perception of danger that people feel cycling in Paris, looking at to what extent it differs from actual data on crashes, what factors of the built environment drive those perceptions and how Paris improves safety for bike users.

In order to approach this aim, this thesis will be guided by three main research questions:

Research question 1

How is Paris approaching its plan to increase cycling mode share and improve cyclists' safety? To address this question, I examine the set of policies implemented by the city since the 1990s, as well as their implementation.

Research question 2

How does the perception of cycling safety align with actual data of bike crash from 2005 to 2017? To approach this question, I developed maps to understand the overlapping between perceived safety and actual bike crashes.

Research question 3

What are the determinants (external, environmental or personal) associated with bicycle crashes and perception of danger in Paris? To answer this question, I consider conducting statistical correlation of variables as well as analysis of interviews and drawings made by participants.

1.1.2 Conceptual framework

I develop a conceptual framework that provides the theoretical underpinnings of my investigation of how the perception of cycling safety is influenced by internal and external factors and how bicycle safety could be improved with infrastrcutures improvements and the implementation of policies. (**Figure 1.1**)

First, I review perceptions literature in order to inform my discussion of how people's perception is framed when traveling on roads.

Second, I draw on transport safety literature and its improvements in order to provide examples of transportation safety improvements both in France and abroad.

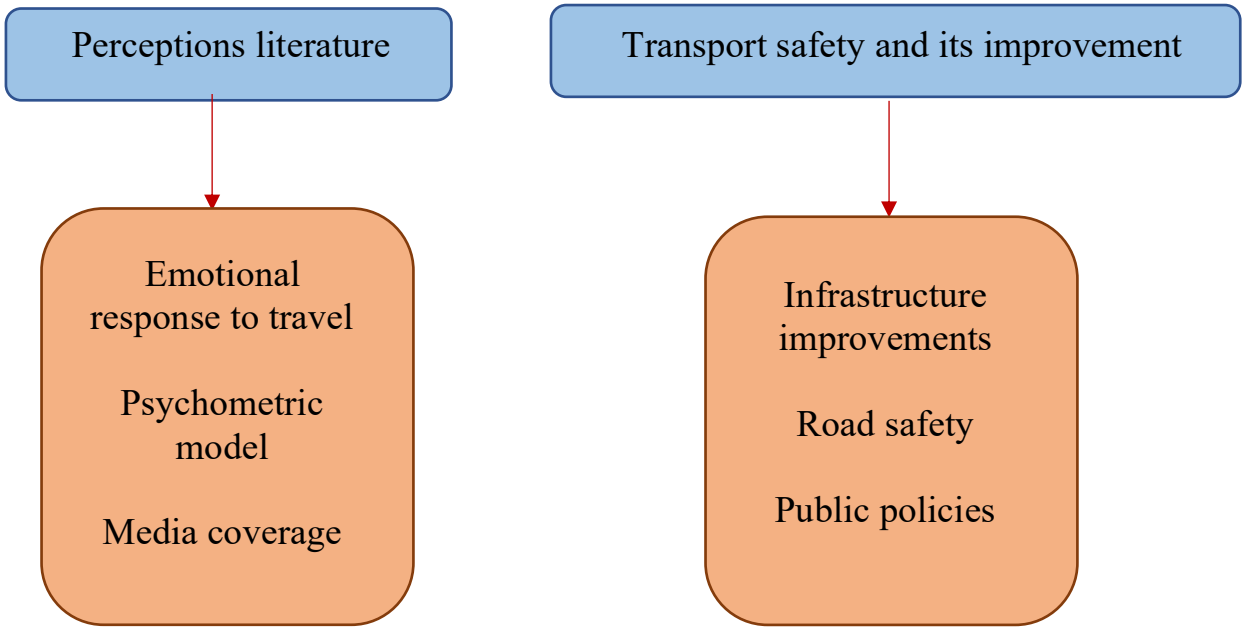


Figure 1.1 Conceptual Framework Key Ideas

1.2 Context

1.2.1 History of the role of cycling in France

During the first half of the 20th century, the bicycle established itself as one of the main means of transport (Morio & Raimbault, 2021). In the 1920s and 1930s, French people saw cycling as an affordable opportunity to increase their mobility and their opportunity for leisure activities (Dauncey, 2012, p. 247).

Under the governance of the Popular Front led by Léon Blum from 1936 to 1938, leisure activities gained momentum in France, following the introduction of the two weeks paid holidays for workers. This reform favored the increase in the use of bicycles and reinforced the multiple roles of cycling, not only as a mode of transport but also as a form of both leisure and freedom. Until the late 1940s, institutionalized practices around cycling as leisure were developed, such as *cyclosport* and *cyclotourisme* (Dauncey, 2012, p. 248). The modernization, the apparition and the democratization of affordable automobiles and new forms of transport such as the Vélo-Solex after the Second World War and the economic reconstruction of France changed the social perception of the bicycle. Automobiles embody an undeniable image of modernity and progress that were the key values promoted during the *"Trente Glorieuse"*. This public discourse in favor of cars led to the establishment of an urban planning doctrine centered around the automobile. This car-centered policy was also fully promoted by the government, as President Georges Pompidou's public speech extract in 1971 underlines : "We need to adapt cities to automobiles" (Morio & Raimbault, 2021). This car-ownership society further changed the social perception of cycling as a form of leisure rather than an individual mobility mode (Dauncey, 2012, p. 248). In the 1970s, *"Véloroutes"* and so-called green roads emerged in the country, which further intensified cycling at the crossover of sport, tourism and leisure activity. Moreover, in the 1960s, 1970s and 1980s, the Tour de France dominated the French sporting calendar and was heavily covered by the media. Its societal influence further participated in the great expansion of national enthusiasm for recreational cycling.

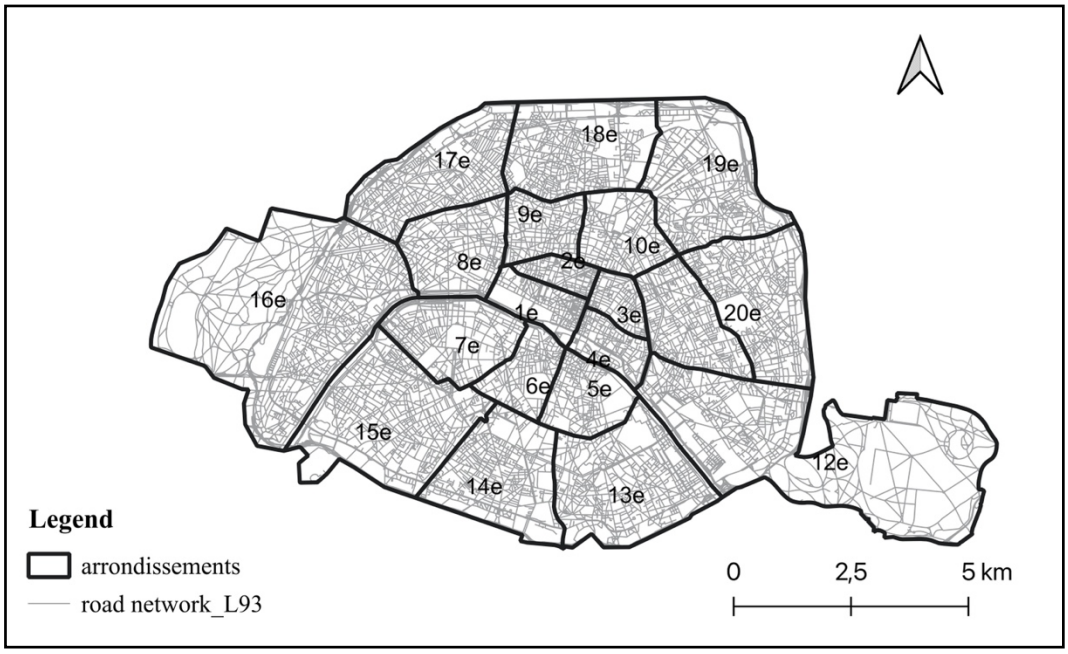
However, after the protest in May 1968, environmental protests emerged and bicycles started to reintroduce to the political realm thanks to the support of associations such as *Amis de la Terre* (Morio & Raimbault, 2021). In 1972 occurred the first "*vélorutions"* protest, a movement that progressively expanded across France. Both these mobilizations and the creation of the *Fédération des Usagers de la Bicyclette* helped promote and institutionalize cycling within local policies on mobility (ibid). Because of the political decentralization, cities and territorial communities – regions, departments – gained the responsibility of leading urban mobilities policies. Improving cycling infrastructures was indeed integrated into local agendas.

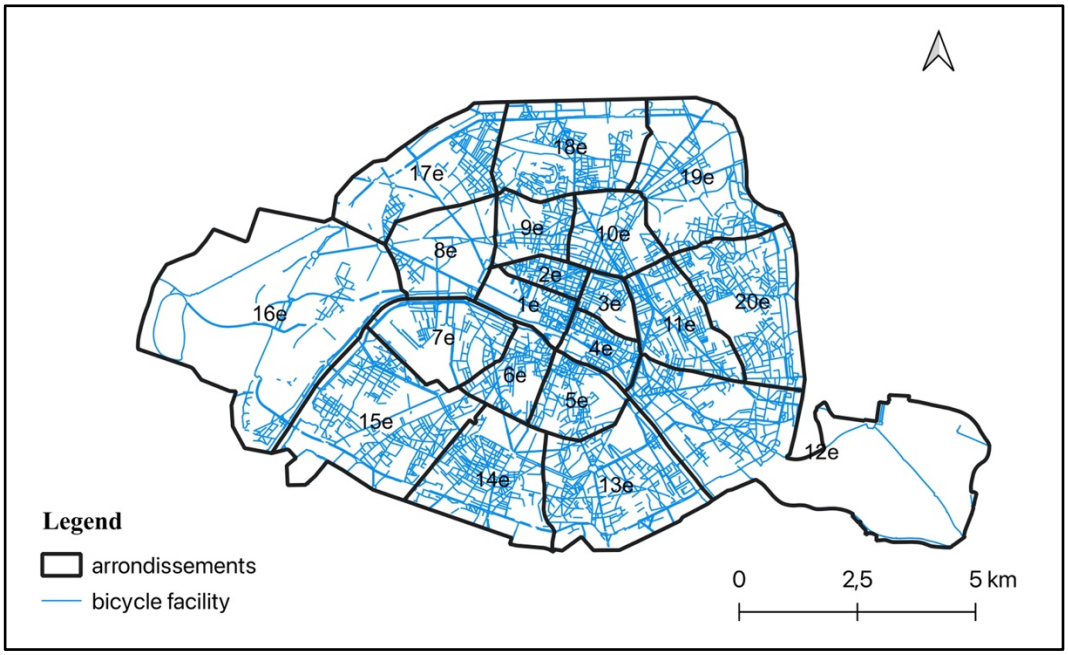
The implementation of the *loi sur l'Air et l'Utilisation Rationnelle de l'Énergie* (LAURE) in 1996 drove other laws to be passed to further encourage cycling as a mode of transport. In fact, in the 1990s, the modal share of bike in daily travels only comprised 4% of the total modal share (Carré, 1998). In 2000, in order to counter the lack of information territorial communities faced, the government published numerous policy recommendations for cycling infrastructures (Morio & Raimbault, 2021). More recently, the *Loi d'Orientation des*

Mobilités (LOM) voted in 2019 by the French government, gave bicycles a predominant role in the modes of transport by allocating 350 millions € of funding to triple the modal share of bikes by 2024 (*La loi d'orientation des mobilités*, n.d.).

1.2.2 Bicycling policies in Paris

Well known French capital and most populous city in France, Paris had a population of 2,145,906 in 2020 (*Population Estimates - All - Ville de Paris | Insee*, n.d.). The road network of the city has a total length of 1,965 km. Around 55% of these roads (1,083 km) are equipped with bicycle facilities, ranging from bike path, bike lane, bus corridor open to bicycles, pedestrian areas (see **Map 1.2.2**)





Map 1.2.2 : Parisian roads and bike networks

Since the 1970s and the establishment of the first bicycle path in Paris, the city began to invest in bicycle infrastructure. Following the bike crash of Jacques Essel, the founder of "La Maison du Vélo" in 1992 and its heavy media coverage, Jacques Chirac, the Mayor of Paris from 1977 to 1995, launched the creation of 30 km of "couloir de courtoisie". Those facilities are only painted areas on the road reserved for cyclists. They rapidly became known as "couloir de la mort" given the narrowness of the space allocated to the cyclists.

In January 1996, the Mayor of Paris, Jean Tiberi presented the first "plan vélo" that planned to create two axes – north/south and west/east to increase the use of bicycle in the Capital ("Paris, ville entrouverte à la bicyclette," 1996). In 2002, for the first time, the city adopted a document named "schema directeur du réseau cyclable parisien" aimed at defining how bicycling should be promoted

In 2007, the first "Vélib" – a short for "vélo liberté," / "free bike") was launched. This is a large-scale public bike-sharing system that allows residents and tourists to rent bicycles from a network of stations throughout the city ("Velib' parisien," 2019). In 2015, this program was replaced by "Vélib'Métropole" which expanded the network of stations. In May 2020, in response to COVID-19 Pandemic, Paris implemented "coronapistes" – bike paths to make bicycle commutes more secure while decongesting public transportations. The COVID-19 pandemic has changed the status quo in modal share of bicycles in Paris, passing from less than 5% before the pandemic to 7% (*Bientôt de nouvelles pistes cyclables partout dans Paris !*,

n.d.)). In November 2021, the Council of Paris took one step further by adopting a new cycling plan with the desire to make Paris a 100% cycling city by 2026. However, the increased use of bikes in Paris in 2020 has been correlated with a greater number of crashes involving cyclists (+47% compared to 2019) (*Bilan Sécurité Routière Ville de Paris | Observatoire National Interministériel de La Sécurité Routière*, n.d.)

The results from the "Baromètre des villes cyclables" 2021 revealed that Parisian feel safer than in 2019 when they are cycling on the main boulevards. Recently implemented bike lanes are also well praised by the respondents of the Baromètre. Intersections and roundabouts remain a significant source of danger for cyclists in Paris. Overall, the effort made by the City is encouraging, but it seems that the promises in terms of length of bike lane implemented are late. Only 17% of the Plan Vélo 2021-2026 is implemented whereas 45% of the timeframe passed (*Observatoire du Plan Vélo de Paris*, n.d.).

CHAPTER 2: LITERATURE REVIEW

This chapter summarizes the existing literature concerning the perception of risk and transportation safety. In my review of the perception of risk literature, I focus primarily on authors who base their research on the psychological analysis of risk, which provides insights and understandings on my first research question. In regard to transportation safety, I highlight the role of transport infrastructures, particularly those built for bicycles to improve safety.

