

Research article

Occupational road safety in last-mile delivery: a qualitative comparison of parcel delivery drivers and platform food couriers in Belgium

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Platform food couriers and parcel delivery drivers are generally studied separately, despite their shared role in last-mile delivery. This qualitative study compares how both groups experience occupational road safety and manage dangerous situations during delivery work in Belgium. The analysis draws on interviews with 10 parcel drivers and 12 stakeholders and experts, as well as a focus group with 16 platform food couriers. Although both groups experienced pressure to complete deliveries efficiently, this pressure arose in different ways. Food couriers' earnings depended directly on completed orders, which could encourage faster delivery and longer working hours. These pressures, together with limited organizational support and the physical vulnerability associated with two-wheeled vehicles, shaped the dangerous situations couriers described while travelling through traffic. Parcel drivers generally had more organizational protection and greater familiarity with their delivery areas. Their safety challenges were instead concentrated around the practical requirements of van-based delivery, particularly when stopping near customers and manoeuvring in urban streets with limited parking or loading space. The findings reveal two distinct patterns of occupational road safety experiences. Parcel drivers primarily described dangerous situations when stopping and re-entering traffic, whereas food couriers mainly described them while moving through traffic. In both groups, potentially unsafe practices frequently constituted pragmatic responses to organizational and infrastructural constraints. Improving safety therefore requires action beyond the level of individual workers.

1. Introduction

The growth of e-commerce and app-based services has made last-mile delivery an increasingly visible component of urban mobility (Lyons & McDonald, 2023; Rai & Dablanc, 2023; Useche et al., 2025). Rising delivery volumes add movements to congested urban road networks, intensify competition for space, and place a growing number of workers in traffic for substantial parts of their working day (Cardenas et al., 2017; Christie & Ward, 2019; Oviedo-Trespalacios et al., 2022; Useche et al., 2025). Road safety has therefore

become an important but still incompletely understood dimension of last-mile delivery.

For delivery workers, defined here as parcel delivery drivers and platform food couriers, traffic is not simply the environment through which they travel. It also forms an essential part of their workplace (Christie & Ward, 2019; Useche et al., 2025). Their safety is shaped by the interaction between work organization, including remuneration, scheduling, and organizational support, and traffic-related conditions such as vehicle characteristics, infrastructure, congestion, weather, and other

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road users. Accordingly, a recent systematic review presents road safety in last-mile delivery as being shaped by interconnected physical, psychosocial, organizational, and technological factors rather than individual road user behaviour alone (Useche et al., 2025).

Despite their shared position within last-mile delivery, parcel drivers and platform food couriers are often studied separately. Food delivery research has focused on platform management, precarious employment, psychosocial demands, and risky riding (Chen, 2023; Christie et al., 2025; Christie & Ward, 2019, 2023; Gregory, 2021; Hsu et al., 2023; Mao et al., 2025; Nguyen-Phuoc et al., 2023, 2025; Oviedo-Trespalacios et al., 2022; Papantoniou et al., 2025; Qian et al., 2024; Thakrey et al., 2026; Useche et al., 2024; Zhang et al., 2025). This research links piece-rate payment, algorithmic management, irregular hours, and limited organizational protection to outcomes including stress, burnout, unsafe riding, and collision involvement.

Research on parcel delivery, by contrast, focuses more strongly on logistics and the practical demands of light commercial vehicles, including frequent stops, scarce loading space, unauthorized parking, time pressure, and interactions with other road users (Allen et al., 2021; European Agency for Safety and Health at Work, 2022; He et al., 2023; Iacobucci et al., 2022). The occupational road safety experiences of parcel drivers nevertheless remain comparatively understudied (Useche et al., 2025). This separation obscures which challenges are shared across last-mile work and which are specific to particular delivery models.

A comparison of both groups can provide a more integrated understanding of occupational road safety in last-mile delivery. Payment per delivery, for example, may increase time pressure, but its safety implications also depend on other factors, like the vehicle being used, the available infrastructure, and the degree of organizational support. Conversely, relatively stable employment conditions do not eliminate occupational road safety

challenges when workers must repeatedly stop delivery vehicles in environments that provide insufficient space for loading and unloading. Comparing delivery models therefore makes it possible to examine how combinations of organizational and traffic-related conditions produce different occupational road safety challenges.

This qualitative study compares how parcel delivery drivers and platform food couriers in Belgium experience occupational road safety. It draws on accounts from delivery workers, stakeholders and experts familiar with the Belgian last-mile sector to examine how organizational and traffic-related conditions interact and how workers manage competing demands. This systemic perspective aligns with the Safe System approach, which distributes responsibility for road safety across multiple actors (ITF, 2016; Larsson et al., 2010). The study addresses the following research question: *how do parcel delivery drivers and platform food couriers experience occupational road safety, and how are these experiences shaped by work organization and the traffic environment?*

The study contributes to the literature by comparing two forms of delivery work often studied separately, integrating organizational and traffic-related explanations, and adding workers' perspectives to a field often approached through crash statistics or survey data (Thakrey et al., 2026). In doing so, it identifies shared and delivery-specific mechanisms that can inform interventions extending beyond individual responsibility.

2. Literature review and conceptual background

2.1 Occupational road safety in last-mile delivery

Occupational road safety is used here as the overarching concept for safety during work-related travel and closely related roadside activities, such as stopping, parking, loading or unloading, and entering or

leaving traffic.¹ In last-mile delivery, such activities form a central part of the job and are performed under commercial and organizational constraints, often in complex urban environments (Dablanc et al., 2017; Useche et al., 2025). Safety therefore depends not only on individual behaviour, but also on how delivery work is organized, the vehicles used, and the environments in which deliveries take place, i.e. the work context.

The distinction between individual characteristics and work context is important because last-mile delivery comprises heterogeneous forms of work. Vehicles range from vans and motorcycles to bicycles and electric bicycles, while workers may be employees, subcontracted workers, or self-employed platform workers paid by time or per delivery transporting goods with different delivery requirements. These combinations generate different safety challenges. Van drivers are for instance better protected in collisions, but must repeatedly manoeuvre and stop large vehicles in dense urban areas. Food couriers, by contrast, occupy less road space but have less physical protection and are more affected by road conditions, the types of goods they carry, and adverse weather.

