Safety Science 199 (2026) 107180

Contents lists available at ScienceDirect

Safety Science

journal homepage: www.elsevier.com/locate/safety

Safety, identity, and inequity at the last mile: a qualitative study of app-based bicycle delivery riders in Spain

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ARTICLE INFO

Keywords:
Gig workers
Occupational vulnerability
Algorithmic management
Bicycle delivery
Safety practices
Qualitative research

ABSTRACT

The expansion of the gig economy has led to a growing number of urban workers engaged in app-based food delivery. This sector, often seen as flexible, conceals complex occupational, legal, and psychosocial risks. Recent evidence suggests that delivery riders' safety is shaped not only by infrastructure or individual behavior, but also by precarious work conditions, limited legal protections, and forms of social exclusion that remain largely unaddressed.

Aim: This qualitative study examined how safety, identity, and equity are experienced and negotiated in app-based bicycle delivery in Spain, with attention to algorithmic timing, organizational rules, and street-level conditions.

Methods: Twenty semi-structured interviews were conducted with food delivery riders (mostly migrant men) in urban areas of Spain. A reflexive thematic analysis (inductive) was applied, with attention to patterns, contrasts across cases, and speech insights suggesting broader socio-labor dynamics.

Results: Three core themes were identified: (1) persistent exposure to traffic and environmental hazards, often aggravated by digital pressures and limited enforcement of safety regulations; (2) a fragmented social identity, with riders feeling excluded from both formal labor structures and mainstream cycling culture; and (3) strong perceptions of systemic inequity, including legal precarity, economic fragility, and marginalization in public and policy narratives, which may influence how riders manage risk in practice (e.g., rule compliance, incident reporting) and, in turn, safety outcomes.

Conclusion: The findings highlight the vulnerabilities of bicycle food delivery riders and suggest the need to rethink how safety, labor protections, and urban inclusion are framed and implemented in this sector.

1. Introduction

The proliferation of platform-based work has become a defining feature of contemporary urban economies. Among the most visible exponents of this shift are bicycle food delivery riders. Overall, this segment of the last-mile working population is portrayed in the literature as working under tight time constraints and being guided by algorithmic platforms that dictate the pace and structure of their tasks (Useche et al., 2025). Although promoted as flexible and accessible, this form of work increasingly shows signs of structural imbalance, with implications for road safety, legal protections, and social inclusion (Popan, 2024; Nguyen-Phuoc et al., 2022, 2025).

Previous research has stressed the heightened risk exposure of these riders, not only due to the physical demands of riding in traffic-dense environments, but also because of algorithmic management practices that amplify stress, fatigue, and distraction (Oviedo-Trespalacios et al., 2022). Unlike traditional cyclists or registered workers in other sectors, food delivery riders often fall through the cracks of urban mobility and labor legislation. As noted by studies such as Laskaris et al. (2024) and Nguyen-Phuoc et al. (2025), their precarious status, frequently shaped by undocumented migration, lack of insurance, and unclear contractual arrangements, positions them in an ambiguous zone between

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https://doi.org/10.1016/j.ssci.2026.107180
Received 8 October 2025; Received in revised form 21 January 2026; Accepted 3 March 2026
Available online 10 March 2026

informality and public service.

Beyond occupational safety, recent work has called attention to the broader psychosocial and identity-related dynamics faced by riders. Many experience a dual sense of invisibility: unrecognized as workers within formal labor systems and simultaneously excluded from the urban cycling cultures that dominate micromobility discourses (Zheng et al., 2019; Useche et al., 2024). In contexts such as Spain (where platform work has expanded rapidly but regulation remains uneven), this dual exclusion often translates into a lack of representation in transport policy, labor protections, and even public perception.

Given these overlapping issues, a growing body of literature has emphasized the importance of investigating rider experiences from an intersectional perspective, examining not only safety concerns but also the identity and equity dimensions of their work (Nguyen-Phuoc et al., 2022, 2024; Popan, 2024). However, most available evidence remains quantitative in nature or focused on large-scale surveys, leaving a gap in our understanding of the subjective, contextualized experiences of these workers.