2.1. Perception of risk literature

2.1.1. Emotional response to travel

A connection exists between emotions and travel behavior. However, the social spatial mediation of emotions remains under analyzed. As stated by Anderson and Smith, feelings and emotions greatly participate in the making of societies and societal relations, which in turn influence people's lives. Housing studies, employment studies, and international migration studies would benefit from acknowledging this; the "emotionally-present intricacies" in their respective relationships highlight the influential role of emotions in shaping space(Anderson & Smith, 2001, p. 4). Feminist scholars such as Kwan argue that more aspects of geospatial technologies need to integrate emotions and feeling because of the transversal role emotions play in practitioners' decisions to engage in particular issues or develop geospatial technologies

all the more “attentive to bodies and emotions” (Kwan, 2007, p. 24). This integration of emotion and subjectivity would contrast with the “detachment, objectivity and rationality” that has been valued and associated with masculinity (Kwan, 2007, p. 24). Taking into consideration the influential power of emotions on how people perceive their environment and interact within it would help gain insight into their perception of risk on roads. This idea is closely related to one of the three aspects of attitude in the realm of social psychology, which is explained by Triandis (1971) as “an affective aspect involving feelings, emotions and values ” (Van Acker et al., 2010, p. 9). He also argues that attitude consists of “a cognitive aspect involving perception and knowledge of the stimuli, and a behavioral aspect involving acting in response to the two other aspects” (ibid). One’s attitude is therefore a combination of perception, feeling and reaction to a stimulus and the surrounding environment. It is in this manner, through an analysis of the impactful role of emotions on an individual's reactions to risk, that people’s emotional response to travel can be better understood.

2.1.2. The Theory of Reasoned Action (TRA)

The Theory of Reasoned Action behavior is aimed at explaining how individuals form a perception about a specific stimulus. In their study, Van Acker and Witlox underline that each stimulus is associated with one belief (or perception), which depends on the attributes of the stimulus (2010, p. 9). People's response and attitude towards stimuli are then determined by their comprehension and interpretation of those beliefs. This theory appropriately explains attitude towards a predicted stimulus. However, since human beings act as rational individuals, their response to stimuli of external objects is issued from an interpretation of them. In turn, one’s response to stimuli plays a role in the shaping of their psychological state. As such, the interaction between individuals and their transportation environment — which includes their perception of risk factors (the aforementioned stimuli) — directly affects how they feel.

2.1.3. Psychometric model and its cultural variations

Douglas and Widavsky developed the Psychometric model; this cultural theory is based on the influence of social processes (Backer-Grøndahl & Fyhri, 2009, p. 10). Studies have put an emphasis on the potential variations that could arise in how risk is perceived among nations and cultures. Instead of being cognitively determined, risk perception would be determined by individuals and would thus vary across cultures. Studies carried out in Hungary, Norway and

Poland demonstrated that the "level of risk perception in Norway is clearly below similar risk ratings in the USA, however above such ratings in Hungary" (Backer-Grøndahl & Fyhri, 2009, p. 6). This cross-national difference in perception of risk is the result of people living in a multifaceted world where social, technological, environmental factors are intertwined. Nyland (1993) argues that differences in rating the perception of magnitude of risks between countries depend on how characteristics of each country's environment influence the "factual risk". This risk, as defined by Nyland (1993, 90), is an objective measure looking at "annual injury and fatality rates" across various nations. People are exposed to dangers of different magnitude depending on which part of the world they are in. For example, motor traffic in Brazil is known to be more dangerous than in Sweden because traffic conditions differ. Speed, traffic density, the number of regulations enforced, and the average age of cars are objective factors that can influence how dangerous roads can be in a certain country. Individuals would perceive risk based on these objective factors, and not on cultural components, which would explain the cross-national variation of risk perception. However, other authors (Royal Society Group, 1992;Adams, 1995) have emphasized that factual risk is socially constructed by images and knowledge disseminated by the media or observed in the environment (cemeteries).

Nonetheless, it is important to note that roads or safety standards are all relative; they change from one country to another or even from one city to another. The reproduction of those standards in some countries need to be understood through the prism of equity, rights and authority and their promoted symbols. In this sense, the media would appear to be a key player in the production and reproduction of safety standards due to their considerable influence on public attitudes.

2.1.4. Influence of the media in the perceived risk

Medias' material selection, their positions on how information is presented (attenuated or amplified), the number of reports about risks, and the frequency with which this type of information is conveyed are all elements expected to strongly impact how risk is socially represented and perceived. As mentioned by Sjoberg et al (1996, 67-68), "it cannot simply be assumed that the media "mediate" risk in an invariant way across all societies". Cross-national differences in terms of themes covered, for example, could widely vary among countries (Boholm, 1998, p. 147), which would in turn influence how people interpret and perceive one's risk.

3.2. Transport safety and its improvement

3.2.1. Road safety

Road safety is a major societal issue in European countries suffering from congestion, road crashes and pollution. According to the European Commission, more than 70% of the European population lived in urban areas (cities, towns and suburbs) in 2018. This statistic is even higher when looking at France: more than 80% of the French population live in cities today.

A clear framework is required in order to properly assess road safety, so as to define which elements are part of the definition and which criteria need to be measured. Road safety measures often rely on the number of road crashes, road casualties and the associated negative consequences per million km of travel (Buehler et al., 2021, p. 61). Therefore, registration of crashes by police forces is the official way of collecting these data. However, certain crash types are underreported, most notably bicycle crashes. Thus, hospital records and self-reports of injuries are two additional sources of data that are used (Buehler et al., 2021, p. 62).

3.2.2. Infrastructures improvement to increase cycling safety

Well-connected, and safe infrastructures are key components of making cycling safer in cities. A consensus among studies promotes the importance of separating cycling lanes from motorized traffic in order to increase both perceived and objective safety (Buehler et al., 2021, p. 78). Peter Furth emphasizes the existence of four types of bike route facilities : stand-alone paths, cycle tracks, conventional bike lanes, mixed traffic roads (Buehler et al., 2021, p. 78). Whereas the former two examples are physically separated from motorized traffic, the other two do not enjoy this advantage. Riding on the same road as motorized vehicles significantly improved the risk of serious injury and fatalities. To emphasize on the importance of road design in the traffic injuries occurrence, urban planning experts in traffic safety now refer to the term of crash instead of accidents. Improving the infrastructure design should be based on examples from Northern Europe such as the Netherlands and Denmark, who implemented “an extensive system of on road bicycle and off-road bicycle path” (Pucher & Buehler, 2016). Those roads are not only separated from motorized roads but also offer expressways thus minimizing interactions with other cyclists and the risk of crashes.

3.2.3. Role of policy in the prevention of cycling safety

Mandatory traffic safety education programs are another form of fighting against cycling crashes. Mostly proposed in Europe, these programs promote safe walking and teach cycling skills to participants to increase safe behaviors on roads. Other forms of educational programs resides in the increased role of police in enforcing and regulating motorized traffic (Pucher & Buehler, 2016).

CHAPTER 3: DATA AND METHODOLOGY

In this chapter, I begin with a description of the data collection process. I detail the methodology that I developed to survey, interview and let participants draw the way they perceive cycling safety in Paris. Those methods are aimed to determining the factors influencing the perception of being safe on bicycles in Paris. I also outline the other portion of the project dedicated to statistical and cartographic analysis of crash data and census data published by the *Ministère de l'Intérieur et des Outre-Mer*, and the *Institut national de la statistique et des études économiques*. These data are pertinent to the project by approaching the difference between the objective bicycle safety and perceived bicycle safety.

To obtain permission to conduct surveys, interviews and drawing, an application for ethics approval was submitted to the McGill University Research Ethics Board on June 17th 2022. The REB's approval to the application was granted on July 6th 2022. The data collection was carried out from July to September 2022. All surveying, interviews and drawing were assigned remotely to accommodate with each participant. All identifiable information and personal data used during the project will be stored on an external hard drive and a password protected computer for 3 years.

3.1 Data sources

In the following sections, I explain the primary data collection steps. I employed five data sources to answer my research questions.

3.1.1 Questionnaire-based survey on bicycle safety in Paris

I distributed my survey online targeting five Facebook groups specialized in cycling-related topics in Paris: *Vélotaf, Velotaf Paris, Vélo à Paris, Vélo d'occasion et neuf Paris Ile de France, Vélo volés Paris/ banlieue*. Those groups were chosen in order to increase the number of potential participants since members of those groups could be interested in my project. This would also help me obtain a sample geographically concentrated in Paris and exclude people from other places.

My final sample is one hundred and three adults living in Paris. Participants were asked eighteen questions covering background information about themselves, their relationship with cycling, factors influencing their perception of safety and geographically dispersion of safe and

unsafe perceived roads for cyclists (see Appendix A). All participants involved in this project were required to be at least eighteen years old, as indicated in the REB application.

Consent from survey participants was obtained at the beginning of the online survey, and a detailed consent form was attached to each message advertising the survey to allow every participant to access and read it (see Appendix C). Every participant of the survey remained anonymous as no identifying characteristics were collected, except for those who expressively indicated their email address to be contacted for either the interview or drawing part of the project. In the consent form, participants were informed that they could risk an emotional harm given that questions ask for their experiences with bicycle crashes. Participants were thus advised to take breaks or to stop the questionnaire at any time to address any potential issues related to being overwhelmed.

Following the data collection, I exported the results and started to quantitatively analyze trends between individuals using pivot tables in Microsoft Excel and regressions statistics. Additionally, I used the survey result to build colored-scale maps representing the perceived dangerousness of roads based on participants' answers to the survey, as well as others integrating the number of bike crashes occurring on each road, based on their level of safety perception.

3.1.2 Interviews

In the questionnaire, participants who have been involved in a bicycle crash were invited to take part in an extended, remote, semi-structured interview later in order to discuss with me their experience and the consequences of the event on their bicycle journeys. Only three interviews ended up happening among the twenty who indicated their interests, which is less than 3% of the total number of participants of the questionnaire. The interview was the opportunity for participants to share their experience as a victim of a bicycle accident in Paris and give their impression on the recent evolution of the cycling policy in Paris.

Conducted on Zoom software, the three semi-structured interviews lasted between thirteen and twenty-eight minutes, covering eight guiding questions and conversational follow-ups. Consent was obtained through the digital signature of a consent form shared in advance to each interviewee (see Appendix E). Interview participants were informed in the consent form that their names would remain confidential in the final report to avoid any harm that could result from the publication of their names. Audio of each interview was recorded on my personal phone and notes were taken separately.

3.1.3 Drawings

Finally, at the end of the online questionnaire, each participant was asked to indicate their willingness to participate in another extension of the project: representing on a piece of paper how they feel when they are on a bike in Paris. This experimental method is unique concerning the "access to emotional aspects of experiences" and particularly well complete the online questionnaire that focused on factual data and not emotions (Coen, 2016, p. 12). As for the interview, participants interested in the drawing were required to digitally sign and send me the consent form previously transmitted to them (see Appendix D). They could opt for not having a copy of their drawing published in the final report, which would give them flexibility and would avoid any harm that could be associated with the publication of their personal drawing. Three people ended participating in the drawing, which represents 3% of the total number of participants of the survey.

3.1.4 « Base des accidents corporels géocodée »

The "base des accidents corporels géocodée" from the community database of the French Interior Ministry (Gräbener, 2017) compiled crashes that occurred between 2005 and 2016 in France. Sorting them by cities and types of vehicles involved in the collision, I was easily able to generate a new cleaned file only containing the 596 relevant crashes located in Paris and involving at least one bike. Each crash record contains details on the type of intersection – in X, T roundabout, no intersection -, the weather, the location, the date and time of the crash, the type of road – national, regional, local, the direction of traffic, the severity of the accident - barely injured, hospitalized, fatality. Each crash is also geocoded, which allows for geographic representation of crashes.

3.1.5 Census data

In order to have demographic information on people living in Paris, I downloaded sociodemographic data at the census tract level for Paris from the 2015 the Institut National de la Statistique et des Etudes Economiques (INSEE) national census made by the Atelier Parisien d'Urbanisme (APUR). This is the most recently available INSEE data I found that geolocalized each sociodemographic variable at the IRIS level. IRIS (Ilots Regroupés pour l'Information Statistique) refers to a French territoiral division system used in cities of more than 10,000

inhabitants. I used the APUR data because it incorporates data at the IRIS level rather than at the district level. This very useful to understand and evaluate the relative impact of socioeconomic and demographic predictors on both the perception of bicycle safety and the real occurrence of crashes when overlaid with the *Base des accidents corporels géocodée*.

3.2 Spatial clustering of crash

I used the cleaned *Base des données géocodées* dataset to perform an hotspot analysis for bike crashes in Paris. As I wanted to apply this tool to represent both a bike crashes density map and the another one representing crash density weighted by the level of severity of the crash, I first made changes to the *Base des données géocodées* Excel file. I added a binary variable named severity of crash. I coded the variable that was previously divided into four string variables (number of uninjured victims, numbers of lightly injured victim, number of hospitalized victims and number of fatalities) as a binary variable by attributing the value of 0 to all crashes associated with an uninjured to lightly injured victims and the value of 1 to victims who needed to be hospitalized and those who were fatally wounded. The numbers of victims in each category is detailed in the **Table 3.2**.

Table 3.2 : Count of victims by the severity of the crash

Victims category	# of victims	Severity of crash	# of victims
uninjured	486	0	1168
lighly injured	682		
hospitalized	53	1	54
dead	1		
Total	1222		

I then converted the Excel file to a CVS document and imported it into QGIS 3.28.0 as a delimited text layer. I changed its projection from SCR WGS84 to SCR Lamber 93 - the projection I used throughout the project. To gain a better idea of the spatial dispersion of the high crash densities, I overlaid the bike crash layer with the Parisian road network one as well as the boundaries of the twenty Parisian districts. I applied the hot map tool to perform a hotspot analysis. This allowed me to get a preliminary idea of how clustered bike crashes were in Paris and if certain places were more prone to more severe crashes. Results are displayed on two maps in Chapter 4.

Additionally, I created a bike crash density map of Paris, aggregated by census tract to

visualize the correlation between the numbers of bike crash and their location in local districts. To make this map, I used the tool "count points in polygon" in QGIS 3.28.0. My polygon layer was the IRIS census population data. This allowed me to calculate the number of bike crash points located within each census tract (IRIS) and display these results on a map. I show the clustering result in Chapter 4.