Crash statistics provide only a partial picture of occupational road safety. Police and administrative datasets do not always identify whether someone was working, what was being delivered, or under which employment arrangements (Christie & Ward, 2023), while minor crashes and single-vehicle incidents involving riders are also likely to be underreported. Nevertheless, limited

Belgian evidence suggests that such events are not exceptional: among 93 parcel delivery workers, 8% reported a crash and 50% at least one near miss during the preceding three months (Wrzesinska et al., 2022), while historical records for food couriers indicated a rate of work-related accidents around ten times the national average (Defossez, 2022).² By design, official crash records reveal little about near misses, routine conflicts, perceived danger, or workers' adaptations. Although workers' perceptions do not measure objective crash risk, they can nonetheless expose organizational pressures, recurrent dangerous situations at work, and coping strategies that official statistics rarely capture. Research into occupational road safety therefore benefits from examining workers' everyday experiences alongside recorded safety outcomes.

2.2 Work organization and occupational road safety

Research on work-related driving links safety to workload, scheduling, fatigue, management commitment, and safety procedures (Christie & Ward, 2019, 2023; Mao et al., 2025; Nguyen-Phuoc et al., 2024, 2025; Oviedo-Trespalacios et al., 2022; Papantoniou et al., 2025; Qian et al., 2024; Useche et al., 2024). These organizational conditions are especially salient in last-mile delivery, where targets, delivery windows, route planning, customer expectations, and payment systems can create pressure to complete many deliveries quickly.

The Job Demands–Resources model provides a useful framework for organizing these

¹The study examines occupational road safety through participants' accounts of crashes and near misses, situations perceived as dangerous, conditions associated with these situations, and strategies used to prevent or manage them. "Crash risk" refers specifically to the likelihood of crash involvement, while "exposure" denotes the amount, duration, or frequency of contact with traffic or particular road hazards. References to risk factors or contributing conditions indicate associations with safety outcomes rather than causally estimated effects. As a qualitative study, the analysis does not measure objective crash risk or exposure but examines how occupational road safety is experienced and understood by workers and stakeholders active in the last-mile delivery industry.

²The Belgian parcel delivery sample comprised 89 van drivers and four cargo-bike couriers and was not nationally representative; 86% of the reported crashes involved property damage only. The food courier figure concerned work-related accidents recorded through SMarT in 2016–2017. Further evidence of the scale of the problem comes from a UK survey of 231 gig-economy drivers and riders: 42% reported a collision causing vehicle damage, 10% a collision involving injury, and 75% having taken action to avoid a collision while working (Christie & Ward, 2019). Although the studies use different populations, reference periods, and measures, their findings consistently indicate that crashes and near misses are recurring rather than exceptional features of delivery work.

conditions (Nguyen-Phuoc et al., 2023, 2024). Job demands, such as workload and time pressure, require sustained effort, whereas resources such as autonomy, training, safety information and organizational support help workers meet these demands. High demands combined with insufficient resources may cause fatigue and burnout and undermine safe performance. Among food delivery riders, burnout and limited job resources have been associated with self-reported risky riding (Nguyen-Phuoc et al., 2023), while a study of 248 food couriers found that fatigue mediated the relationship between stressful working conditions and occupational crashes (Useche et al., 2024).

These relationships are particularly visible in platform-based food delivery. Digital platforms use applications to allocate orders, communicate with couriers, monitor performance, and calculate remuneration (Vallas & Schor, 2020). Although this arrangement offers workers flexibility, it may also create uncertainty and indirect control. Under payment per delivery, waiting and cautious riding can reduce earnings, while algorithmic systems may further obscure how work is allocated and performance assessed. Couriers may thus be formally autonomous, yet remain dependent on systems over which they have little influence.

Qualitative research shows how these arrangements can transfer responsibility for managing broader occupational risks from organizations to individual workers. Gregory (2021) found that couriers managed physical, financial, and informational risks by normalizing danger, relying on personal judgement, and developing informal support networks. Christie & Ward (2019) similarly identified time pressure, fatigue, distraction, and limited safety management in gig-economy driving and riding. Their later comparison found more self-reported speeding, red-light violations, mobile-phone distraction, incentives to ride in adverse conditions, and collision involvement among platform-based than employed food-delivery riders (Christie & Ward, 2023). These findings suggest that the business model through

which delivery work is organized may shape road safety behaviour alongside the physical vulnerability associated with riding a two-wheeled vehicle.

Organizational resources may counter these pressures. A positive safety climate signals that management supports safe traffic behaviour even when it conflicts with short-term productivity. Safety communication, equipment, training, feedback, and management commitment have been associated with greater safety compliance and participation among food delivery riders (Nguyen-Phuoc et al., 2025). Job resources and motivation may likewise support both required safety behaviour and actions that contribute to the safety of colleagues and other road users (Nguyen-Phuoc et al., 2024). These findings shift attention away from correcting individual riders alone and towards the organizational conditions that enable or constrain safe behaviour.

Although platform food delivery has received most attention, work organization is also relevant to parcel delivery. Drivers may work for large companies, subcontractors, or platforms under varied employment conditions (European Agency for Safety and Health at Work, 2022). Their rounds can involve demanding schedules, many stops, long hours, and pressure to meet targets and consumer expectations. Christie et al. (2025) found that parcel delivery drivers perceived time pressure as contributing to speeding and unsafe parking, but found no reduction in self-reported crashes among drivers using telematics. Monitoring may therefore be insufficient and could add pressure when not embedded within a broader safety culture.

Experience and familiarity may provide further resources. Delivery workers must navigate, locate addresses, monitor traffic, interact with customers, handle goods, and repeatedly decide where to stop (European Agency for Safety and Health at Work, 2022; Iacobucci et al., 2022). Familiar routes can reduce navigational demands and help workers anticipate difficult locations, whereas

turnover and inexperience may increase cognitive workload and encounters with unfamiliar situations.

2.3 Vehicle use and the traffic environment

Organizational conditions operate within a traffic environment. The same time pressure may have different behavioural and safety consequences for a cyclist, motorcyclist or a van driver (Useche et al., 2025). Vehicle type affects physical protection, speed, manoeuvrability, stopping requirements, and access to infrastructure and should therefore be understood as an integral feature of the delivery model.