This study addresses that gap by presenting findings from a qualitative exploration of bicycle food delivery riders in Spain, emphasizing their perceived challenges regarding safety, social identity, and systemic fairness. Therefore, it aims not only to document their accounts, but also to situate them within current debates on platform work road safety compliance, emerging safety-related factors, and occupational justice.

1.1. Literature review

A growing number of studies have documented the precarious working conditions of food delivery riders across diverse urban contexts. While early research focused primarily on economic instability and informality, more recent analyses have highlighted complex relationships among psychosocial stressors, safety risks, and subjective well-being outcomes affecting this occupational group. Fatigue, overwork, and the mental burden of continuous app-based management have been consistently linked to increased psychological strain and health issues (Christie & Ward, 2019; Convery et al., 2020; Useche et al., 2025; Vignola et al., 2023).

Moreover, delivery riders have been identified as highly exposed to traffic hazards, with elevated rates of injury and road conflict in cities where infrastructure is not adapted to higher cycling speeds or lacks protective elements for vulnerable users. Research has also noted that algorithmic management practices (e.g., dynamic pricing, performance-based penalties, limited transparency) may add layers of pressure, leading riders across modes to adopt riskier behaviors to meet quotas and avoid sanctions (Christie & Ward, 2023; Rosenblat & Stark, 2016).

These challenges are further intensified by legal and social marginalization. In many cases, riders operate outside formal labor protections, often working through intermediaries or on behalf of legally registered third parties (van Doorn, 2017). This lack of institutional support is compounded by limited access to medical care, compensation after injuries, or mechanisms for reporting abusive or unsafe working conditions (Pires et al., 2024; Useche et al., 2025).

Recent research has also pointed to the need for greater attention to justice and equity dimensions in the governance of platform labor. This includes addressing the legal liminality of riders, the limited recourse available to those injured on the job, and the unequal impacts of algorithmic control mechanisms – particularly for migrant or racialized workers (van Doorn, 2017; Rosenblat & Stark, 2016). These disparities are not merely economic but reflect broader patterns of exclusion embedded within contemporary labor platforms.

1.2. Regulatory and labor context: Delivery work in Spain

As one of the first European countries to address these issues, Spain regulated platform-mediated delivery work through the so-called *Rider Law*. In 2021, amendments to the Workers' Statute established a presumption of employment in app-based delivery when the company exercises managerial control (including algorithmic management) and granted works councils a right to information about the parameters and instructions that underpin algorithms affecting working conditions, job access, and retention, and profiling (Official State Gazette (BOE), 2021a,2021b).

These statutory changes functionally replicated and extended the Supreme Court's 2020 position, which characterized riders as employees based on the platform's control over price, organization and sanctions (much of it mediated by software) in a leading case involving an app-based delivery service (Supreme Court, Labor Chamber, 2020). Subsequent case law and labor-inspection activity have continued to test the boundaries of compliance, and public authorities have stated that models preserving misclassification remain non-compliant. Recent enforcement statements included warnings of potential criminal action where misclassification persists (Official State Gazette (BOE), 2025).

Spain's framework operates within an EU baseline that supports status determination and algorithmic governance. In this regard, at the EU level, Directive (EU) 2024/2831 on platform work entered into force on December 1, 2024, with transposition due by December 2, 2026. The Directive establishes a rebuttable presumption of employment, strengthens transparency and human oversight in algorithmic management, and protects workers against adverse treatment for exercising rights under the Directive (European Parliament and Council of the European Union, 2024).

Although Spain is among the first European countries to adopt a dedicated legal framework for platform-mediated delivery work, similar debates and reforms are taking place in other EU member states. In many of these jurisdictions, court decisions and legislative initiatives are also moving towards a presumption of employment and stronger oversight of algorithmic management in app-based delivery services. Because these developments unfold under the common baseline established by the aforementioned EU-Directive, the Spanish case can be read as an early example of broader regulatory shifts. This, in turn, suggests that the working conditions and tensions described in this study are likely to resonate with riders in other countries where comparable regulatory architectures are being implemented.

1.3. Study objectives, guiding questions, and current gaps

This study examines how safety, identity, and equity are experienced and negotiated in app-based bicycle delivery in Spain, with attention to algorithmic timing, organizational rules, and street-level conditions. We use semi-structured interviews and reflexive thematic analysis (inductive) to develop evidence-grounded insights that can inform system-level action by platforms, regulators, and cities. While previous research has described broad patterns through quantitative approaches, this study seeks to complement those efforts by collecting and interpreting riders' first-hand accounts and the tensions they articulate.