3.3 Spatial representation of roads safety perception

Based on the responses I got from the questionnaire, I wanted to map the roads my participants mentioned as being safe and unsafe for bicycles to spatially represent the bicycle safety perception of roads in Paris. I collected 124 different names of streets for both categories. I attributed a grade between 1 and 5 (low to high level of safety perception) to each of them based on how often they were repeated. Considered the variety of roads mentioned, roads in the safe category repeated between 1 and 5 times received the grade of 4 and those mentioned more received the grade of 5. The same coding scheme was chosen for the roads in the dangerous category; the most repeated got grade 1 and the other grade 2. Grade 3 was given to roads mentioned in both categories.

Using the place search function of OpenStreetmap on QGIS 3.28.0, I was able to easily geolocate each street and place mentioned by the participants on the Parisian road network vector layer. I had to filter the entities by their "identifiant séquentiel de la voie (n_sq_vo) as a way to select the entire road mentioned instead of a section. The *n_sq_vo* variable was the same for each section belonging to the same road. I ended up with 2749 entities selected. By using the regrouping tool, I grouped entities by their *n_sq_vo* numbers to obtain 124 final entities. This allowed me to create a buffer of 15 meters around each entity and to run the "counting points in polygons" tool on QGIS 3.28.0 with the buffer as the polygon layer and the bike crash location as the point layer. I obtained a layer whose attribute table specified the number of crashes for each road. Results analyzed in Chapter 4.

3.4 Statistical understanding of safety perception

Using data from the survey, I transformed the string variable into numeric variable using the "encode" formula on STATA. I did the same process with the "base des accidents geocodés" to be able to draw a graph from the data. The goal is to determine the relation between external factors (the environment), demographic factors (the population density, personal profile of each participant), and personal factors such as experiences of bike crash, on either, the occurrence of bike crash or the grade of safety level. Whereas I tempted to model regression to test for

correlation between variables, the models were not statistically significant. I decided not to include them in the final copy.

3.5 Safety perception from participants insights

Semi-structured interviews were also proposed to participants of the survey who experienced a bike crash. This style of interview is recognized for its ability to gain access to participant's experiences and emotions while offering specific theme to cover during the interview (Valentine, 1997). In total, I conducted 3 semi-structured that lasted between 20 minutes and 40 minutes. Each interview was asking the same pattern of questions from the contextual information about the bike crash, how the crash happened, the reactions of the surrounding persons, the type of vehicles involved, participants' behavioral changes on the road since the crash and their opinion on Parisian policies to improve the bicycling network. I adapted this guidance to every situation as an attempt to minimize the influence of my questions on their storytelling of their experiences.

3.6 Ethical considerations and positionality

The recognition of positionality is crucial to the process of conducting research. Despite being French and having lived a few months in Paris, I do consider myself as an outsider to the Parisian bubble. Thus, developing my questionnaire and my interviews, there was a risk that I would carry out and impose incorrect representations on Paris. From my perspective of being a *"provincial"*, coming from a small city in the south of France, I always imagined Paris as a noisy, unfriendly and almost unpleasant city to live, which has significantly influenced my choice to pursue research on this city.

Moreover, despite the ongoing enthusiasm for bicycling in Paris, I never found this city attractive for cycling because of the highly dense traffic reputation the capital hold. Being able to live two months in Paris as an intern, was an objective I had to potentially deconstruct my bias. Those bias have surely influenced the way I designed the questionnaire and phrased specific questions, which in turn may have impacted the types of responses I received. To limit this double incidence, I avoided closed-ended question in my questionnaire and favored questions requiring an individual answer. In regard to the interviews, I might have lost some form of professionalism, as I was sometimes not able to correctly locate the places mentioned or visualize the infrastructural specificity they alluded to. This has highlighted my outsider feeling, whereas some participants could have expected I know the area by heart.

Furthermore, whereas the data collected through participation in surveys, interviews and drawing was done remotely, I was in the city during this period which allowed me to go visit specific areas based on survey answers. For instance, since I was intrigued by the fact that few streets were frequently named by participants for being both dangerous and safe, I could directly contextualize the survey answers and make my own opinion.

Finally, I recognized my privilege as a white, young, educated female-identified adult from a supportive family to have the opportunity to conduct field research on this topic in my native language, which has surely made my overall experience so much easier.

3.7 Conclusion

In the first part of this chapter, I outlined the data sources I used to complete my work, specifically both quantitative and qualitative data from the French ministry, INSEE, and those I collected on my side using interviews, surveys and drawings. I then detailed the methods I undertook to complete the analysis and how my research was influenced by moral ethics.

CHAPTER 4: RESULTS

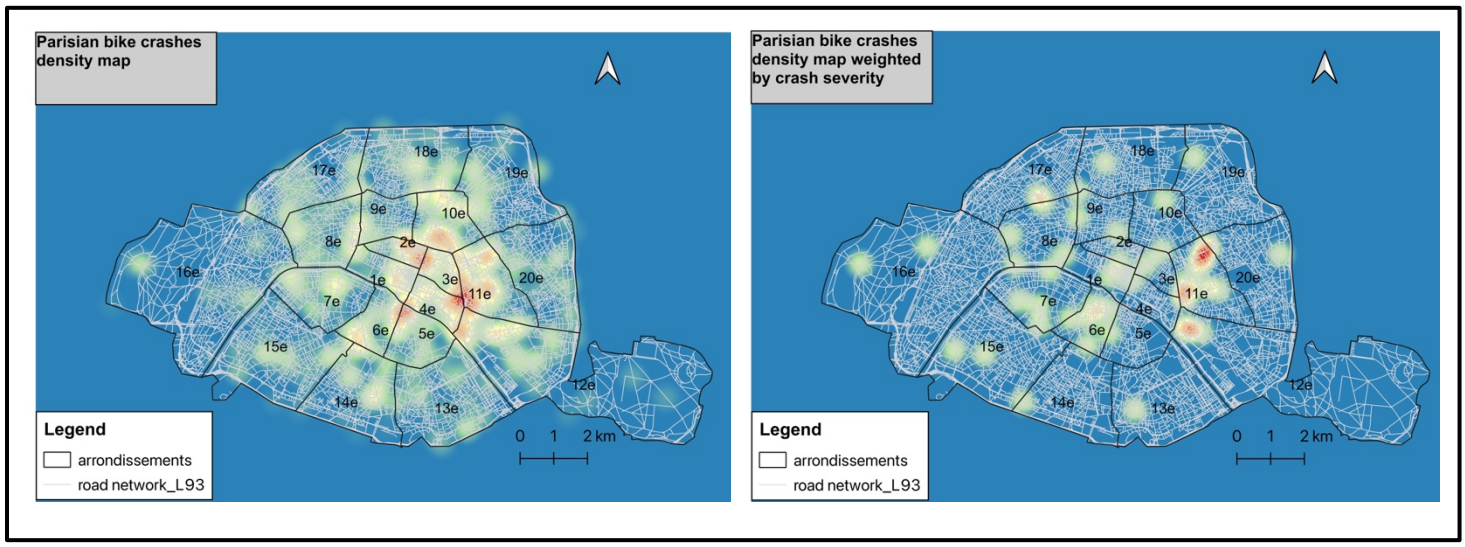
In this chapter, I present the key findings that answer my last two research questions : ***How does the perception of cycling safety align with actual data of bike crash from 2005 to 2017? What are the determinants (built environment, weather, time of day etc.) associated with bicycle crashes in Paris?*** In order to address the two aspects of these questions, this chapter is divided into three sections that followed the methods' analysis : bike crash cluster and density map (4.1), spatial representation of the safety perception (4.2) and factors influencing safety perception (4.3).

4.1 Bike crash cluster and density map

As I mentioned in section 3.3, I created bike crash hotspot cluster density maps for bike crashes that occurred in Paris between 2005 and 2017. The maps allow to visualizing boroughs with high levels of bike crash concentration – represented in red.

4.1.1. Bike crash cluster

Map 4.1.1 reveals a higher concentration of bike crashes in districts located in the center right of the city, and in particularly in places located close to districts' borders. Hotspots are located between the 2nd, 3rd, 5th, 10th and 11th districts. Bike crashes are dispersed in every district, except in the 16th where the *Bois de Boulogne* is located.



Map 4.1.1: Bike crashes hotspot clusters in Paris, 2005-2017

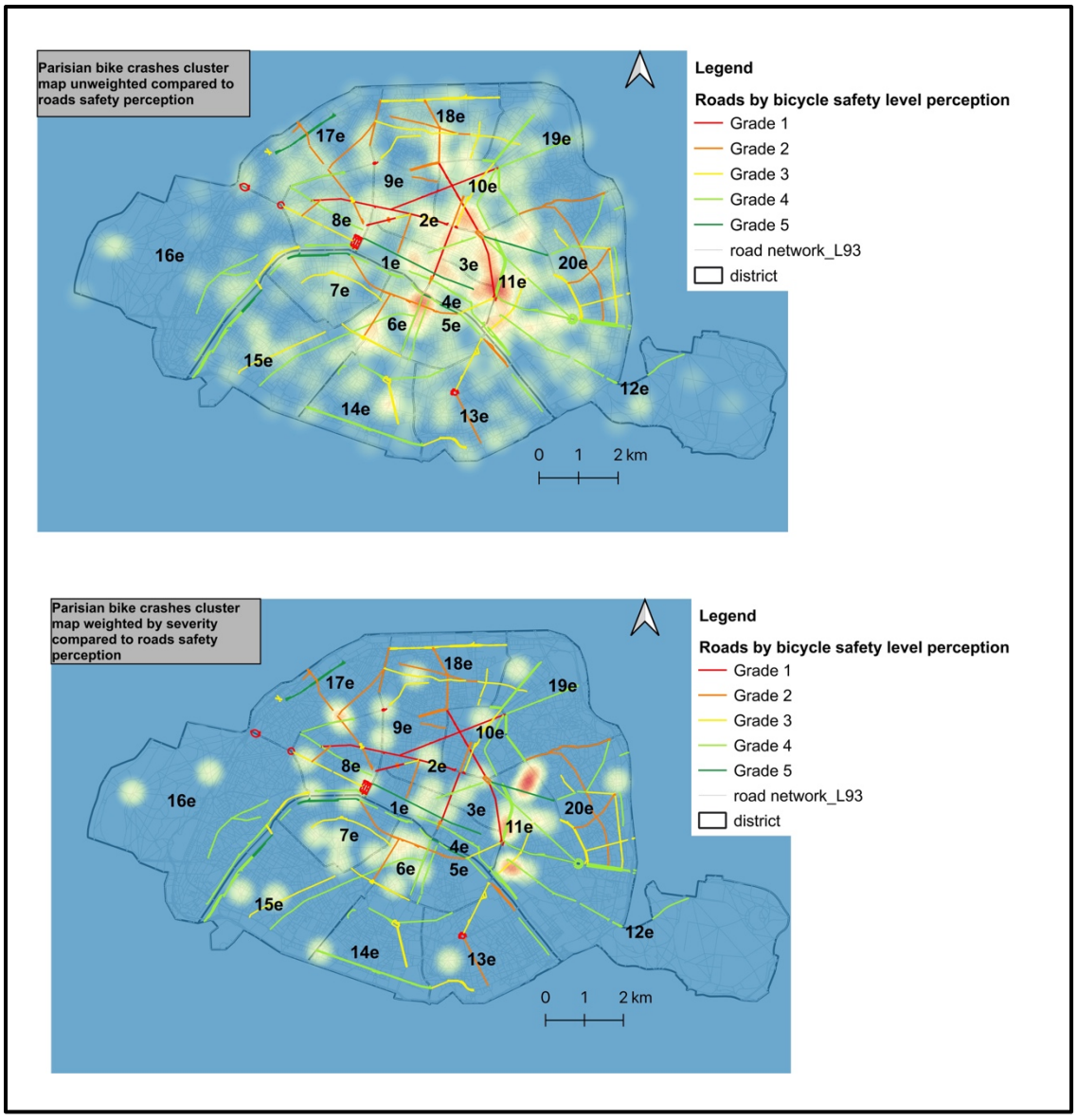
However, bike crashes dispersion changes with the weight being put on the severity of the crash. In this case, higher density clusters moved from the roads located at the intersection of the 3rd and 10th district to roads located in the 11th district close to the 20th.
Severe crashes represent only 8% of the total number of bike crashes that occurred in Paris between 2005 and 2017 (52 over 668) among those that were reported to the police. A study led by Shinar et al in 30 countries showed that the percentage of cyclists reporting their bike crash to police remains very low on average - below 10%. What is all the more striking is that even the most severe crashes that resulted in hospitalization were reported to the police only slightly more than one third of the times (Shinar et al., 2018, p. 12). It could have been expected that severe crashed received a higher rate of police report, since medical services were needed right after.

The **Maps 4.1.2** help visualize the relation between bike crash cluster location and the perception of safety by participants in my survey. Whereas it is expected that roads surrounded by high clusters of bike crash are represented in red – the lowest grade attributed to safety perception - the following maps show that this assumption is not verified for every cluster. Indeed, the main cluster, identified above, located at the intersection of the 3rd and 11th districts, is clearly located on a road perceived as dangerous by my participants. This road is named *Boulevard Beaumarchais* and is very prone to crashes according to both the survey and the dataset of bike crash issued by the French Interior Ministry. 7 bike crashes have been reported on this road – the higher number of bike crash reported on a single road, making it the most dangerous in Paris (see **Table 4.1.1**).
Other main clusters of crashes are located on roads making a triangle between the 2nd, 3rd and 10th districts ; in addition to *Boulevard Beaumarchais*, the other road dividing the 2nd and the 3rd district is *Boulevard Sébastopol* – the most mentioned road in my survey in the dangerous category (16 times).

Nonetheless, other roads located in the northern districts (17th, 18th) are perceived as dangerous but do not contain bike crash clusters. However, when looking at the bike crash clusters map weighted by severity of the crash, clusters seems to be more defined in the districts aforementioned. One of them being situated right on *Place de Clichy* - the red road portion in the 9th district. A similar pattern exists at the intersection of the 3 roads represented in orange in the 17th district.