Food couriers using bicycles, electric bicycles, mopeds, or motorcycles are physically vulnerable in collisions and falls. They manoeuvre through traffic, use cycling infrastructure of varying quality, and interact with larger motorized vehicles. Poor road surfaces, inadequate infrastructure, complex intersections, adverse weather, darkness, and other road users are recurrent sources of danger for couriers (Gregory, 2021; Oviedo-Trespalacios et al., 2022; Papantoniou et al., 2025). Smartphones create further safety challenges because accepting orders, navigation, and contacting customers may cause distraction.

Safety implications also differ between two-wheelers. Motorcycles and mopeds allow higher speeds and may increase crash severity, whereas conventional bicycles involve more physical effort and may increase fatigue during long shifts. Electric bicycles reduce physical demands, but allow higher average speeds. Crash and injury risks appear especially pronounced among motorized two-wheeler users, although cyclists and e-bike users remain vulnerable because of their limited protection and interaction with motorized traffic (Useche et al., 2025).

Vans create a different set of challenges. Parcel drivers must repeatedly leave the traffic stream and stop near customers, yet urban streets often provide insufficient parking and loading space. They must then

choose between searching for parking and walking farther with parcels, thereby delaying delivery, or stopping in an unauthorized location. Drivers generally prefer authorized parking but often regard unauthorized stopping as unavoidable (Iacobucci et al., 2022). Such practices may obstruct other road users and create dangerous situations, as may searching for addresses, responding to route changes, or operating navigation devices while driving.

Overall, occupational road safety in last-mile delivery is shaped by the interaction between work organization and the traffic environment. These dimensions are frequently studied separately, however, and the available evidence remains unevenly distributed across delivery sectors. A comparative approach can clarify the mechanisms shared across delivery models as well as those specific to particular forms of delivery work. The present study applies this comparative perspective to parcel delivery drivers and platform food couriers in Belgium.

3. Methodology

3.1 Study design and setting

This study adopted a comparative design to examine how parcel delivery drivers and food couriers experience occupational road safety. Qualitative research was considered appropriate because the study focused on workers' interpretations of traffic safety at work, the conditions they associated with these situations, and the strategies they used to manage risk while completing deliveries. The design combined accounts from delivery workers with interviews with stakeholders and experts familiar with the organization and regulation of last-mile delivery in Belgium.

Data were collected between March and October 2023 and primarily concerned delivery work in and around the Brussels-Capital Region. Brussels constitutes a particularly relevant setting for such a study because of its dense urban environment, high traffic volumes and its extensive last-mile delivery economy.

3.2 Participants and recruitment

Three types of participants were included in the study: stakeholders and experts, platform food couriers, and parcel delivery drivers.

Stakeholders and experts were recruited through purposive sampling. Selection sought to capture variation between public and private actors and between different parts of the last-mile sector. Participants included representatives of parcel delivery companies and food-delivery platforms, policymakers, professional associations, trade-union or cooperative representatives, and academic or other subject-matter experts. Twelve stakeholders and experts participated, equally divided between public and private actors.

Food couriers were recruited at a central meeting place for delivery couriers in Brussels. Information about the study and an invitation to participate were distributed at this location beforehand. Some participants were approached directly by peers in the surrounding public space. Sixteen couriers participated in a focus group, which was more than initially anticipated, and all were included in a single group. All worked as self-employed or peer-to-peer couriers for one of two major digital food-delivery platforms. They used bicycles, electric bicycles, mopeds, or motorcycles to complete deliveries, although conventional and electric bicycles were the most common modes represented. Participants received a small gift voucher to compensate for their time and potentially lost earnings.

Parcel delivery drivers, finally, were recruited in the early morning while waiting to collect parcels at a depot operated by a major parcel company near Brussels. Researchers explained the study to drivers and registered the contact details of those expressing an interest in participating. Interested drivers were subsequently contacted for an individual telephone interview. Ten parcel delivery drivers were interviewed. All were employees of subcontractors providing delivery services for various parcel delivery companies. They used vans to complete their delivery rounds.

Participants received a gift voucher for participating via postal mail.

Because the number of drivers initially approached was not recorded, a response rate could not be calculated. Detailed demographic information, including age and gender, was not systematically collected either. Hence, the analysis did not examine variation in experiences according to sociodemographic characteristics. Table 1 summarizes the three data sources.

3.3 Data collection

All data were collected using semi-structured interview guides. This format provided a common structure across interviews while allowing participants to introduce experiences and concerns that had not been anticipated by the researchers. Questions were formulated in an open and non-directive manner.

The guides were structured around the study's broad concept of occupational road safety and adapted to participants' roles. Together, they covered crashes and near misses, situations perceived as dangerous, work organization, vehicle use, the traffic environment, and ways of managing safety. The worker guides elicited personal experiences, whereas stakeholder questions addressed organizational conditions and any recorded crash or violation indicators. Questions about working hours, routes, and distances provided context for contact with traffic but were not used to calculate exposure or crash likelihood.

The stakeholder and expert interviews were conducted online between March and May 2023. Interviews began with participants' views on the growth and organization of e-commerce and last-mile delivery in Belgium before addressing road safety challenges, employment conditions, vehicle use, and possible countermeasures. Interview guides were adapted slightly to the participant's institutional role and area of expertise. Interviews lasted approximately one hour.

The food courier focus group took place in June 2023 and lasted approximately two

Table 1. Overview of participants and data collection for this study

Participant group	Recruitment	Number	Data collection method	Approximate duration	Compensation
Stakeholders and experts	Purposive sampling	12	Online individual interviews	60 minutes	None
Platform food couriers	Convenience recruitment at a courier meeting place	16	In-person focus group	120 minutes	Gift voucher
Parcel delivery drivers	Convenience recruitment at a parcel depot	10	Telephone interviews	45 minutes	Gift voucher

hours. It was conducted in French and led by the researcher responsible for the study, with a second researcher taking notes. The discussion addressed couriers' general feelings of safety, experiences with crashes and near misses, working hours, time pressure, payment arrangements, navigation, equipment, insurance, infrastructure, and interactions with other road users. Participants discussed one another's experiences, and the moderator invited quieter couriers to contribute when more vocal participants dominated. The second researcher's notes were subsequently checked and expanded against the recording.