Consistent with the exploratory nature of qualitative analysis, the study was guided by three working questions:

Question 1. How do platform design choices and algorithmic management (for example, task assignment, timing, ratings) influence riders' safety-related practices, exposure to risk and the reporting of safety-related incidents?

Question 2. How do riders describe and negotiate their identity and social recognition within the cycling environment and the wider urban setting, and in what ways do these experiences relate to everyday safety practices?

Question 3. How do legal status, documentation and access to protections (insurance, equipment, representation) affect perceptions of fairness and the adoption of safer work routines; which system levels appear to facilitate or hinder improvement?

Together, these questions aim to address three specific gaps in current knowledge: first, most existing evidence on food delivery work comes from survey-based or administrative sources, with relatively few qualitative accounts of riders' everyday experiences in contexts where

regulation has started to evolve. Second, safety, identity and equity are often examined separately, which makes it harder to understand how they intersect in practice for those who ride under algorithmic control. Third, migrant riders' voices remain under-represented in mainstream debates on cycling safety and labor regulation, despite their central presence in this segment of the workforce.

At a practical level, focusing on these dimensions in a regulated European setting allows the present study to add depth to current discussions on platform labor and to inform future work on both road safety and occupational justice.

2. Methods

2.1. Participants and sampling

Participants were recruited directly on the street in areas of high rider activity, such as restaurant clusters and main delivery corridors in several Spanish cities, using a purposive street-intercept strategy. Inclusion criteria required being at least 18 years old and currently working as a bicycle food delivery rider for one or more app-based platforms operating in Spain. Fig. 1 illustrates these recruitment settings, showing riders waiting near restaurant pick-up points where the interviewer introduced the study and invited them to participate.

Recruitment took place during typical peak delivery hours (mainly weekday evenings and weekends), when riders were waiting for orders or between deliveries. The interviewer approached individuals who were visibly working as bicycle food delivery riders (for example, carrying platform-branded insulated bags or equipment), briefly explained the study, and invited them to take part. No intermediaries, employers or labor organizations facilitated recruitment, and participation was entirely voluntary.

A total of 20 riders (14 men, 5 women, 1 non-binary) participated in the study, in line with guidance on sample sufficiency for qualitative interview designs with relatively homogeneous populations and focused research questions (Guest et al., 2006; Hennink et al., 2017; Wutich et al., 2024). Across the full fieldwork period, approximately 40 riders were approached. Of these, about 25 expressed interest and 20 ultimately completed an interview, with the remaining individuals declining due to time constraints or lack of interest. Interviews were conducted once the interviewer had confirmed participants' status through brief screening questions about platforms used, typical schedules and length of experience. Because recruitment relied on street-intercepts rather than a predefined sampling frame, these figures are best interpreted as an approximate participation proportion rather than a formal response rate. A detailed sociodemographic breakdown of the study participants is presented in Table 1.

Nearly all were migrants from South American and North African countries, with 60% lacking regularized documentation and 30% holding temporary permits or awaiting administrative resolution, and a remaining 10% not willing to disclose this issue. In most cases,

Table 1
Demographic background of the study sample.

Participant ID	Gender	Age	Origin	Years in Delivery
P01	Female	23	Migrant	1
P02	Non-binary	25	Migrant	2
P03	Male	35	Migrant	2
P04	Male	40	Migrant	4
P05	Male	26	Migrant	1
P06	Male	40	Migrant	1
P07	Female	23	Migrant	4
P08	Female	35	Migrant	2
P09	Male	24	Migrant	4
P10	Male	37	Migrant	3
P11	Male	26	Migrant	2
P12	Male	29	Migrant	1
P13	Male	27	Migrant	4
P14	Male	33	Migrant	4
P15	Male	36	Migrant	3
P16	Female	34	Migrant	3
P17	Male	28	Migrant	3
P18	Male	34	Migrant	4
P19	Male	38	Spanish	4
P20	Male	31	Spanish	3