4.1.2. Comparaison of bike crash cluster and roads safety perception

Map 4.1.2: Comparaison of bike crashes hotspots cluster in Paris, 2005-2017 and roads safety perception



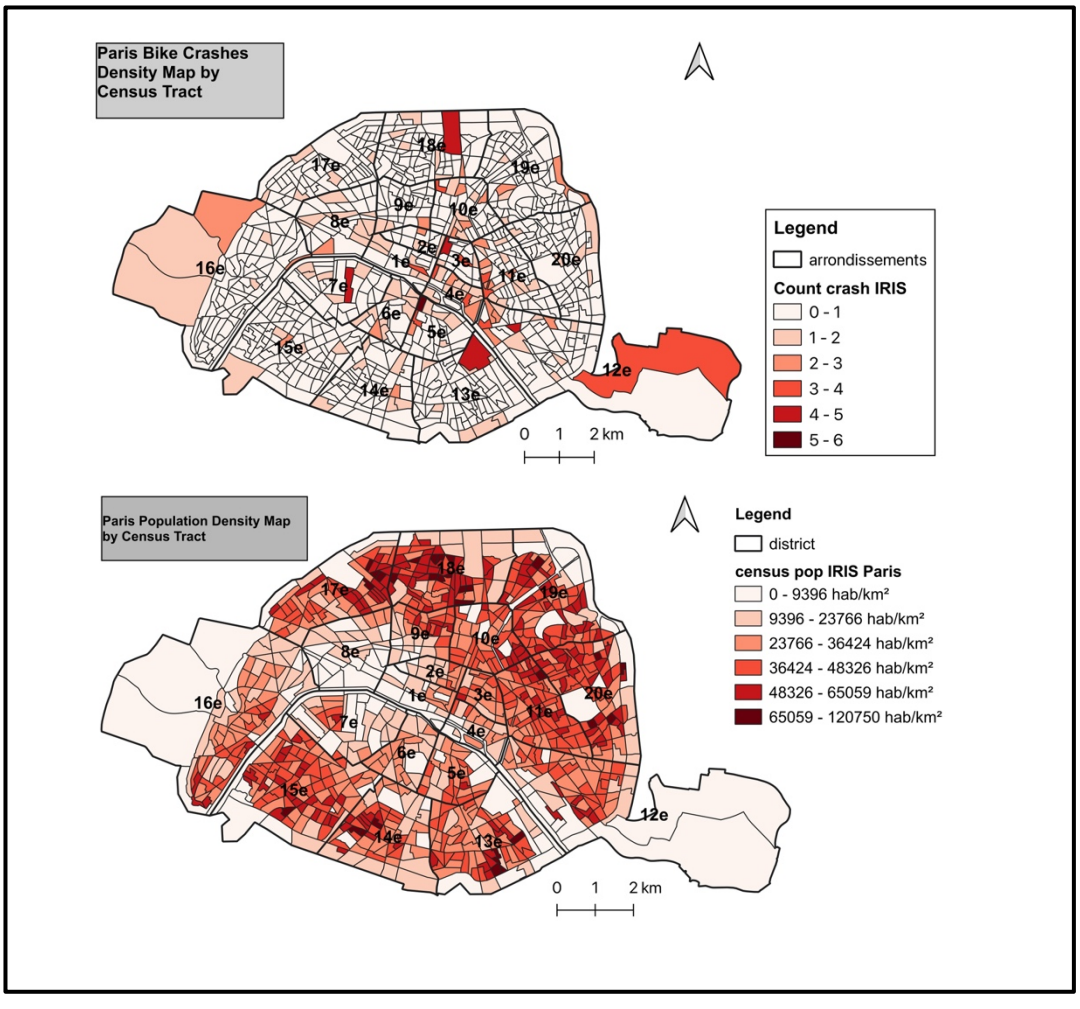
However, it seems that the overall dispersion of severe bike crashes is located close to places supposedly safer according to my participants. Among the 37 clusters of severe crash that can be visually identified on the **Map 4.1.2,** 23 of them are located close to roads graded 4 and 5 for their safety perception. This represents 60% of the total severe crashes cluster being located on roads perceived as safe. Similarly, the two most visible clusters of severe bike crashes are located close to roads being perceived as safe (from grade 3 to grade 5). The one in the 12th district is close to *Avenue Dausmenil* and the one in the 20th is on *Avenue de la République*.

One of the participants who mentioned *Avenue Dausmenil* among the road being safe for cycling specified that the one-way direction of the road makes it safer than it could be, considering the narrowness of the road. One-way roads seem to positively influence both safety perception and bike crash severity.

4.1.3. Bike crash density by IRIS

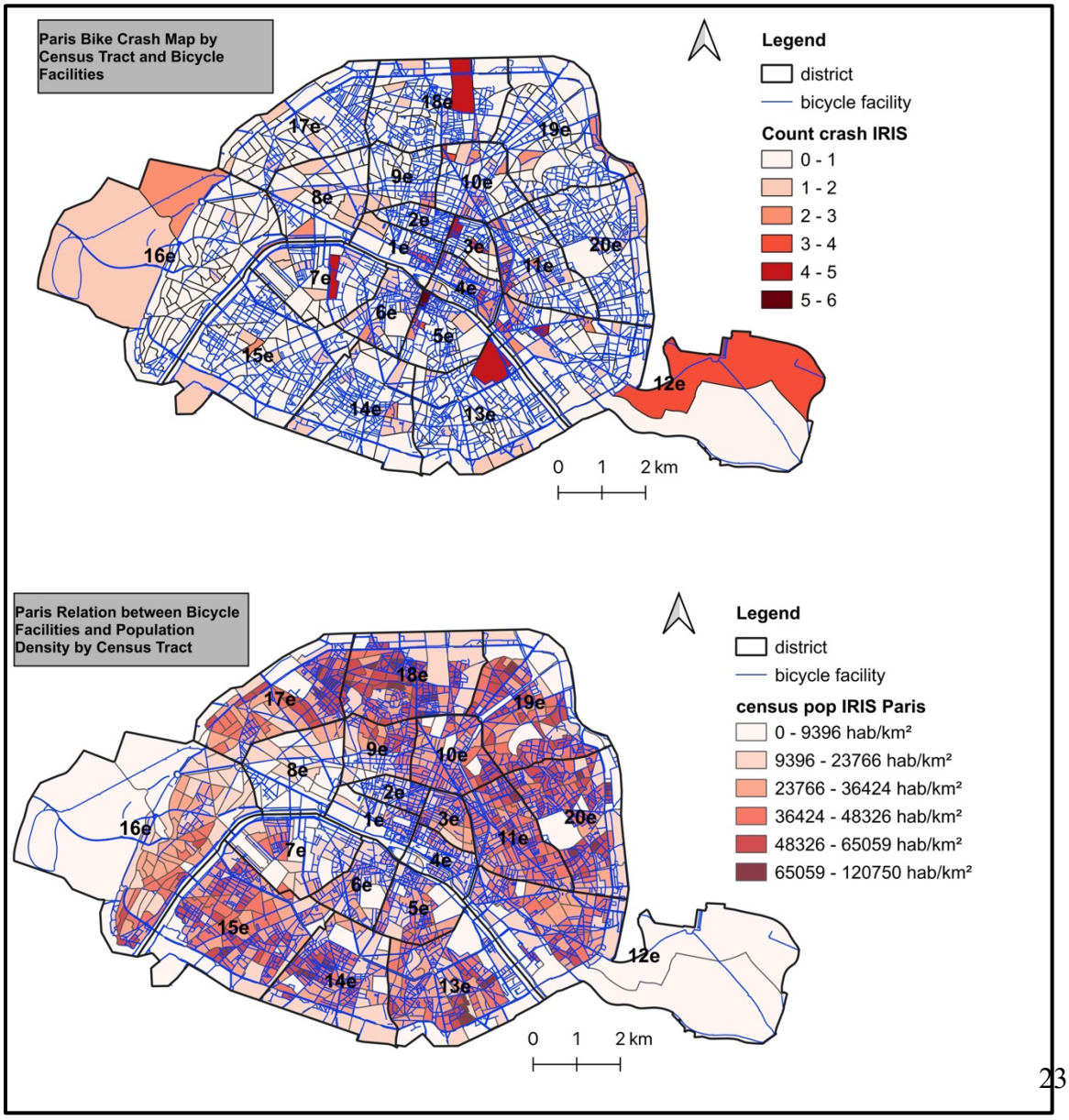
To understand how the population density influenced the occurrence of bike crash in Paris, the **Maps 4.1.3** represents the count of crashes in each of the 992 IRIS as well the population density y IRIS. Whereas, IRIS with a greater land area seem to be prone to bike crash as these are the one most represented among the dark red category, other smaller IRIS are also represented among the most prone to bike crashes. This is the case of the IRIS containing the higher number of crashes (6), its area is only 77,000 m^2 (around twice the land area of the downtown McGill campus). However, dark-colored IRIS representing IRIS with higher bike crash counts are, for most of them, less densely populated. In fact, those having between 4 and 5 crashes within their boundaries have a population density lower than 36,424 inhabitants/km^2. Thus, population density does not seem to be a direct factor influencing bike crash occurrence.

Map 4.1.3 : Paris bike crashes count and population density map by census tract (IRIS)



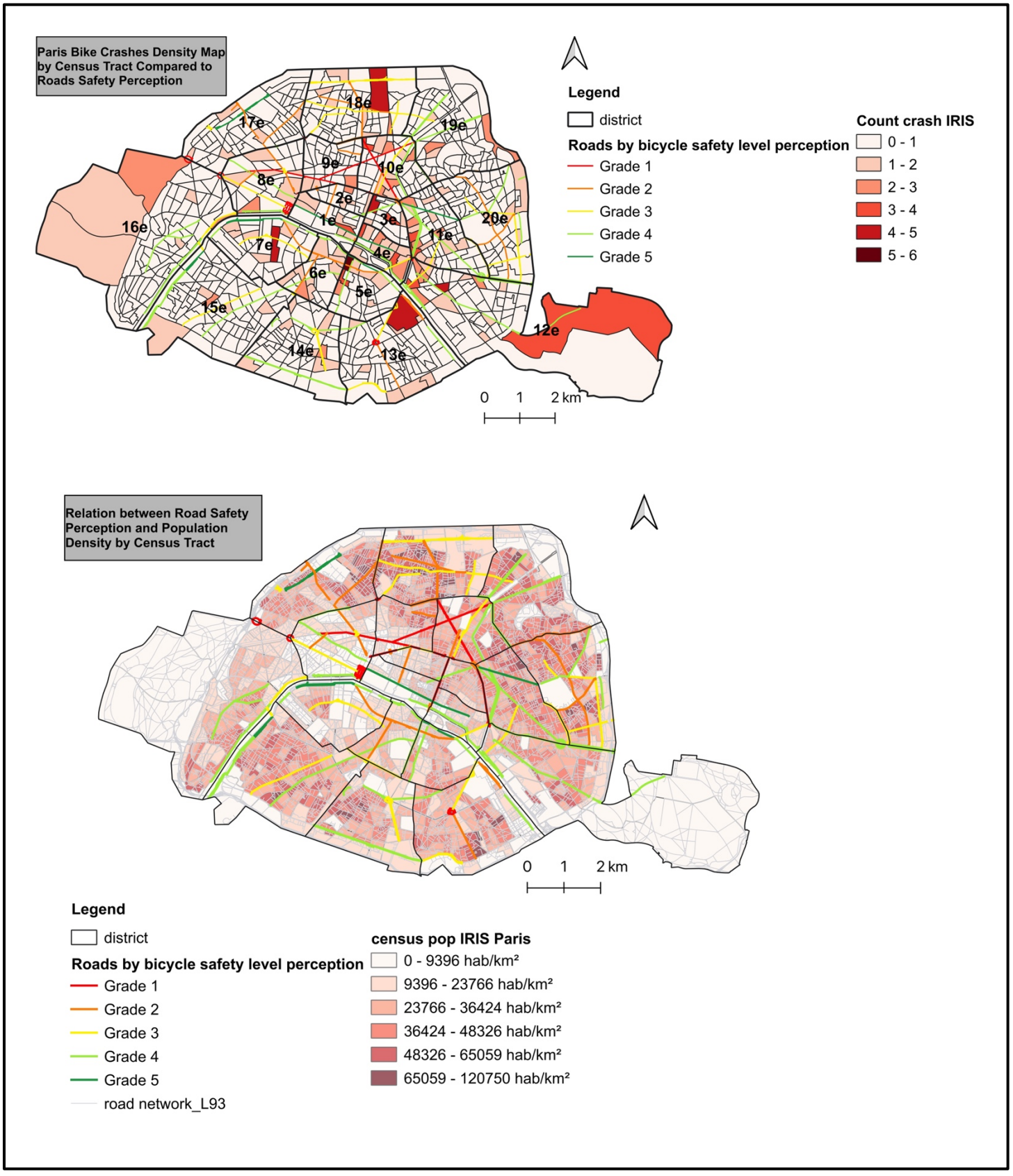
Moreover, by overlapping the bicycle network layer to the bike crash count by IRIS, it can be visually noted that the IRIS combining a high surface area and a high number of crashes are those almost not served by bicycle facilities (see **Map 4.1.4**). A correlation between the length of bike lanes available and the number of bike crash can be raised, but it cannot be extrapolated to every IRIS. In fact, those located in the center of the city are among those the most equipped with bicycle facilities but are also those containing clusters of bike crash. This could mean that most equipped areas experience a more intense bike traffic than those having less cycling facilities. Among the respondents of the survey, 17% of the them answered that bicycle traffic was the most important factor influencing their perception of bicycle safety.