Parcel delivery drivers, finally, participated in semi-structured telephone interviews lasting approximately 45 minutes. Interviews were conducted in Dutch, French, or English, according to participants' preferences. Questions concerned their employment situation, organization of delivery rounds, perceived time pressure, experience and route familiarity, vehicle and equipment, parking and stopping, interactions with other road users, and experiences of crashes or other dangerous situations.

All interviews and the focus group were audio-recorded with participants' permission. Before data collection, participants received information about the purpose of the study, the voluntary nature of participation, the recording of the discussion, and the confidential treatment of their information. Informed consent was obtained before each interview and the focus group. Participants could decline to answer questions or discontinue their participation. The recordings supported the preparation and verification of detailed notes and structured

summaries but were not transcribed verbatim. This decision reflected the time and resources available for the project. The recordings were stored on protected organizational servers for six months and subsequently deleted. The analytical material therefore consists of interview notes and detailed structured summaries rather than complete transcripts.

3.4 Data analysis

The data were examined using a pragmatic thematic analysis informed by established principles of thematic analysis (Guest et al., 2012; Nowell et al., 2017). The analysis proceeded in several stages. First, the researcher became familiar with the material by conducting the interviews, listening to the discussions, preparing interview summaries, and organizing the notes in a common format. Second, relevant passages in the notes and summaries were marked and assigned initial codes relating to occupational road safety. Coding remained open to issues introduced by participants but was guided by the overall research question. Examples included time pressure, remuneration, working hours, equipment, route planning, experience, crashes and near misses, parking, cycling infrastructure, and interactions with other road users.

Third, related codes were grouped into broader candidate themes. Themes were retained when they recurred across participants or provided a particularly relevant explanation of how occupational or traffic conditions shaped road safety experiences. Fourth, candidate themes were reviewed against the interview material and

refined to reduce overlap and ensure that they remained grounded in participants' accounts.

For the comparative analysis, the themes were organized in a cross-case matrix contrasting parcel delivery drivers and platform food couriers. Individual interviews and focus groups were treated as complementary data sources that can reveal different dimensions of participants' experiences (Guest et al., 2017; Lambert & Loisel, 2008). The comparison focused on four overarching areas: the organization of delivery work; employment protection, resources, and experience; interaction with the urban traffic environment; and experiences of crashes, near misses and dangerous situations, and strategies to manage them. The stakeholder and expert interviews provided a broader view of how food and parcel delivery were organized, including payment arrangements, subcontracting and constraints on (urban) deliveries. Their accounts were compared with workers' accounts to identify points of agreement and disagreement. They were used to contextualize and qualify workers' descriptions, rather than as substitutes for their personal experiences.

Because the interviews were not transcribed verbatim, the study does not present statements from participants as direct quotations. The findings are rather presented as a thematic comparison, using paraphrased accounts from contemporaneous notes and summaries to illustrate similarities and differences between the two delivery groups. This presentation keeps the comparison in view. The approach also avoids attributing exact wording to participants that cannot be verified from the retained analytical material.

4. Findings

The comparative analysis identified four themes: (i) how time pressure was organized; (ii) employment protection, resources and experience; (iii) the interaction between delivery vehicles and the urban environment; and (iv) reported crashes, near misses and responses to dangerous situations. Table 2

summarizes the main comparative patterns in participants' accounts. Stakeholder and expert accounts contributed to each theme and largely converged with workers' descriptions of time pressure, employment conditions, vehicle use and urban space. Their contributions are therefore integrated into the thematic comparison rather than presented as a separate set of findings.

4.1 Different forms of time pressure

Both groups described time pressure, but its sources differed. Food couriers generally earned money per completed delivery, making waiting and journeys without a completed order economically unproductive. Several felt encouraged to deliver quickly to increase their income. A stakeholder who had previously worked as a courier reported that disregarding traffic rules had enabled substantially more deliveries within a day. For couriers, therefore, the pressure to work faster did not necessarily depend on being given a delivery deadline.

Couriers described time pressure arising from payment per delivery, but also from uncertain order allocation and customer evaluations. They did not always know why one rider received an order while another waited, or why access to the platform could suddenly be restricted. Some believed that rapid delivery or continued availability affected future orders, although they did not know how the platform's algorithm operated. Late delivery could also mean cold food and a poor customer rating. Bad weather presented a related trade-off: stakeholders said that direct bonuses for riding in snow or other dangerous conditions had become less common, but platform notifications still highlighted increased demand and earning opportunities. The resulting pressure was indirect. Couriers remained formally free to decide whether to work, but had an economic incentive to ride when road conditions were less safe.

Without fixed shifts, some couriers continued until they reached a daily earnings target. On low-demand days, waiting could

Table 2. Comparative patterns in participants' accounts of occupational road safety

Theme	Parcel delivery drivers	Platform food couriers
Time pressure	Planned delivery rounds and targets, generally with hourly pay and defined shifts	Payment per delivery, uncertain order allocation and open-ended/irregular hours
Employment and resources	Formal subcontractor employment, maintained vans, occupational accident insurance, management contact and familiar routes; conditions varied between subcontractors	Self-employed or peer-to-peer arrangements, own or rented vehicles, insurance coverage described as limited or unclear, limited direct support and less familiar routes
Vehicle and urban environment	Dangerous situations mainly around stopping, parking, leaving and re-entering vans, and manoeuvring	Dangerous situations while riding in traffic and negotiating road conditions and inconsistent cycling infrastructure
Reported incidents and responses	Few crashes reported; near misses around stopping and interactions with other road users; route familiarity and parking choices used to manage situations	Almost all focus-group participants reported at least one crash; experience and navigation informed route choices; avoiding dangerous weather or declining orders could reduce earnings

extend work into the night or even early morning without generating income. Food couriers associated long hours and late travel with fatigue, reduced concentration, poor visibility and encounters with speeding or intoxicated road users. Again, the distinction between freely choosing to continue working and feeling economically compelled to do so was often unclear in their accounts.