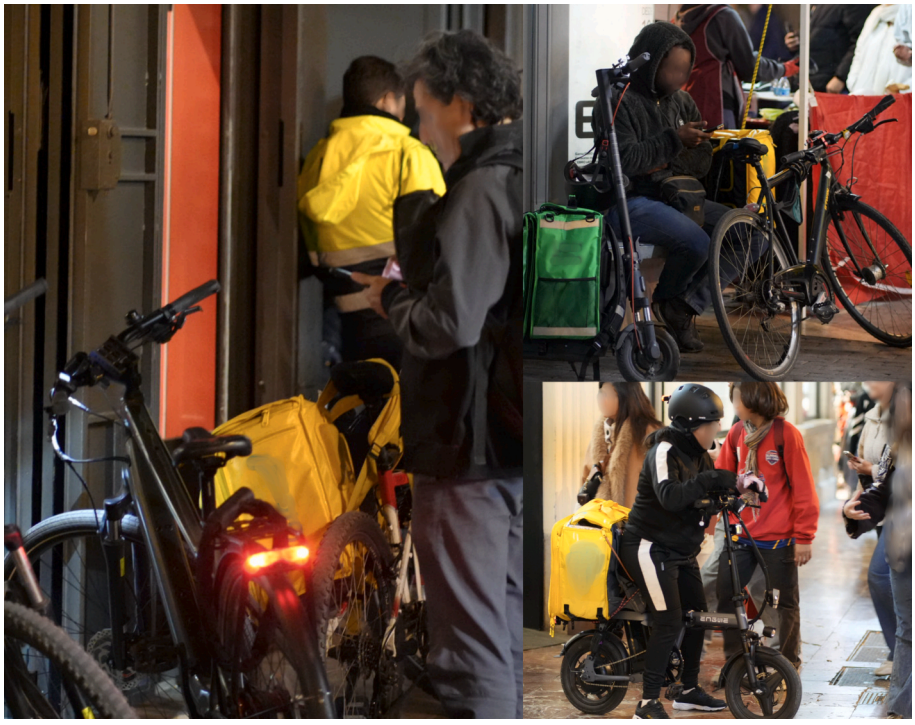

Fig. 1. Fieldwork snapshots of street-intercept recruitment. The left and top-right panels show typical situations in which potential participants were approached, while the bottom-right panel portrays a rider being approached on site (faces and brands blurred to comply with privacy and data protection regulations).

participants reported working "on behalf" of another individual legally registered on the platform, often through informal financial arrangements. This practice is widespread in the sector and creates a disconnect between the person performing the delivery and the legal contract holder.

2.2. Data collection

Semi-structured interviews were conducted in Spanish during the year 2025. The description of the setting, participants, and data collection procedures was informed by the COREQ criteria for interviews and focus groups (Tong et al., 2007).

Interviews typically lasted between 30 and 40 min and were conducted in quiet locations adjacent to pick-up points chosen by the participants, while not in the middle of these to avoid interferences. In addition to being active adult app-based bicycle delivery riders, participants were required to have fluency in spoken Spanish, as all interviews were conducted in this language. This helped to uniformly guarantee steady communication and allowed participants to describe their experiences in detail without the need for translation or interpretation. Only one single potential partaker was dismissed because of this requirement. Participants received a modest cash voucher for their time, which was explained in advance and was not contingent on the content of their responses.

The interview guide covered themes such as working conditions, safety perceptions, app-related pressures, social inclusion, and experiences of exclusion or discrimination. The topic guide, which is available in the Appendix (supplementary material) of this paper, was informed by previous work on gig-economy delivery, cycling safety and the health and social position of precarious workers, including both international studies, systematic reviews of the literature, and the research team's own prior work in these fields (e.g., Bajwa et al., 2018; Muntaner, 2018; Nguyen-Phuoc et al., 2022; Oviedo-Trespalacios et al., 2026; Salmon et al., 2023; Useche et al., 2025). Data collection took place after Spain's Rider Law had entered into force and after Directive (EU) 2024/2831 on platform work had been adopted at the EU level, so participants were working within a context of ongoing regulatory implementation (see Section 1.2).