Map 4.1.4 Paris bicycle facilities overlaid to bike crashes count and population density by census tract (IRIS)

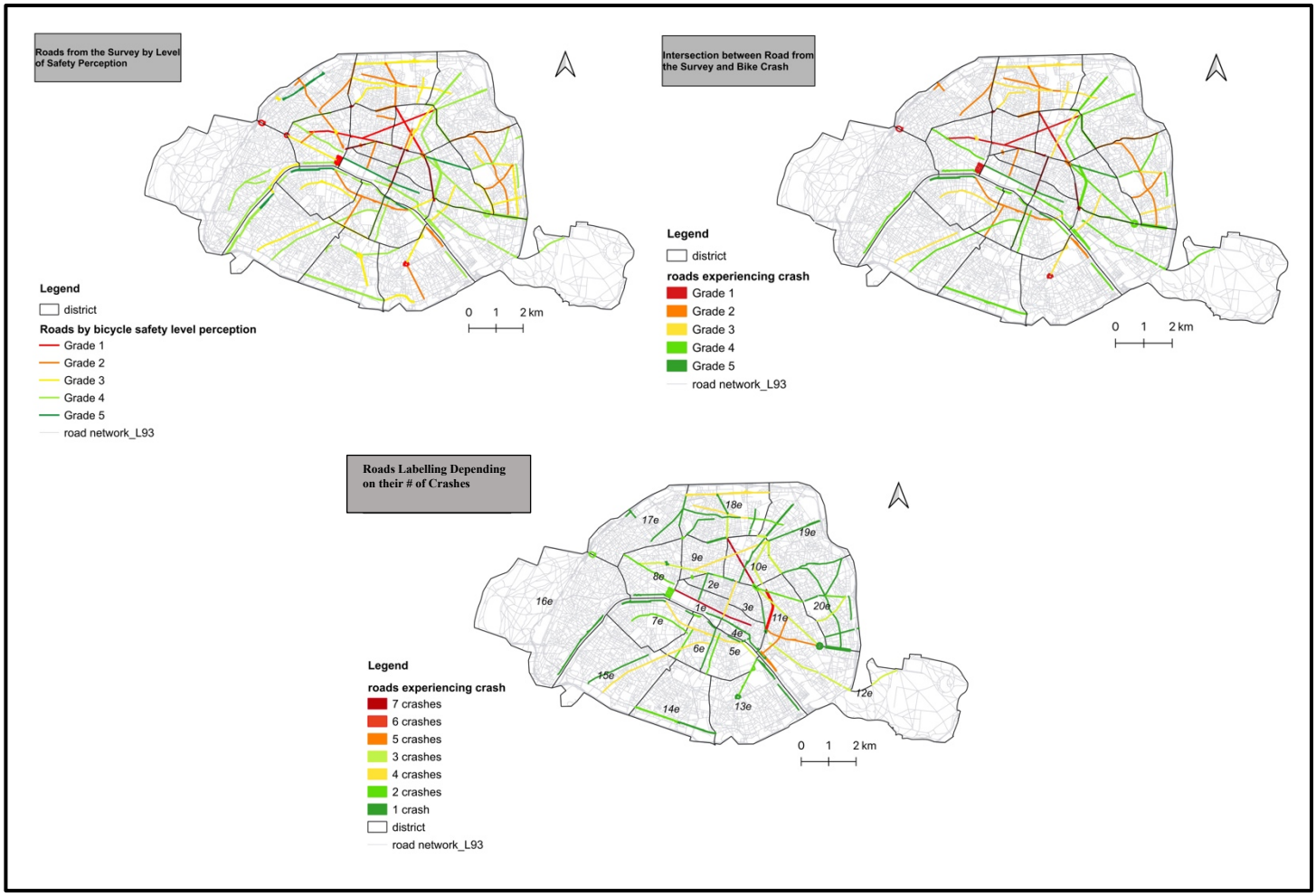


4.2. Spatial representation of the safety perception

Map 4.2.1 Road safety perception overlaid on bike crash count and population density by census tract (IRIS)



Map 4.2.2 Spatial dispersion of roads depending on safety perception and occurrence of bike crash



Map 4.2.2 presents the dispersion of roads mentioned in the survey depending on the grade they received, as explained in section 3.3. Roads mentioned that are also places prone to crash represent 68% of the length of the total of road mentioned in the survey and 60.5% of the numbers of total of roads mentioned in the survey. To quantitatively attest how well the perception of safety by the participant is aligned with the reality of crash location, it is expected that the bike crashes mainly occurred on roads labeled as unsafe (grade 1 and 2). However, the length of roads both labeled as unsafe and experiencing bike crash represent 21% of the total length of roads mentioned whereas bike crashes occurred on 68% of the total length of roads mentioned. Thus, as seen in section 4.1.1, whereas bike crash clusters followed their expected location – being close to roads labeled as unsafe – it seems that the overall dispersion of crashes is widely extended to other roads. However, based on the bottom **Map 4.2.2**., the number of crashes occurring on a road is not totally correlated to the level of safety perception. In fact,

whereas the southern roads of Paris were perceived as relatively safe, their number of crashes remain in the lowest category (between 1 and 4). On the other way, northern west roads that were perceived as more dangerous according to the participants survey, appeared to have experienced a lower number of crashes (between 1 and 4 as well). The difference in the level of safety perception for these two aforementioned areas cannot be explained with the actual dangerousness measured with number of crashes.

Using **Maps 4.1.4** and **Maps 4.2.1**, it can be visually tested that higher population density could be a factor influencing safety perception, as the northern areas are also more densely populated that the southern districts. Data compiling the population density by district are in **Table 4.2.3**. **Figure 4.2** below demonstrates that the correlation between high population density and high number of crashes is not true for every district : indeed, whereas this trend is greatly visible for the district 10, the opposite exists for the 12th district and the 8th district. The 12th district has the highest number of crashes concentrated in its area (58) and has also one of the lowest population density rates (8,600 inhabitants/km^2). Similarly, the 8th district has a population density of 9,183 inhabitants/km^2 and has 27 bike crashes reported. However, based on **Map 4.1.4**, we can affirm that these districts are also the ones with a less developed bicycle network compared to other districts. In this case, the lack of bicycle facilities could be one of the main factor responsible for the high number of crashes compared to the population density rate.

Figure 4.2 : Multi Y-Axis graphic shwoing the evolution of both population density and number of crash depending on the district number in Paris

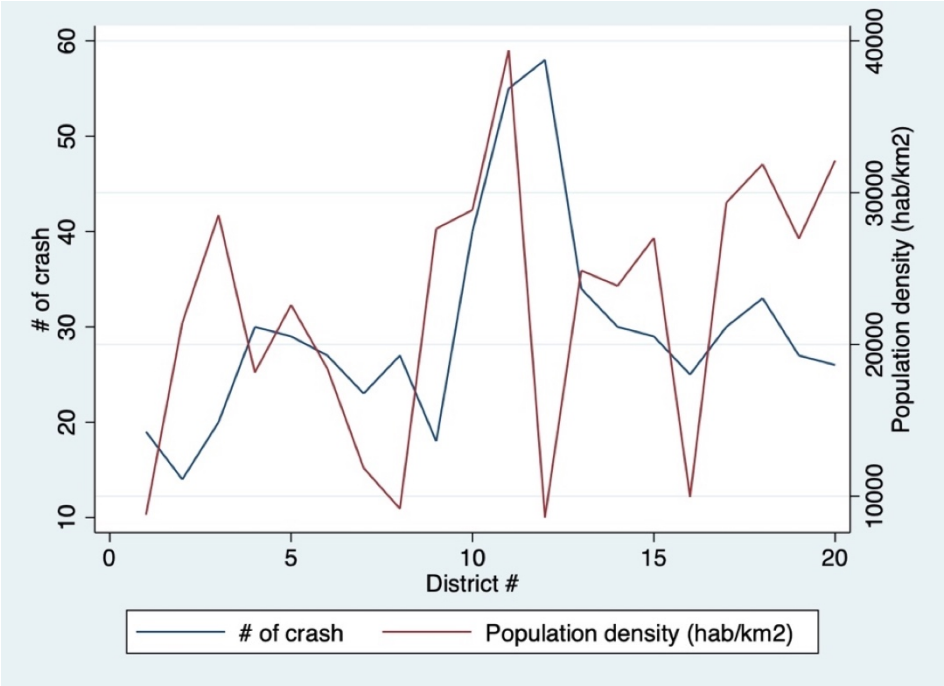


Table 4.2.1 presents the count of roads in each category of safety perception, as well as the numbers of roads experiencing crashes by safety category. It is worth noticing that the category of roads that have the most bike crashes reported is the one labeled as safe (level of safety 4) and the category that was expected to "host" most bike crashes is actually the second category with the least numbers of bike crash (9.7% of the total number of bike crash among the road mentioned). These results could be surprising, but the data compiled in **Table 4.2.2** as well as the hotspots maps in section 4.1.1 raised an important point. Bike crashes reported on roads labeled at safety level 4 are mostly individual events dispersed in Paris. 13 of the 56 bike crashes that occurred on these roads happened on 13 different roads. This is shown in the **Map 4.2.3** on the left : these roads are not associated with a high density of crashes, which can explain why people tend to grade these roads as safe despite the occurrence of individual crash. Similarly, on the right, when comparing with the dispersion of the road labeled 1, it is clear that, despite the relatively low number of crashes occurring on these roads compared to roads labeled 4, the latter overlaps well with clusters of high bike crash density. This explains why people attributed a lower safety perception grade to them.

Maps 4.2.3 Roads safety level and occurrence of crash compared to bike crash cluster location

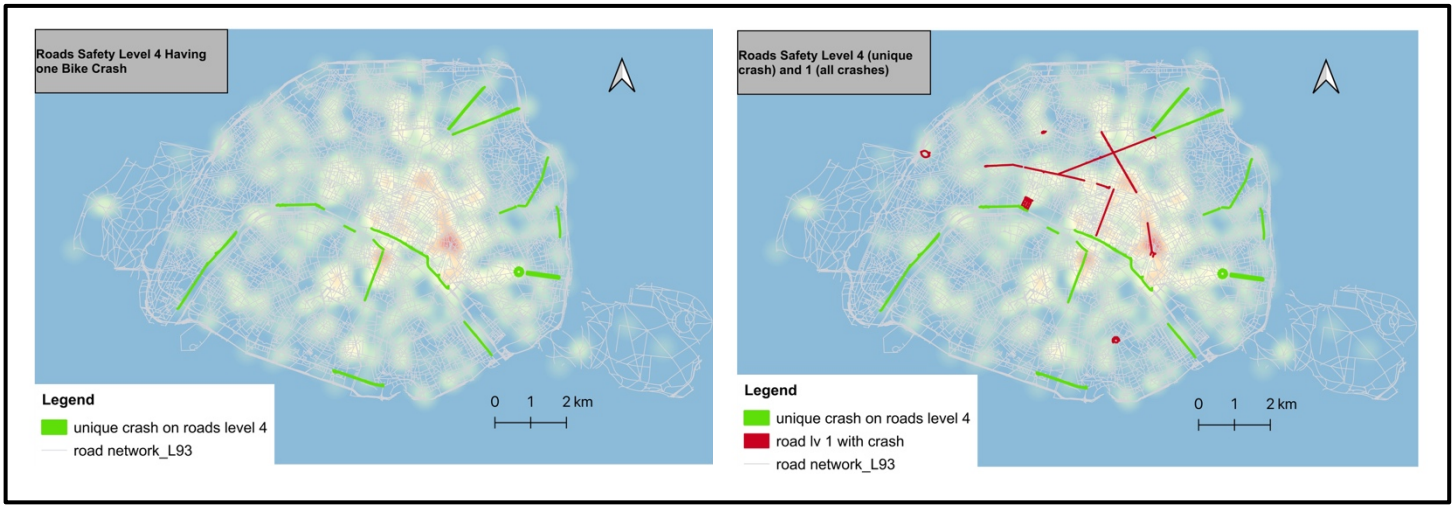


Table 4.2.1: Count of roads mentioned in the survey by level of safety

	# of roads mentioned		% of roads with reported crash / total # of roads mentioned	% of roads with reported crash / # roads in the safety category
Level of safety	**all roads**	**crash reported**		
1	18	12	9.7%	66.6%
2	23	16	12.9%	69.5%
3	32	16	12.9%a	50%
4	43	26	21%	60.5%
5	8	5	4%	62.5%
Total	**124**	**75**	**60.5%**	

Table 4.2.2 : Count of bike crash on road mentioned in the participant survey

	# of crash							Total	Total (%)
Level of safety	**1**	**2**	**3**	**4**	**5**	**6**	**7**		
1	5	3	1	2	0	0	1	29	18.8%
2	9	3	2	2	0	0	0	29	18.8%
3	9	5	0	1	1	0	0	28	18.2%
4	13	4	5	1	2	1	0	56	36.4%
5	3	1	0	0	0	0	1	12	7.8%
Total								154	100%

Table 4.2.3 : Count of crash and population density by Parisian district

District #	# of crash	Population density (hab/km^2)
1	19	8784
2	14	21423
3	20	28524
4	30	18154
5	29	22599
6	27	18405
7	23	11863
8	27	9183
9	18	27625
10	40	28859
11	55	39370
12	58	8600
13	34	24875
14	30	23859
15	29	27013
16	25	9944
17	30	29341
18	33	31877
19	27	26971
20	26	32111
Total	594	

4.3 Factors influencing the bike safety perception

4.3.1 Demographic factors

The first section of the survey inquired about participant demographics, including gender, age bike ownership. **Table 4.3.1.a** presents the entire results.

Table 4.3.1a : Participant survey results, 2022

Question	Responses
Years living in Paris	
# of respondents who lived 0-1 year	1
# of respondents who lived 1-5 years	9
# of respondents who lived +5 years	78
# of respondents not living in Paris	15
Gender	
Women	42
Men	58
Non-binary	1
Other	2
Prefer not to say	0
Age	
18-29	21
30-60 years	77
60+ years	4
Prefer not to say	
Other	1
Type of cyclist	
Regular cyclist (2-3 times a week)	95
Occasional cyclist (Several times a month)	6
Almost never	2
Covid-19 and frequency of cycling	
More often	42
Less often	3
Nothing change	56
other	2
Type of bike (own or rented)	
Own	86
Bike share services	6
both	11
Reason for displacements on bike	
Commuting to work	93
Recreational use	82
Other	
Perception of safety grade	
1	1
2	2
3	10
4	19
5	13
6	20
7	23
8	10

9					3
10					0
# respondent experiencing bike crash					
Yes					54
No					49
Covid-19 and bicycle safety perception					
Less safe					15
Safer					50
Still unsafe					21
Still safe					16
Factors of bicycle safety feeling					
Grade	1	2	3	4	5
Bicycle facilities	4	4	8	24	62
Intersections	15	15	34	16	18
Motorized vehicules traffic density	18	12	19	26	25
Bicycle traffic density	15	14	34	21	17
Speed of motorized vehicules	12	14	14	21	40
Closeness to motorized vehicules	12	12	14	16	48
Traffic direction	8	12	27	37	16
Protective gear	21	13	19	19	30
Weather	16	26	33	19	8
Daylight	14	17	37	21	11

Most respondents were between the ages of 30 and 60 years (75%). This wide range of age was chosen considering that I wanted to separate participants in terms of their "working status" more than their specific age. I assume that needs and expectations for bicycle safety were different depending on whether a participant was a student, a worker, or a retired person. The results also indicate that the majority of the respondents identified themselves as men (56%). Regarding their numbers of years living in Paris, respondents were mostly well settled in the capital, with 76% living in Paris for at least 5 years. 15% of the respondents said that they were not living in Paris, but all of them fulfill the optional questions on roads being perceived as safe and dangerous. As their responses were useful for my analysis, I decided to include them in the final analysis, whereas I first wanted to focus exclusively on people living in Paris. Finally, my sample contains almost exclusively people owning a bike (97%), taking into account both the 86 owners and the 11 person that do use their own bike as well as the share services. 10.6% of the respondents affirmed that they are using bother their own bike and the share systems such as Vélib'. Only 6% use exclusively bike share systems. This is easily understandable, since more than 90% of the respondents are cycling at least 3 times a week – this is the cheapest option for intense use.

Crossing the demographic characteristics with the grade people attributed to their perception of safety, I was able to determine trends and factors that could influence bicycle safety perception. **Table 4.3.1.b** represents which percentage of respondents answered for each grade, depending on their gender identity. 27.59% of men gave a grade of 7/10, and this percentage increased for grades comprised between 6 and 9/10 ; 58% of men gave a grade in this range.
On the other way, 62% of women (26) attributed a grade between 4/10 and 6/10. It can be said that women do feel less safe than men on bikes in Paris. Gender seems to influence bicycle safety perception.