Parcel drivers, by contrast, described more predictable forms of time pressure. Most were paid by the hour, worked on planned rounds and covered familiar routes. Parcels were on balance also ready for loading at the start of the working day. Several said hourly pay reduced any incentive to speed, and some were satisfied with their typical workload. They reported that delays caused by congestion or vehicle problems could sometimes be accommodated without immediate consequences. Nevertheless, targets, year-end peaks and late shifts could create substantial pressure. Some said late or Saturday work was inadequately compensated. Drivers and stakeholders also described subcontractors that combined rounds intended for multiple workers or imposed unrealistic workloads. However, these practices were described as problematic segments of the subcontracting system (the “bad apples”) rather than as the normal experience of the interviewed drivers.

The comparison indicates that both groups balanced productivity and safety, but within

different incentive structures. Parcel drivers' time pressure was primarily connected to delivery-round planning and employer expectations, whereas food couriers' pressure was more directly connected to income, platform allocation, and customer evaluation. Among food couriers, the boundary between voluntarily working longer and being economically compelled to remain available was rather unclear.

4.2 Employment protection, resources and experience

The two delivery models also differed in the organizational resources available to workers. Nearly all interviewed parcel drivers were formally employed by subcontractors. Their employment arrangements defined working hours and pay, and subcontractors generally supplied and maintained their vans. Drivers had occupational accident insurance and a manager to contact about delivery problems. They regarded the van as essential to their work and said that a crash could interrupt deliveries, damage the vehicle and affect their relationship with their employer. Repeated or serious incidents could threaten employment or their professional reputation, while traffic fines were their personal responsibility. These circumstances encouraged caution in traffic, as drivers had financial reasons to avoid speeding or illegal parking where possible. Importantly, the subcontracting system introduced heterogeneity. Drivers working

under the branding of the same parcel company could be employed by different firms with different contracts, different workloads, and different management practices. In this context, various stakeholders acknowledged that large parcel companies had very limited insight into the daily conditions and practices within every subcontractor.

Food couriers working under self-employed or peer-to-peer arrangements, on the other hand, described considerably less organizational protection. Most were responsible for acquiring, renting, and maintaining their own bicycle, moped, or motorcycle. Repair costs could be substantial relative to earnings. Stakeholders described couriers continuing to use poorly maintained vehicles, because repairs were unaffordable. Renting a maintained bicycle offered an alternative, but also meant an additional cost for the courier. Although platforms made efforts to provide advice or checklists on helmets and vehicle condition, couriers said that compliance was not systematically checked and that they also had to pay for protective equipment themselves. Couriers furthermore pointed out that carrying several hot meals or supermarket orders at once could create heavy or unstable loads that affected balance and control.

In comparison to parcel drivers, who had an identifiable employer or manager to contact when delivery problems arose, platform couriers described much more distant organizational support. For them, organizational information came mainly through applications, and assistance with a crash, account problem or disconnection could depend on automated systems or remote staff. Some experienced the lack of direct contact as especially difficult when help was urgent. They also described platform-provided accident coverage as limited or unclear. Some did not know the conditions or lacked accessible documentation, and others found claims procedures burdensome. Additional private insurance could furthermore be difficult to obtain because insurers were reportedly reluctant to cover professional food delivery. A crash could therefore mean injury

alongside lost income, medical expenses, damage to their own or a rented vehicle and concerns about an undelivered order. In their accounts, the financial consequences of an incident often fell on the individual worker.

Experience provided another contrast. Parcel drivers typically returned to the same areas, helping them anticipate difficult addresses, roadworks and possible stopping locations without consulting navigation constantly. Several had considerable professional experience as well, which is consistent with the fact that stakeholders described greater workforce retention than in platform food delivery. Both food couriers and various experts in this industry, by contrast, characterized courier work as rather temporary, with regular turnover within the workforce. Couriers could start in different zones and receive orders taking them to unfamiliar destinations. They therefore relied heavily on smartphone navigation. As a result, they sometimes followed unsuitable routes or consulted the screen repeatedly while travelling. Participants associated experience with vehicle control, knowledge of the road network and anticipating dangerous situations, but the changing destinations of platform work made route familiarity harder to develop.

Overall, parcel drivers generally had access to various employment-related resources benefitting occupational road safety. These included defined working hours, hourly remuneration, maintained vehicles, insurance, identifiable management, and route familiarity. Such resources were less consistently available to platform food couriers, who were expected to manage many of the occupational and financial consequences of road safety individually. Nevertheless, variation between subcontractors meant that the relative protection of parcel drivers should not be understood as universal.

4.3 Different vehicles, different urban safety problems

The most visible contrast between the two groups concerned the interaction between their delivery vehicles and the urban environment. Parcel drivers focused on stopping their vans near customers and leaving or re-entering traffic. Food couriers, by contrast, emphasized riding in traffic and using cycling infrastructure.

The lack of parking space to deliver parcels was the most consistently reported traffic-related problem among parcel drivers. Their work implied numerous short stops, often in streets where no legal parking space was available near the customer. Parking places for delivery were described as very rare and, if existent, frequently occupied by other vehicles. Parking farther away was not always feasible because parcels could be heavy and additional walking time could delay the remainder of the delivery round.

Drivers therefore regularly faced a choice between continuing to search for parking or stopping temporarily in an unauthorized location. In this context, double parking was frequently treated as unavoidable. Parcel delivery drivers reported doing so despite knowing that it could obstruct traffic and create danger for themselves as well as other road users. Drivers also described stress when stopping on or near cycling infrastructure, pedestrian crossings, or busy roads. Leaving and re-entering the van could itself be dangerous when traffic passed close to the vehicle. Some had received fines that cancelled parts of the earnings from that working day.

The accounts did not indicate indifference towards traffic rules. Most drivers preferred to stop legally and recognized that unauthorized parking could hinder or endanger other road users. However, the combination of scarce space, parcel weight, delivery expectations, and limited time meant that legal compliance was not always perceived as practically feasible. One driver avoided unauthorized parking by walking

farther to customers, but this strategy was not presented as feasible for every delivery. Stakeholders similarly identified parking space as one of the central challenges facing urban parcel delivery.

Other challenges arose when familiar delivery rounds were disrupted. Stakeholders and parcel drivers alike pointed out that roadworks, diversions, and changes in traffic circulation could undermine optimized routes and create delays. Drivers then had to improvise while maintaining their delivery schedule. Locating addresses constituted an additional source of distraction, especially when house numbers were unclear or navigation systems failed. Participants described the combined task of controlling a van, monitoring traffic, and searching for a delivery location as complicated and stressful.

Parcel drivers finally reported difficult interactions with cyclists and e-scooter users. These road users were perceived as fast, quiet, and sometimes difficult to see or predict, particularly in poor weather or darkness. Some drivers felt that cyclists and e-scooter users appeared from unexpected directions or did not consistently follow traffic rules. Near misses were reported particularly when drivers manoeuvred, opened doors, or stopped near cycling facilities. Drivers also encountered frustration or verbal aggression from other motorists when their vans obstructed the traffic flow.

Food couriers, on the other hand, described a different set of challenges. As users of bicycles, electric bicycles, mopeds, or motorcycles, they experienced problems with road conditions and interactions with larger vehicles. Participants identified cobblestones, tram tracks, roadworks, narrow streets, discontinuous cycling facilities and cycle paths that unexpectedly merged with pedestrian space as important challenges. Poor weather could make these conditions worse by reducing visibility and grip.

Cycling infrastructure was appreciated where it provided separation from motorized traffic, but couriers repeatedly described inconsistencies in its design. Cycle paths

could end abruptly or direct riders into an ambiguous position. Streets allowing cyclists to travel against the general direction of traffic created conflict when motorists were unaware of the exception. Similar misunderstandings occurred in cycle streets, where drivers sometimes followed closely, sounded their horns, or treated couriers as obstructing traffic. Close overtaking and aggressive acceleration were experienced as particularly threatening.

Food couriers finally reported encountering vehicles parked on cycling infrastructure and motorists distracted by mobile phones. Buses and other large vehicles passing at short distance created feelings of vulnerability. At the same time, couriers acknowledged that delivery riders themselves did not always follow traffic rules. Smartphone distraction, riding on pavements, filtering through congestion, and taking unsuitable routes were described as common adaptations to time pressure and infrastructure gaps. Couriers sometimes selected a route different from the one suggested by the application, but the alternative could also be inappropriate.

4.4 Crashes, near misses and responses to dangerous situations

Crashes and near-misses featured more prominently in the accounts of food couriers than in those of parcel delivery drivers. Most parcel drivers described few crashes while at work, generally minor collisions involving limited damage. Stakeholders from the parcel sector similarly did not regard crashes as the sector's most urgent problem. Drivers nevertheless recounted near misses around unauthorized stops, leaving vans on busy roads and interactions with cyclists or e-scooter users. Their accounts located dangerous situations at particular points in the delivery round, especially when stopping or rejoining traffic, rather than throughout the journey. Route familiarity sometimes helped them anticipate these situations.

Almost all food courier focus group participants, by contrast, said they had experienced at least one crash, and several

described repeated incidents.³ Many reported relatively minor injuries, such as bruises or scratches, but couriers and stakeholders also knew of more severe or even fatal incidents.

Both groups described practical responses to these situations. Parcel drivers used local knowledge to plan stops and sometimes walked farther, accepted delays or paid fines to avoid a more dangerous stopping place. They oftentimes regarded unauthorized parking as unavoidable. Food couriers, conversely, drew on experience, informal knowledge and navigation applications to choose routes and make decisions in traffic. They could decline orders or avoid working in dangerous weather, but such decisions could reduce earnings.

Road safety challenges were consequently managed largely at the worker level, even when their sources were organizational or infrastructural. Parcel drivers could not create parking space, and food couriers could not redesign unsafe cycling infrastructure or make platform algorithms more transparent. Individual caution remained important, but participants' accounts repeatedly illustrated the limits of personal control.

Across both groups, unsafe practices were generally not presented as deliberate disregard for road safety. Double parking, travelling between congested vehicles, checking a smartphone, selecting an unsuitable route, or continuing to work while fatigued were better understood as adaptations to conditions that made fully safe delivery difficult. The form taken by these adaptations differed between delivery models, but the underlying tension was shared: workers were expected to complete deliveries efficiently in urban environments and organizational systems that did not always make safe behaviour the easiest or most viable option.

³Because in this study, parcel and food couriers were recruited differently and interviewed using different formats in small numbers, these accounts do not provide evidence that one group has a higher crash rate than the other. The results simply show how both groups differently described crashes and dangerous situations in their work.

5. Discussion

5.1 Two configurations of occupational road safety

This study compared how parcel delivery drivers and platform food couriers experienced occupational road safety and how these experiences were shaped by work organization and the urban traffic environment. Participants in both groups described safety challenges and related them to different combinations of organizational and traffic conditions. The comparison concerns reported experiences rather than measured crash likelihood or traffic exposure.

Among platform food couriers, reported safety challenges were primarily associated with the interaction between piece-rate payment, undefined working hours, limited organizational protection, unfamiliar routes, and physical vulnerability as users of two-wheeled vehicles. Parcel drivers' accounts placed less emphasis on travel between stops and more on the practical requirements of completing deliveries with a van, particularly stopping, parking, locating addresses, and interacting with other road users in dense urban environments. Formal employment, hourly remuneration, maintained vehicles, and route familiarity appeared to provide parcel drivers with resources that were less consistently available to platform food couriers.

The comparison therefore suggests that last-mile delivery should not be treated as a uniform occupational category. Similar pressures, including delivery targets, congestion, navigation, and customer expectations, are translated into different safety challenges depending on the delivery model. These findings support understanding workers' safety experiences in terms of distinct configurations of work organization, employment conditions, vehicle use, and traffic environment.

5.2 Work organization as a road safety mechanism

The findings reinforce previous research showing that work organization is closely connected to road safety behaviour among delivery workers. Studies of platform food delivery have associated time pressure, burnout, fatigue, and limited job resources with risky riding and crash involvement (Christie & Ward, 2023; Nguyen-Phuoc et al., 2023; Useche et al., 2024). The present study adds qualitative insight into how these mechanisms were experienced by couriers themselves.