Table 4.3.1.b: Grade of safety perception depending on gender identity

Tabulation of Gender Grade for perception of safety

	Grade for perception of safety									
Gender	1	2	3	4	5	6	7	8	9	Total
0 binary	0	0	0	0	1	0	0	0	0	1
	0.00	0.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00	100.00
men	1	3	5	9	6	9	16	6	3	58
	1.72	5.17	8.62	15.52	10.34	15.52	27.59	10.34	5.17	100.00
other	0	0	0	0	0	1	1	0	0	2
	0.00	0.00	0.00	0.00	0.00	50.00	50.00	0.00	0.00	100.00
women	0	0	5	10	6	10	7	4	0	42
	0.00	0.00	11.90	23.81	14.29	23.81	16.67	9.52	0.00	100.00
Total	1	3	10	19	13	20	24	10	3	103
	0.97	2.91	9.71	18.45	12.62	19.42	23.30	9.71	2.91	100.00

First row has *frequencies* and second row has *row percentages*

Samewise, **Table 4.3.1.c** represents which percentage of respondents answered for each grade depending on their age. Concerning the 18-29 years old category, more than a quarter of them attributed the grade of 7/10 for their safety perception and 45.5% gave a grade between 6 and 7/10. Similarly, among the 77 respondents being between 30 and 60 years, 41.56% of them gave a grade comprised between 6 and 7/10 (each being attributed equally). Moreover, the same number of people (16) gave a grade of 4/10. The same pattern is observed for younger respondents : a relatively high percentage of respondents gave a low grade (3/10). Finally, the last category is not very statistically significant considering that the sample is only 4 people. Among them, 2 gave the grade of 7/10, 1 the grade of 4/10 and the other one gave the grade of 5/10. Overall, grade 4, 6 and 7/10 are those that appeared the most both in the total and among categories 1 and 2. There is no specific correlation defined between the grade of safety attribution and the age of the respondent.

Table 4.3.1.c: Grade of safety perception depending on age

Tabulation of age Grade for perception of safety

age	Grade for perception of safety									
	1	2	3	4	5	6	7	8	9	Total
1 (18-29 y)	0	1	4	2	2	4	6	2	1	22
	0.00	4.55	18.18	9.09	9.09	18.18	27.27	9.09	4.55	100.00
2 (30-60y)	1	2	6	16	10	16	16	8	2	77
	1.30	2.60	7.79	20.78	12.99	20.78	20.78	10.39	2.60	100.00
3 (60y+)	0	0	0	1	1	0	2	0	0	4
	0.00	0.00	0.00	25.00	25.00	0.00	50.00	0.00	0.00	100.00
Total	1	3	10	19	13	20	24	10	3	103
	0.97	2.91	9.71	18.45	12.62	19.42	23.30	9.71	2.91	100.00

First row has *frequencies* and second row has *row percentages*

4.3.2. Personal experience factors

The other part of the survey intended to understand how personal experience with bicycling and with the city environment influence someone's safety perception. The surprising finding concerns the relation between people's frequency of cycling and their corresponding grade of safety perception. I assumed that the more someone is used to bike, the safer he tends to feel cycling due to the fact that he started to master both its environment and the reaction needed to face external factors influencing safety – such as unexpected actions from motorized close to the bike. However, the **Table 4.3.2.a** underlines that 83.33% of occasional cyclists gave a high grade between 7 and 9/10. This great proportion is probably due to the smaller sample they represent– occasional cyclists count only for 6% of the total number of respondents -. On the other way, regular cyclists count for 92% of the total number of respondents : among them 43.2% attributed a grade of 6 or 7/10 to their safety perception, but the same proportion gave a grade comprised between 3/10 and 5/10. Thus, it is difficult to define a precise relation between the type of cyclist and the level of safety perceived.

Table 4.3.2.a : Grade of safety perception depending on type of cycling

Tabulation of Type of cyclists Grade for perception of safety

Type of cyclists	Grade for perception of safety									
	1	2	3	4	5	6	7	8	9	Total
1 (beginner)	0	0	0	0	1	1	0	0	0	2
	0.00	0.00	0.00	0.00	50.00	50.00	0.00	0.00	0.00	100.00
2 (occasional - several times a month)	0	0	0	0	1	0	2	1	2	6
	0.00	0.00	0.00	0.00	16.67	0.00	33.33	16.67	33.33	100.00
3 (regular - 2-3 times a week)	1	3	10	19	11	19	22	9	1	95
	1.05	3.16	10.53	20.00	11.58	20.00	23.16	9.47	1.05	100.00
Total	1	3	10	19	13	20	24	10	3	103
	0.97	2.91	9.71	18.45	12.62	19.42	23.30	9.71	2.91	100.00

First row has *frequencies* and second row has *row percentages*

Another factor the survey tends to address is the influence of bike crash experiences of the participants on their safety perception, represented in the **Table 4.3.2.b.** Among the 103 participants, there is almost an equal division between those who experienced a bike crash (category 1) and those who did not (category 0). Slightly more numerous, 47% of the person who experienced a bike crash gave a grade between 6 and 7/10, whereas only 37% of those who did not experience a bike crash gave a grade in this range. Among the people who did not experience any bike crash, no specific relation can be deducted from the table given that they almost equally gave a grade between 3/10 and 8/10. However, having been involved in a bike crash seems to negatively influence the perception of safety as 33 % of the victims gave a grade between 7-9 and 46% of the people who did not experience any bike crash graded their safety perception with a grade lower than 5/10.

Table 4.3.2.b: Grade of safety perception depending on having been involved in a bike crash

Tabulation of Experience crash Grade for perception of safety

Experience crash	Grade for perception of safety									
	1	2	3	4	5	6	7	8	9	Total
0	1	2	6	7	7	8	10	7	1	49
	2.04	4.08	12.24	14.29	14.29	16.33	20.41	14.29	2.04	100.00
1	0	1	4	12	6	12	14	3	2	54
	0.00	1.85	7.41	22.22	11.11	22.22	25.93	5.56	3.70	100.00
Total	1	3	10	19	13	20	24	10	3	103
	0.97	2.91	9.71	18.45	12.62	19.42	23.30	9.71	2.91	100.00

First row has *frequencies* and second row has *row percentages*

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4.3.3 Environmental factors

The factor aforementioned was the key driver of the three semi-structured interviews I did. Interestingly, two of the participants interviewed had similar answers to the questions asking if their behavior changed since their bike crash. Whereas they both told me that following their accidents they kept riding on the same roads without major change in their own safety protection, they underlined the fact that their behavior while driving changed. This event happened as an eyes-opening of how dangerous motorized vehicles could be for cyclists, especially when they share the same roads. My first participants interviewed affirmed that they pays more attention to cyclists to give them sufficient space.

However, the third participant stopped riding for 2 years after his bike crash considering the severe trauma he felt. His vigilance on bike became all the more sharpened and developed.

The importance of the speed of motorized vehicules and their closeness to cyclists remain the main cause of bike crash and low safety perfection and reality for the three participants interviewed. This factor was proposed in the survey and required to be graded on a range from 1 to 5, from the less important to the more important factor influencing their cycling safety. Results are compiled in **Table 4.3.2.c.**

Table 4.3.2.c : Grade of safety perception depending on the speed of motorized vehicules around

Tabulation of Grade for perception of safety Speed of motorized vehicles

Grade for perception of safety	Speed of motorized vehicles					
	1	2	3	4	5	Total
1	0	0	0	1	0	1
	0.00	0.00	0.00	100.00	0.00	100.00
2	0	0	1	0	2	3
	0.00	0.00	33.33	0.00	66.67	100.00
3	0	1	3	3	3	10
	0.00	10.00	30.00	30.00	30.00	100.00
4	2	2	1	4	9	18
	11.11	11.11	5.56	22.22	50.00	100.00
5	2	1	1	2	6	12
	16.67	8.33	8.33	16.67	50.00	100.00
6	4	1	3	4	8	20
	20.00	5.00	15.00	20.00	40.00	100.00
7	2	5	3	5	9	24
	8.33	20.83	12.50	20.83	37.50	100.00
8	1	4	2	2	1	10
	10.00	40.00	20.00	20.00	10.00	100.00
9	1	0	0	0	2	3
	33.33	0.00	0.00	0.00	66.67	100.00
Total	12	14	14	21	40	101
	11.88	13.86	13.86	20.79	39.60	100.00

First row has *frequencies,* and second row has *row percentages.*

Table 4.3.2.c underlines that among the participants who gave a high grade of their safety perception (8/10 to 9/10), only 3 persons attributed the factor 5 to the speed of motorized vehicles. However, among the people who attributed a lower grade for their safety perception safety (between 1/10 and 5/10), 20 thought that the speed of motorized vehicles is one of the most important factor influencing their safety on bike. This represents 50% of the total number of people who attributed 5 as a factor level to speed of motorized vehicles.

Similarly, one of the persons interviewed emphasized on the importance of having separated bike lane from the motorized traffic and dedicated biklane especially as Paris has a great amont of bike lanes shared with the bus. I created a correlation matrix with indicators from different opendata sources previously used such as the "base des accidents geocodés", the "Académie de Paris Arrondissement de Paris" that grouped the socio-economic data such as the median revenue by "Unité de consummation" (a French unit used to calculate the number of participants in a household) and the part of people of 60 years old and more in the population. The correlation matrix is shown in **Table 4.3.2.d.**

	Neighborhood	*Length of bike lane (km)*	*Nbr of bikelanes' sections*	*borough's areas (km²)*	*Population (2020)*	*Pop density*	*lenght of cycle lane by hab (m)*	*Nbr of crash (2005-2017)*	*Facilities shared with bus (km)*	*nbr bike sections shared with bus*	*Median income by UC*	*% 60years + in pop*
Neighborhood	1											
Length of bike lane (km)	0.736637868	1										
Nbr of bikelanes' sections	0.748534115	0.877731101	1									
borough's areas (km²)	0.6103504	0.91943207	0.90553257	1								
Population (2020)	0.924636251	0.825750052	0.81525705	0.674612242	1							
Pop density	0.474165264	0.041645537	0.143431943	-0.143833991	0.512785914	1						
length of cycle lane by hab (m)	-0.663327449	-0.301054643	-0.41932626	-0.291209399	-0.628053444	-0.700546273	1					
Nbr of crash (2005-2017)	0.29531413	0.600725408	0.534965434	0.656995075	0.393119455	0.079082347	-0.281897067	1				
Facilities shared with bus (km)	0.504969826	0.548839831	0.655077068	0.513618037	0.479971366	-0.205416477	-0.029096505	0.065393246	1			
nbr bike sections shared with bus	0.221029494	0.245466353	0.458432953	0.252885114	0.193667489	-0.221328619	-0.012381955	-0.079585969	0.856696509	1		
Median income by UC	-0.508192488	-0.442442422	-0.471957229	-0.235190207	-0.557765135	-0.614566438	0.327622199	-0.281444117	0.043913574	0.081557636	1	
% 60years + in pop	-0.053790286	0.091386505	0.052439526	0.15700368	-0.05567409	-0.488138192	0.097550209	0.040544027	0.309030568	0.210580279	0.693620595	1

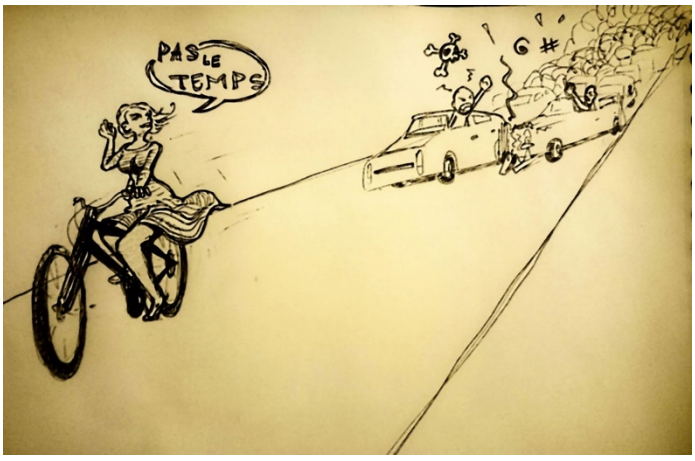
Table 4.3.2.d: Correlation Matrix by district numbers

The correlation matrix highlights a strong positive correlation between the length of bike lanes and the population (0.82) whereas a strong negative correlation exists between the length of bike lane and population density (-0.70). The latter confirms the analysis of the **Map 4.1.4** made in section 4.1 with the examples of the 15th or 19th district that have a dense population whose lacking a well developed bike networks. However, the length of facilities shared with bus is not correlated to bike crash number (0.06) contrary to what is widely assumed. The significance of this correlation matrix remains to be proven as the analysis is based on only 20 observations - that corresponds to the 20 districts.

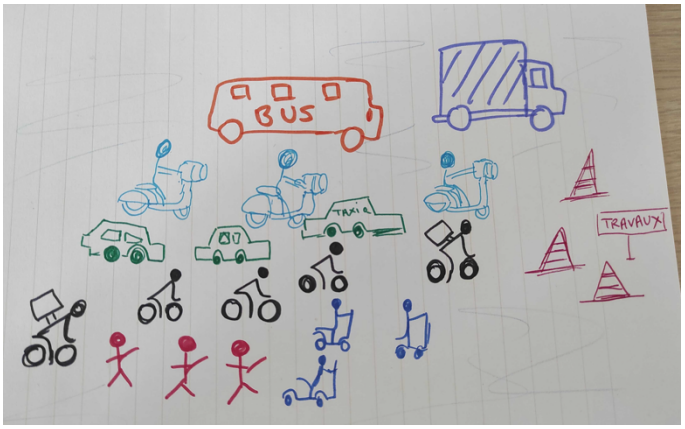
However, one interesting correlation is the positive one between the percentage of people being 60 years old and more in a given district and the median income by *unité de consummation*. This would mean that the older a district is in terms of population, the healthier households are in the same district. This is explained by the fact that when people reach 60 years old, they no longer have dependents in the household, which decreases the number of parts taken into account in the calculations.

4.3.3. Key findings from the drawings

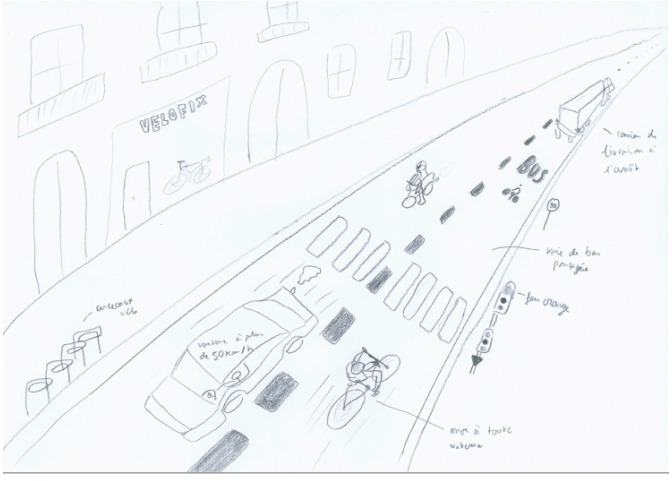
Figure 4.3.3: Drawing



Drawing from participant A



Drawing from participant B



Drawing from participant C

Additional drawings from participant A

To the question of how do you feel when cycling it Paris, three participants drew different situations. Both drawings from participants A and B underline the issue of traffic density as a central factor influencing their feeling while biking. Whereas it is clear that the participant A puts the emphasis on the superiority of being a cyclist compared to motorized drivers in terms of convenience to commute, participant B, on the contrary, underlines the fact that no matter the modal share people take, they are all in the same crowd on the road. From truck drivers to scooter users and pedestrians, every user of the roads is stuck in traffic. The use of distinctive colors to separate users depending on their mode of transport makes the concurrence of every mode all the more the issue than if they were all mixed together. The cone indicating zones under constructions is a nod to Paris ongoing constructions on the roads that make the displacements all the more complex and dangerous. Finally, the drawing from participant C stands compared to the other, as the participant was willing to comment on his drawing to make it clearer for interpretation. This is a way to ensure that the key message is well circulated. The participant is the only one that explicitly represents himself on a bike. However, the angle chosen allows for an omniscient view of the scene which exemplifies the high level of the cyclist.

CHAPTER 5: DISCUSSIONS, LIMITATIONS AND CONCLUSION

In this chapter, I discuss the findings from the quantitative analysis based on the maps and the brief statistical understanding of the factors influencing bike safety perception. I also crossed the analysis with the participant survey, drawings, and interviews that help nuance some findings. I compare the results, acknowledge the limitations of this analysis, and suggest areas for future work research.

5.1 Locally explanation of the influence of bicycle safety perception

The second and third research questions explore the difference between perception of cycling safety and real occurrence of crash, as well as the determinants that influence bike crashes and safety perception. Broadly, it appears that clusters of crashes well overlap with roads perceived as unsafe. However, cluster of severe crashes occurred in Paris between 2005 and 2017 do not align with the location of low road safety perception. On the contrary, some severe crashes were located close to perceived safe road.

Nonetheless, discrepancy continues in terms of alignment between perceived safety and actual one. In fact, roads perceived as safe (grade 4) have the greater number of bike crashes reported on them. Bike crash occurred on 68% of the total length of the bicycle network in Paris, whereas roads perceived as unsafe and having bike crashes reported only count for 21%. Crashes occurred on an extended network three times greater than the network of unsafe roads mentioned by people in the survey. It seems that no general trends nor correlations can be generalized, however, correlations between variables do exist locally. This was demonstrated with the example of the 8th district that contains a majority of roads perceived unsafe, but those roads had either no bike crash reported or less than 2. In this case, population density did not seem to be a determinant of bike crash. However, the lack of bicycling facilities available in the 8th district compared to other districts could explain the fact that despite people perceiving these roads as safe, crashes still occurred.

Moreover, concerning the demographic and personal factors influencing the safety perception, it appears that being a man positively influences the perception, whereas, having been involved in a bike crash seems to negatively influence the perception of safety. Similarly, the correlation between the length of bike lane and population density is strongly negative.

5.2 Limitations

Due to the lack of bike crash reported to police, the statistical significance of this study remains low. 595 bike crashes reported on a period of 12 years is extremely low, which prevented me from filtering crashes by year in the analysis.
Regarding the participant survey, I was only able to reach a sample containing a vast majority of people who cycle regularly. Whereas this turns to be a great privilege that allows me to interview people who do care about this issue, I had to remove, from the main predictors tested, the frequency of cycling variable. Similarly, the fact that I disseminated the survey on Facebook groups limited the participant pool, as I was unable to recruit participants not members of the group. I faced the rejection of some groups to publish the message and the link to the survey on their group. Additionally, to simplify the questionnaire in order to reach more people, I reduced the age range and did not ask in which district the participant lived neither any information concerning their social-economic status. I do believe that having these data would have been useful to determine a correlation between perception of safety and someone's socio-economic information. Similarly, being able to locate someone's approximate living area would have allowed to determine how influential the direct environment is for the perception of safety.

5.3 Future work

As the perception of safety is one of the main factors influencing someones's intention to bike in Paris, understanding the determinants of safety perception is essential to increase the modal share use of bike and promote bicycle as an healthy and safe mode of transport. Given the relatively small sample from which I base my understanding of factors influencing cycling safety perception, additional research incorporating similar factors could be interesting to expand on the statistical possibilities. Other data could also be added such as the number of tickets by category given to the population on specific roads and place.

5.4 Conclusion

I conducted a case study of the bicycle safety perception in Paris to analyze if this perception, formed by a multitude of factors could be statistically proven through the maping analysis of the roads and bike crash. I obtained the bike crash datset, developed an online survey targeting

Parisian willing to share their experience on bike in Paris, interview and proposed a drawing method to three other participants.

Using these data sources, I created a layer of the roads mentioned in the survey by cateogory of safety, bike crash cluster and density maps to cross compare roads with crash reported to roads level of safety perception.

I demonstrated that overall, roads safety level match with the reality of crash but often discrepencies between the two can be explained looking at other local factors such as available bikelane.

Despite the limitations of the methodological and sample approaches, my thesis provides insight into factors that crash occurrence and safety perception. Particularly, drawings and interviews highlighted the importance of bicycle facilities as well as speed of the traffic.

With the growing appetite for bicycling in many major cities and the increase of alternative transport methods, understanding the motives and factors of a low perception of safety are keys for a successful bicycle policy.

REFERENCES

Anderson, K., & Smith, S. J. (2001). Editorial: Emotional geographies. *Transactions of the Institute of British Geographers*, *26*(1), 7–10. https://doi.org/10.1111/1475-5661.00002

Backer-Grøndahl, A., & Fyhri, A. (2009). *Risk perception and transport—A literature review*.

Baromètre des villes cyclables. (n.d.). *Paris en Selle*. Retrieved April 21, 2023, from https://parisenselle.fr/barometre-des-villes-cyclables/

Bientôt de nouvelles pistes cyclables partout dans Paris ! (n.d.). Retrieved April 23, 2023, from https://www.paris-v4-preprod.paris.fr/pages/les-pistes-cyclables-provisoires-vont-devenir-perennes-18264

Bilan sécurité routière ville de Paris | Observatoire national interministériel de la sécurité routière. (n.d.). Retrieved April 23, 2023, from https://www.onisr.securite-routiere.gouv.fr/etudes-et-recherches/analyses-territoriales/communes-et-intercommunalites/bilan-securite-routiere-ville-de-paris

Boholm, A. (1998). Comparative studies of risk perception: A review of twenty years of research. *Journal of Risk Research*, *1*(2), 135–163. https://doi.org/10.1080/136698798377231

Buehler, R., Handy, S., Pucher, J., Garrard, J., Rissel, C., Bauman, A., Giles-Corti, B., Elvik, R., Furth, P. G., & Heinen, E. (2021). *Cycling for Sustainable Cities*. MIT Press. http://ebookcentral.proquest.com/lib/mcgill/detail.action?docID=6454637

Carré, J.-R. (1998). Le vélo dans la ville: Un révélateur social. *Les cahiers de médiologie*, *5*(1), 151–164. https://doi.org/10.3917/cdm.005.0151

Coen, S. (2016). *What can participant-generated drawing add to health geography's qualitative palette?* https://nottingham-repository.worktribe.com/index.php/output/1485362

Dauncey, H. (2012). A Sense of Cycling in France. In *French Cycling* (pp. 247–256). Liverpool University Press; JSTOR. https://doi.org/10.2307/j.ctt5vjd61.13

Gräbener, T. (2017, October 27). *Bases de données annuelles des accidents corporels de la circulation routière—Années de 2005 à 2021—Data.gouv.fr*. https://www.data.gouv.fr/fr/datasets/bases-de-donnees-annuelles-des-accidents-corporels-de-la-circulation-routiere-annees-de-2005-a-2021/

Kwan, M.-P. (2007). Affecting Geospatial Technologies: Toward a Feminist Politics of Emotion*. *The Professional Geographer*, *59*(1), 22–34. https://doi.org/10.1111/j.1467-9272.2007.00588.x

La loi d'orientation des mobilités. (n.d.). Ministères Écologie Énergie Territoires. Retrieved December 17, 2022, from https://www.ecologie.gouv.fr/loi-dorientation-des-mobilites

Morio, L., & Raimbault, N. (2021). Plus de place pour le vélo en ville ? Covid-19, mise à l'agenda et mise en œuvre des politiques cyclables en France. *Droit et Ville*, *91*(1), 179–200. https://doi.org/10.3917/dv.091.0179

Observatoire du Plan Vélo de Paris. (n.d.). Observatoire du Plan Vélo de Paris. Retrieved April 21, 2023, from https://observatoire.parisenselle.fr/

Paris, ville entrouverte à la bicyclette. (1996, January 21). *Le Monde.fr*. https://www.lemonde.fr/archives/article/1996/01/21/paris-ville-entrouverte-a-la-bicyclette_3703464_1819218.html

Population estimates—All—Ville de Paris | Insee. (n.d.). Retrieved April 19, 2023, from https://www.insee.fr/en/statistiques/serie/001760155#Tableau

Pucher, J., & Buehler, R. (2016). Safer Cycling Through Improved Infrastructure. *American Journal of Public Health*, *106*(12), 2089–2091. https://doi.org/10.2105/AJPH.2016.303507

Shinar, D., Valero-Mora, P., van Strijp-Houtenbos, M., Haworth, N., Schramm, A., De

Bruyne, G., Cavallo, V., Chliaoutakis, J., Dias, J., Ferraro, O. E., Fyhri, A., Sajatovic, A. H., Kuklane, K., Ledesma, R., Mascarell, O., Morandi, A., Muser, M., Otte, D., Papadakaki, M., … Tzamalouka, G. (2018). Under-reporting bicycle accidents to police in the COST TU1101 international survey: Cross-country comparisons and associated factors. *Accident Analysis & Prevention*, *110*, 177–186. https://doi.org/10.1016/j.aap.2017.09.018

Triandis, H. C. 1926-2019. (1971). *Attitude and attitude change*. Wiley; WorldCat.org.

Valentine, G. (1997). Tell me about . . .: Using interviews as a research methodology. In *Methods in Human Geography* (2nd ed.). Routledge.

Van Acker, V., Wee, B., & Witlox, F. (2010). When Transport Geography Meets Social Psychology: Toward a Conceptual Model of Travel Behaviour. *Transport Reviews*, *30*, 219–240. https://doi.org/10.1080/01441640902943453

Velib' parisien: Tout ce qu'il faut savoir sur ce transport qui cartonne. (2019, September 5). *Le blog Mobilité*. https://mobilite-nord-isere.fr/lhistoire-du-velib-parisien/

APPENDIX A: ONLINE QUESTIONNAIRE GUIDE

1. Avant de poursuivre ce questionnaire :

- ◯ J'affirme avoir plus de 18 ans et avoir pris connaissance du document de consentement. Je consens à participer à l'étude présentée et à partager mes réponses avec le chercheur principal, Prof Kevin Manaugh et l'étudiante Florence Malgras.
- ◯ Je ne souhaite pas que mes réponses à l'étude soient partagées avec le chercheur principal, Prof Kevin Manaugh et l'étudiante Florence Malgras. Je ne participe pas au questionnaire en ligne.

2. Depuis combien de temps résidez-vous à Paris ?

- ◯ 0-1 an
- ◯ 1-5 ans
- ◯ +5 ans
- ◯ Je n'habite pas à Paris

3. À quel genre vous identifiez-vous ?

- ◯ Femme
- ◯ Homme
- ◯ Non-binaire
- ◯ Autre
- ◯ Je préfère ne pas répondre

4. Quel âge avez vous?

- ◯ 18-29 ans
- ◯ 30-60 ans
- ◯ 60ans et +
- ◯ Je préfère ne pas répondre

5. Quel type de cycliste êtes-vous ?

- ◯ Cycliste régulier (2-3 fois par semaine)
- ◯ Cycliste occasionnel (plusieurs fois par mois)
- ◯ Je ne fais presque jamais de vélo dans Paris

6. La pandémie du Covid-19 a t-elle modifié votre fréquence de déplacements à vélo ?

- ◯ Oui, je me déplace **plus** souvent à vélo
- ◯ Oui, je me déplace **moins** à vélo
- ◯ Non, je fais toujours autant de vélo
- ◯ Autre

7. Quel type de vélo utilisez-vous ?

- ◯ Je suis propriétaire d'un vélo
- ◯ J'utilise les systèmes de vélo en libre-service (Vélib', Lime...)
- ◯ Les 2

8. Dans quel but vous déplacez-vous à vélo?

- ☐ Déplacement pendulaire (lieu de vie-lieu de travail)
- ☐ Loisir
- ☐ Autres

9. Quelle note attribueriez-vous à votre sentiment de sécurité lors de vos trajets à vélo dans Paris ? **1** (danger maximal) ; **10** (sécurité maximale)

1	2	3	4	5	6	7	8	9	10

10. Avez-vous déjà eu un accident de vélo dans Paris? Si oui, seriez-vous d'accord pour me parler de votre expérience?

- ◯ Oui et oui je suis d'accord
- ◯ Oui et non je ne préfère pas
- ◯ Non

11. Si vous acceptez d'être contacté.e pour me parler de votre accident, merci de me communiquer votre adresse e-mail.

Entrez votre réponse

12. Auriez-vous des **noms de rues/artères parisiennes** que vous trouvez particulièrement **dangereuses** à vélo ?

Entrez votre réponse

13. Auriez-vous des **noms de rues/artères parisiennes** que vous trouvez particulièrement bien aménagées pour **assurer la sécurité** des cyclistes ?