Payment per delivery was particularly important. It linked income directly to the number of completed orders and made waiting, cautious route selection, or declining work in adverse conditions financially consequential. The platform did not necessarily need to instruct couriers to ride faster. Economic incentives, customer ratings, order allocation, and uncertainty about the algorithm jointly encouraged workers to remain available and complete deliveries quickly. Formally voluntary decisions could therefore be strongly constrained by the need to generate sufficient income.

These findings are consistent with research describing how platform work shifts responsibility for managing work-related hazards to workers while maintaining indirect organizational control (Gregory, 2021). Couriers were responsible for deciding when and how long to work, but these decisions were made within systems that determined payment, allocated orders, enabled customer evaluation, and could restrict access to work. Responsibility for safety was similarly individualized: couriers were expected to maintain their own vehicles, purchase protective equipment, obtain insurance, select routes, and manage fatigue.

The findings can also be interpreted through the distinction between job demands and job resources (Nguyen-Phuoc et al., 2023). Platform couriers faced demands including time pressure, long or irregular working

hours, economic uncertainty, navigation, riding with limited physical protection, and customer evaluation. Resources such as training, maintained equipment, insurance, direct management support, and predictable routes were comparatively limited. Parcel drivers experienced some of the same demands but generally had access to more organizational resources, including hourly remuneration, defined working hours, employer-provided vehicles, accident insurance, and identifiable management.

This does not imply that subcontracted parcel delivery was consistently safe or well regulated. Stakeholders and drivers identified considerable variation between subcontractors, including excessive workloads, uncompensated overtime, and further subcontracting that reduced oversight. The relevant contrast is therefore not between an entirely protected parcel sector and an entirely unprotected platform sector. Rather, the findings indicate that formal employment and organizational support can provide safety-related resources, while fragmented subcontracting may weaken these protections.

5.3 Vehicle use and the organization of urban space

The comparison also demonstrates that workers' safety experiences are shaped by the interaction between vehicles and urban space. Parcel drivers and food couriers did not merely use different vehicles; their vehicles placed different practical demands on the delivery process.

Parcel drivers primarily described dangerous situations when attempting to leave the traffic stream and position their vans close to the delivery address. Their work required repeated short stops, yet legal parking and loading space was frequently unavailable. Unauthorized or double parking was consequently described as a pragmatic response to the combined constraints of parcel weight, delivery schedules, street design, and scarce space. This is consistent with [Iacobucci et al. \(2022\)](#), who found that parcel drivers generally preferred legal parking but often

considered unauthorized stopping necessary to complete their work.

Interpreting parking behaviour solely as an individual traffic violation overlooks these structural constraints. Drivers remained responsible for where they stopped, but the range of practically available choices was shaped by urban design and delivery expectations. Searching longer for legal parking could reduce hazards associated with unauthorized stopping while increasing time pressure, walking distance, and delays elsewhere in the delivery round. Occupational road safety therefore involved trade-offs rather than a simple choice between safe and unsafe behaviour.

Food couriers mainly described dangerous situations while moving through traffic. Their vulnerability was connected to limited physical protection and dependence on continuous, comprehensible, and well-maintained infrastructure. Discontinuous cycle paths, tram tracks, cobblestones, roadworks, close overtaking, vehicles parked on cycling infrastructure, and misunderstandings about cycle streets were recurring concerns. Smartphone-based navigation and communication added to the demands of riding in this environment.

The contrast can be summarized as follows: parcel drivers primarily described dangerous situations when attempting to leave the traffic stream, whereas food couriers described them while moving through it. However, both groups encountered urban environments that did not consistently accommodate the practical requirements of delivery work. The resulting unsafe practices were frequently adaptations to these conditions rather than evidence of a general disregard for road safety.

5.4 From individual to shared responsibility

The findings have implications for how responsibility for occupational road safety is understood. Traditional road safety approaches may focus on whether individual workers obey traffic rules, avoid distraction,

use protective equipment, or manage fatigue. These behaviours remain important, but the present findings demonstrate the limits of relying predominantly on individual responsibility.

Food couriers could decide to ride more slowly, decline orders, or stop working when fatigued, but these choices could reduce their income. Parcel drivers could avoid unauthorized parking, but doing so was not always compatible with parcel weight, available space, and delivery schedules. Neither group could independently redesign infrastructure, create parking and loading space, alter payment systems, improve platform transparency, or guarantee adequate insurance.

This interpretation is compatible with a Safe System perspective, which assumes that safety is produced by the wider system and that responsibility is shared among the actors designing and managing it. Applied to last-mile delivery, these actors include delivery companies, subcontractors, digital platforms, vehicle and technology providers, infrastructure managers, insurers, regulators, and workers. A system that depends on workers repeatedly compensating for organizational or infrastructural deficiencies cannot rely on individual caution alone.

The study therefore supports moving from a narrow focus on worker behaviour towards examination of conditions contributing to dangerous situations. This does not remove workers' responsibility for their conduct, but it recognizes that safe behaviour is more likely when organizational incentives, technologies, and physical environments support it.

5.5 Practical implications

Several practical implications follow from the findings. First, payment and performance systems should avoid rewarding speed at the expense of safety. For platform food delivery, this may require reducing reliance on piece-rate payment, compensating waiting time, clarifying how orders and ratings affect access to work, and ensuring that couriers are not

financially encouraged to work in dangerous conditions.

Second, platforms and delivery companies should provide accessible safety training, appropriate equipment, clear accident procedures, and meaningful human support. Safety information distributed through an application is unlikely to be sufficient when workers must purchase equipment themselves or cannot contact a responsible person after a crash. Adequate and accessible accident insurance is particularly important because injury may simultaneously remove a courier's income and means of transport.

Third, workload and working hours require attention in both delivery models. Delivery rounds and promised delivery times should account for congestion, parking availability, weather, and the physical demands of the job. Technology such as route optimization or telematics may support safety, but previous research and the present findings suggest that technological monitoring cannot compensate for unrealistic workloads or a weak safety culture (Christie et al., 2025).

Fourth, infrastructure interventions should reflect the different spatial requirements of delivery vehicles. Parcel drivers require appropriately located and effectively protected parking and loading space. Food couriers require continuous cycling infrastructure, safe intersections, clear traffic arrangements, and navigation systems adapted to two-wheeled professional travel. These interventions would benefit delivery workers while also reducing conflicts with other road users.

5.6 Strengths and limitations

A central strength of this study is its direct comparison of two forms of last-mile delivery that are often examined separately. Combining worker accounts with stakeholder and expert interviews also enabled individual experiences to be situated within the wider organization of the sector. The qualitative design provided insight into recurring hazards

and adaptations that are difficult to identify through crash statistics alone.

Several limitations must nevertheless be considered. First, food couriers participated in a focus group, whereas parcel drivers were interviewed individually. Group interaction may have encouraged food couriers to recall and reinforce shared experiences, including crashes, and may partly explain differences in the prominence of particular themes. The focus group's size may also have limited the depth of individual accounts, while uneven participation and differences in language fluency may have given greater weight to the views of more vocal couriers.

Second, the interviews and focus group were extensively summarized rather than transcribed verbatim, and the analysis was conducted by one researcher. Preparing summaries required selecting and condensing material before coding, so less prominent or ambiguous accounts may have received less attention, potentially influencing the themes identified. The researcher's direct involvement in data collection and checks of the summaries against the recordings helped mitigate this possibility, but cannot rule it out. The absence of complete transcripts and independent coding also limits verification of the analysis. Paraphrased accounts were deliberately used to keep the comparison between delivery groups central, although they give readers less direct access to participants' accounts than quotations would.

Third, convenience recruitment limits claims about how common the reported experiences are among delivery workers. The relevance of the mechanisms identified beyond Brussels depends on the similarity of delivery models, employment arrangements, vehicle use, traffic conditions, and street infrastructure or what [Lincoln & Guba \(1985\)](#) call "fittingness". They may be particularly relevant to other dense cities where platform food couriers and subcontracted parcel drivers work under time pressure and compete for road and parking space. How these mechanisms play out may differ where labour arrangements, infrastructure,

or regulation differ. The study also did not systematically collect demographic characteristics, working hours, or exposure measures and therefore cannot assess how experiences varied by age, gender, professional experience, or time spent on the road.

Finally, the study cannot isolate the effects of employment status, payment method, vehicle type, or delivery product. These characteristics varied simultaneously between the two groups. Nor can the study determine whether food couriers had an objectively higher crash rate than parcel drivers. The findings instead identify two combinations of conditions that participants associated with their safety experiences. Future research could examine these mechanisms in larger and more diverse samples, combine qualitative accounts with exposure and crash data, and compare workers using similar vehicles under different employment arrangements.

6. Conclusion

This study examined how parcel delivery drivers and platform food couriers in Belgium experience occupational road safety and how these experiences are shaped by work organization and the urban traffic environment. The findings show that both groups described safety challenges, but that these arose through different mechanisms.

Among platform food couriers, reported safety challenges were closely connected to payment per delivery, long and undefined working hours, limited organizational support, responsibility for equipment and insurance, unfamiliar routes, and physical vulnerability as users of two-wheeled vehicles. Parcel delivery drivers generally benefited from more clearly defined working conditions, hourly remuneration, maintained vehicles, insurance, and route familiarity. Their principal safety challenges were instead associated with the spatial requirements of van-based delivery, particularly the lack of parking and loading space, repeated stopping, and interactions with other road users.

These findings demonstrate that occupational road safety in last-mile delivery cannot be reduced to individual worker behaviour. Practices such as unauthorized parking, checking navigation systems, travelling through congestion, or continuing to work while fatigued frequently represented adaptations to organizational and infrastructural constraints. Safe delivery consequently depends not only on workers' decisions but also on how companies and platforms organize work, how technologies allocate and guide deliveries, and how urban environments accommodate different delivery vehicles.

A more systemic approach should distribute responsibility across delivery companies, subcontractors, digital platforms, infrastructure managers, technology providers, insurers, regulators, and workers. Measures addressing payment systems, working hours, training, equipment, insurance, parking and loading space, and cycling infrastructure could make safe behaviour more practically achievable. The study does not estimate the prevalence of these challenges elsewhere or compare objective crash rates. Its account of how work organization, vehicle use, and urban space interact can nonetheless inform research and interventions in cities with comparable delivery systems. As last-mile delivery continues to expand, occupational road safety should be treated as a central condition of sustainable delivery systems rather than as an individual responsibility or an unavoidable cost of consumer convenience.

CRediT contribution

Mathias De Roeck: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Project administration, Visualization, Writing – original draft, Writing – review & editing.

Declaration of competing interests

The author declares that he has no known financial or non-financial competing interests

that could have influenced the research reported in this article.

Declaration of generative AI use

During the preparation of this manuscript, the author used OpenAI's ChatGPT to support the translation, restructuring, condensation and English-language editing of material from the original Dutch-language research report. The underlying research design, data collection, qualitative analysis, interpretation and original report were completed by the author without the use of generative AI. The author critically reviewed and revised all AI-assisted output and assumes full responsibility for the content of the published article.

Prior dissemination declaration

An earlier and more extensive account of this research was published in Dutch as a Vias institute research report *Subjectieve verkeersveiligheid bij maaltijdkoeriers en pakjesbezorgers* in 2024. Parts of the research were also presented at the 2024 POLIS Conference in Leuven. The present manuscript has been substantially restructured, condensed and developed for publication as an international scientific article and has not previously been published in a peer-reviewed journal.

Ethics statement

Formal review by an ethics committee was not sought because the study was non-interventional, involved no experimental procedures, collected no directly identifying personal data and presented no more than minimal risk to participants. Participation was voluntary, and participants were informed about the purpose of the research, the recording and confidential treatment of their responses, and their right to discontinue participation. Recordings were stored on protected institutional servers for six months and subsequently deleted. Only anonymized research notes were retained and used in the analysis.

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Data availability statement

The interview and focus-group recordings are no longer available, as they were deleted six months after data collection in accordance with the study's data-management procedures. The retained research notes cannot be made publicly available because participants did not consent to the public sharing of their qualitative accounts.

Code availability statement

No software code or computational scripts were used or generated in this qualitative study.

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