Entrez votre réponse

14. La pandémie a t'elle modifié votre sentiment de sécurité à vélo dans Paris?

- ◯ Oui, je me sens moins en sécurité depuis
- ◯ Oui, je me sens davantage en sécurité depuis
- ◯ Non, je ne me sens toujours pas en sécurité
- ◯ Non, je me sens toujours en sécurité

15. Comment classez-vous les éléments suivants dans la hiérarchie des facteurs expliquant votre **sentiment de sécurité** lors de vos déplacements à vélo dans Paris? (1= moins important ; 5 = plus important)

	1	2	3	4	5
Présence d'un aménagement cyclable	◯	◯	◯	◯	◯
Présence d'intersections (en X, T, 4 branches)	◯	◯	◯	◯	◯
Densité du trafic des véhicules motorisés	◯	◯	◯	◯	◯
Densité du trafic cycliste	◯	◯	◯	◯	◯
Vitesse des véhicules motorisés à proximité	◯	◯	◯	◯	◯
Proximité avec les véhicules motorisés	◯	◯	◯	◯	◯

Sens de circulation (bidirectionnel, sens unique)	◯	◯	◯	◯	◯
Port d'un équipement de protection	◯	◯	◯	◯	◯
Météo	◯	◯	◯	◯	◯
Période de la journée (jour vs. nuit)	◯	◯	◯	◯	◯

16. Pensez-vous à d'autres facteurs non mentionnés ci-dessus?

Entrez votre réponse

17. Je souhaite participer à la poursuite de cette étude et accepte d'être contacté.e par e-mail pour représenter sous forme d'un dessin mon ressenti lors de mes déplacements à vélo dans Paris.

◯ Oui j'accepte

◯ Non je ne souhaite pas être contacté.e

18. Si vous acceptez d'être contacté.e pour la prochaine étape, merci de me communiquer votre adresse e-mail.

Entrez votre réponse

APPENDIX B: MCGILL RESEARCH ETHIC BOARD CERTIFICATE

McGill University
Research Ethics Board Office
www.mcgill.ca/research/research/compliance
/human

CERTIFICATE OF ETHICS APPROVAL

REB File Number:	22-06-057
Project Title:	Cycling in Paris : an evaluation of the perception of safety
Faculty Principal Investigator:	Kevin Baxter Manaugh
Department:	Geography
Sponsor/Funding Agency (If applicable):	
Research Team (If applicable):	

Name	**Affiliation**

Approval Period:	
FROM	**TO**
06-Jul-2022	05-Jul-2023

The *REB-IV* reviewed and approved this project by Delegated review in accordance with the requirements of the McGill University Policy on the Ethical Conduct of Research Involving Human Participants and the Tri-Council Policy Statement: Ethical Conduct For Research Involving Humans.

* Approval is granted only for the research and purposes described.
* Modifications to the approved research must be reviewed and approved by the REB before they can be implemented.
* A Request for Renewal form must be submitted before the above expiry date. Research cannot be conducted without a current ethics approval. Submit 2-3 weeks ahead of the expiry date.
* When a project has been completed or terminated, a Study Closure form must be submitted.
* Unanticipated issues that may increase the risk level to participants or that may have other ethical implications must be promptly reported to the REB. Serious adverse events experienced by a participant in conjunction with the research must be reported to the REB without delay.
* The REB must be promptly notified of any new information that may affect the welfare or consent of participants.
* The REB must be notified of any suspension or cancellation imposed by a funding agency or regulatory body that is related to this study.
* The REB must be notified of any findings that may have ethical implications or may affect the decision of the REB.

APPENDIX C: CONSENT FORM FOR QUESTIONNAIRE

McGill **Formulaire de consentement - questionnaire**

Titre du projet Cycling in Paris : an evaluation of the perception of safety
REB File Number #22-06-057

Chercheur principal : *Kevin Manaugh*
Affilié à l'Université McGill /Département de Géographie et École d'environnement
Adresse courriel : kevin.manaugh@mcgill.ca
Étudiante supervisée : *Florence Malgras*
Affiliée à Université McGill /Département de Géographie
Adresse courriel : florence.malgras@mail.mcgill.ca

Invitation à participer :
Je suis invité(e) à participer à la recherche, nommée ci-haut sur la plateforme Microsoft forms. Elle est menée par l'étudiante Florence Malgras

But de l'étude :
Le but de l'étude est d'évaluer la perception du danger à vélo perçu par les cyclistes à Paris, en examinant trois questions :
- Dans quelle mesure elle diffère des données réelles sur les accidents, en soulignant
- Quels facteurs de l'environnement bâti influencent ces perceptions ?
- De quelle manière Paris cherche à améliorer la sécurité des cyclistes ?

Participation :
Ma participation consistera à remplir un questionnaire en ligne à l'adresse https://forms.office.com/r/YM8G3bH8ES
Cela ne devrait pas prendre plus de 10min. Dans ce questionnaire on me demandera de répondre à 15 questions abordant votre expérience sur la sécurité à vélo dans Paris en tant que cycliste
Je comprends que puisque ma participation à cette recherche implique que je communique des informations sur mes habitudes à vélo et mon ressenti en me déplaçant dans Paris à vélo. Il est possible qu'elle crée un inconfort émotionnel. Afin de minimiser ces risques, j'ai reçu l'assurance du responsable de l'étude que je ne suis en aucun cas obligé(e) de répondre au questionnaire, je peux me retirer de l'étude à tout moment et suis assuré(e) que mon identité ne sera pas demandée sans mon consentement et en aucun cas ne sera divulguée.

Bienfaits : Ma participation à cette recherche aura pour effet de contribuer à la documentation sur la sécurité des cyclistes sur les routes Parisiennes grâce à mon témoignage à travers le questionnaire.

Confidentialité et vie privée :
Le chercheur m'a donné l'assurance qu'il traitera l'information que je partagerai avec lui de façon strictement confidentielle. Je m'attends à ce que le contenu ne soit utilisé que pour être analysé dans le but de contribuer à son projet de mémoire de fin d'étude et selon le respect de la confidentialité. Aucune information personnelle ne sera divulguée. Mon anonymat est préservé car il n'est pas demandé de rentrer mes informations personnelles pour compléter le questionnaire en ligne.

Dans le cas où je serais intéressé.e pour participer à la prochaine étape de l'étude, je consens transmettre mon adresse courriel avant de pouvoir participer au tirage au sort me permettant d'être récompensé pour ma participation.
Afin de minimiser les risques de bris de sécurité et pour assurer ma confidentialité, le chercheur me recommande d'utiliser des mesures de sécurité standard, telles que mettre fin à la session, me déconnecter de mon compte, fermer mon navigateur Internet et verrouiller mon écran ou appareil lorsque je ne les utilise plus / lorsque j'ai terminé de remplir le questionnaire.

Conservation des données :
Les données collectées (questionnaires) seront conservées, pendant 7 ans, de façon sécuritaire sur un disque dur sécurisé d'un ordinateur de l'université McGill et seul le chercheur principal y aura accès.

Compensation :
Aucune compensation n'est prévue pour cette partie de l'étude (questionnaire).

Participation volontaire :
Ma participation à cette recherche est volontaire et je suis libre de me retirer en tout temps, de refuser de répondre à toute question à laquelle je ne veux pas répondre sans subir de conséquences négatives. Si je choisis de me retirer de l'étude après avoir soumis le questionnaire 2, mes données collectées ne seront pas forcément retirables de l'étude.
2 cas sont possibles :
- Si j'ai fourni mon adresse électronique dans le formulaire, mes réponses et mon adresse électronique seront alors retirées de l'analyse sous un délai de 2 jours suivant la réception de ma demande d'être retirée de l'étude.
- Si je n'ai pas fourni mon adresse électronique dans mes réponses, celles-ci sont alors anonymes. Il ne sera pas possible de retirer mes données de l'étude car l'étudiante ne pourra pas repérer les données des participants anonymes, s'ils sont plusieurs.
Pour tout renseignement additionnel concernant cette étude, je peux communiquer avec l'étudiante.
Pour tout renseignement sur les aspects éthiques de cette recherche, je peux m'adresser au conseiller en éthique de l'Université McGill au 514-398-6831 ou joindre lynda.mcneil@mcgill.ca.
Le chercheur me recommande de garder une copie du formulaire de consentement.

Acceptation :
En choisissant la phrase ci-dessous dans le questionnaire ci joint, je consens à participer à cette recherche :
- J'affirme avoir plus de 18 ans et avoir pris connaissance du document de consentement. Je consens à participer à l'étude présentée et à partager mes réponses avec le chercheur principal, Prof Kevin Manaugh et l'étudiante Florence Malgras

En choisissant la phrase ci-dessous dans le questionnaire ci joint, je ne consens à participer à cette recherche :
- Je ne souhaite pas que mes réponses à l'étude soient partagées avec le chercheur principal, Prof Kevin Manaugh et l'étudiante Florence Malgras, je ne participe pas au questionnaire en ligne.

APPENDIX D: CONSENT FORM FOR DRAWING

McGill **Formulaire de consentement - dessin**

Titre du projet : Cycling in Paris : an evaluation of the perception of safety
REB # 22-06-057

Chercheur principal : *Kevin Manaugh*
Affilié à l'Université McGill /Département de Géographie et École d'environnement
Adresse courriel : kevin.manaugh@mcgill.ca
Étudiante supervisée : *Florence Malgras*
Affiliée à Université McGill /Département de Géographie
Adresse courriel : florence.malgras@mail.mcgill.ca

Description : Je suis étudiante en premier cycle au sein du Département de géographie de l'Université McGill et j'entreprends des recherches pour ma thèse de spécialisation. Pour cela, j'évaluerai la perception du danger des cyclistes à Paris, en examinant dans quelle mesure elle diffère des données réelles sur les accidents, quels facteurs de l'environnement conduisent à ces perceptions et ce que fait la ville de Paris pour améliorer la sécurité des cyclistes. Je vous invite à participer à mes recherches en dessinant votre ressenti lorsque vous pédalez dans Paris. Votre dessin sera utilisé pour comprendre la perception de la sécurité du vélo à Paris. Les données ne seront utilisées que pour le but de mon étude.

Temps de participation : Le dessin ne devrait pas prendre plus de 30 min.

Risques et avantages : Votre nom demeurera confidentiel et ne sera pas utilisé dans mon rapport final. Vous pouvez vous sentir envahi par l'émotion ou frustré lorsque vous participez au dessin. Prenez des pauses ou écourtez le dessin. Vous pouvez vous retirer de l'étude en tout temps.

Confidentialité et vie privée :
Seuls le chercheur principal et l'étudiante auront accès aux informations partagées. L'information sera traitée de façon strictement confidentielle. Le dessin va être analysé dans le but de contribuer au projet de mémoire de fin d'étude de l'étudiante et selon le respect de la confidentialité. Vous pouvez choisir d'autoriser l'étudiante à inclure une copie du dessin dans son mémoire afin d'illustrer ses analyses. Cependant, aucune information personnelle ne sera divulguée et votre anonymat sera préservé dans le rapport final.

Vos droits : Vous n'êtes pas tenu de participer, vous pouvez mettre fin au dessin à tout moment et vous pouvez vous retirer de l'étude en tout temps.

Questions ou préoccupations ? Vous pouvez communiquer avec la responsable de la recherche, Florence Malgras, par courriel à florence.malgras@mail.mcgill.ca si vous avez des questions après avoir terminé le dessin.
Si vous avez des questions ou des préoccupations concernant vos droits ou votre bien-être en tant que participant à cette étude de recherche, veuillez communiquer avec le conseiller en éthique de McGill au 514-398-6831 ou joindre lynda.mcneil@mcgill.ca. et dites-lui qu'il s'agit de la recherche avec le numéro de certificat d'éthique : REB # 22-06-057.

Je, (*Nom, Prénom*)_____ accepte par la présente de participer à cette recherche et je suis conscient que mes données demeureront confidentielles, qu'il peut y avoir des risques émotionnels associés à cette recherche.

Je, (*Nom, Prénom)*_____ accepte par la présente qu'une copie de mon dessin soit inclus dans le rapport final.

Signature : Date :

Merci d'avoir accepté de participer à mon projet de recherche !

APPENDIX E: CONSENT FORM FOR INTERVIEW

McGill **Formulaire de consentement - échange**

Titre du projet : Cycling in Paris : an evaluation of the perception of safety
REB # 22-06-057

Chercheur principal : *Kevin Manaugh*
Affilié à l'Université McGill /Département de Géographie et École d'environnement
Adresse courriel : kevin.manaugh@mcgill.ca
Étudiante supervisée : *Florence Malgras*
Affiliée à Université McGill /Département de Géographie
Adresse courriel : florence.malgras@mail.mcgill.ca

Description : Je suis étudiante en premier cycle au sein du Département de géographie de l'Université McGill et j'entreprends des recherches pour ma thèse de spécialisation. Pour cela, j'évaluerai la perception du danger des cyclistes à Paris, en examinant dans quelle mesure elle diffère des données réelles sur les accidents, quels facteurs de l'environnement conduisent à ces perceptions et ce que fait la ville de Paris pour améliorer la sécurité des cyclistes. Je vous invite à participer à mes recherches en expliquant l'accident dont vous avez été victime, votre perception du danger lorsque vous pédalez dans Paris et en précisant les mesures que vous préconisez en matière de sécurité. Notre échange sera utilisé pour mieux comprendre la question de la sécurité des cyclistes à Paris. Les données ne seront utilisées que pour le but de mon étude.

Temps de participation : L'échange ne devrait pas prendre plus de 20 min.

Risques et avantages : Votre nom demeurera confidentiel et ne sera pas utilisé dans mon rapport final. Vous pouvez vous sentir envahi par l'émotion ou frustré lorsque vous participez à l'interview. Vous pouvez vous retirer de l'étude en tout temps ou l'interrompre.

Confidentialité et vie privée :
Seuls le chercheur principal et l'étudiante auront accès aux informations partagées. L'information sera traitée de façon strictement confidentielle. L'interview va être analysée dans le but de contribuer au projet de mémoire de fin d'étude de l'étudiante et selon le respect de la confidentialité. L'étudiante pourra inclure un extrait de l'interview dans son mémoire afin d'illustrer ses analyses. Cependant, aucune information personnelle ne sera divulguée et votre anonymat sera préservé dans le rapport final.

Vos droits : Vous n'êtes pas tenu de participer, vous pouvez mettre fin à l'interview à tout moment et vous pouvez vous retirer de l'étude en tout temps.

Questions ou préoccupations ? Vous pouvez communiquer avec la responsable de la recherche, Florence Malgras, par courriel à florence.malgras@mail.mcgill.ca si vous avez des questions après avoir terminé l'interview.
Si vous avez des questions ou des préoccupations concernant vos droits ou votre bien-être en tant que participant à cette étude de recherche, veuillez communiquer avec le conseiller en éthique de McGill au 514-398-6831 ou joindre lynda.mcneil@mcgill.ca. et dites-lui qu'il s'agit de la recherche avec le numéro de certificat d'éthique : REB # 22-06-057.

Je, (*Nom, Prénom*)_____ accepte par la présente de participer à cette recherche et je suis conscient que mes données demeureront confidentielles, qu'il peut y avoir des risques émotionnels associés à cette recherche.

Signature : Date :

Merci d'avoir accepté de participer à mon projet de recherche !