The guide was first drafted around the core study questions and then refined after the initial interviews to clarify wording, adjust the order of prompts, and add probes for emerging issues (for example, informal account arrangements), while remaining sensitive to participants' vulnerabilities. A further advantage of this early refinement stage was that it served as an informal piloting process, allowing the research team to check that questions were understandable for riders with diverse migration and educational backgrounds (unnecessarily sophisticated terms were avoided and concrete examples were provided when needed), while preserving a comparable structure across interviews. All interviews were audio-recorded and transcribed verbatim.

2.3. Data analysis procedure

A reflexive thematic analysis was conducted to identify and interpret meaningful patterns in the data, following the six-phase procedure outlined by Braun & Clarke (2006, 2021) and Konstantinos (2024). This approach was selected for its flexibility and its suitability to capture both experiential accounts and socially constructed meanings in studies of precarious and structurally marginalized populations. The analysis began with repeated readings of transcripts to ensure familiarization and initial analytic immersion. During this phase, preliminary notes captured salient ideas, contradictions, and emotional tones. Inductive, data-driven coding then proceeded iteratively and without a pre-existing theoretical frame. Each transcript was coded line by line in NVivo (v14.4, QSR International), attending to language, tone, and context (see Bergin, 2018).

Initial codes covered recurrent elements in participants' accounts, such as "pressure from the app", "chasing orders", "informal accounts", "no insurance", "not a real worker", or "invisible in traffic". These codes were then examined for conceptual proximity and organized into broader candidate themes that mirrored how riders described safety, identity, and structural inequity. For example, codes related to time stress, near-misses and lack of support after crashes informed the first theme on safety perceptions and risk management, whereas codes on stigma, racialization, and legal liminality contributed to the second and third themes. In practical terms, codes were grouped into themes and subthemes based on conceptual relatedness, while also attending to outliers and disconfirming cases. The analysis preserved both semantic content (what participants said in everyday terms) and more latent readings connected to institutional, legal, or sociocultural conditions. Particular attention was paid to intersectional dimensions (for example, migrant status, gender, and perceived systemic treatment) that appeared throughout participants' narratives and shaped the salience of specific experiences.

Theme development followed an iterative, recursive process. Overlapping categories were consolidated, boundaries were reviewed against the coded corpus and the full dataset, and themes were defined and named in relation to the study's aims and guiding questions. Verbatim quotations were selected to illustrate typical and divergent cases within each theme, maintaining proximity to participants' lived experiences while offering a broader interpretation of structural and occupational processes. Methodologically, this inductive logic was preserved throughout to avoid imposing pre-existing frameworks on participants' narratives (Nowell et al., 2017; Tracy, 2010). Details on rigor and trustworthiness are provided below (see Section 2.3.1).

2.3.1. Methodological rigor and analytic integrity

To address common critiques of qualitative designs, we combined explicit analytic procedures with transparency about decisions and limits (Braun and Clarke, 2006, 2021; Nowell et al., 2017; Tracy, 2010). Coding was inductive and iterative, oriented to meaning rather than frequency alone. A second researcher reviewed a subset of transcripts to probe early interpretations, challenge theme boundaries and seek disconfirming cases; the goal was analytic dialogue, not coefficient estimation. In keeping with reflexive thematic analysis, inter-coder reliability was not calculated, since such metrics are not aligned with the epistemological stance of this approach (Braun & Clarke, 2021). Instead, we prioritized clarity of the coding frame, auditability of changes and explicit rationale for theme consolidation.

Credibility was supported through prolonged engagement with the material (multiple readings and memoing), constant comparison across cases and the inclusion of both typical and divergent quotations for each theme (Nowell et al., 2017). Transferability was addressed by providing contextual information on participants and setting so readers can judge applicability to other contexts. Dependability was enhanced by maintaining an audit trail (dated memos, evolving code lists and versioned theme maps) and by peer debriefing on emergent interpretations. Confirmability was supported by reflexive notes on the research team's assumptions and prior work with cycling safety and platform labor, and by documenting how those assumptions were examined during analysis (Oviedo-Trespalacios et al., 2026; Tracy, 2010).

Regarding sample adequacy, and while its size was still modest, we monitored theme sufficiency rather than adopting a fixed threshold for saturation (Hennink et al., 2019; Hennink and Kaiser, 2022). Interviews continued until additional material provided minor variation without substantively changing theme definitions (Braun & Clarke, 2021; Nowell et al., 2017). This range is consistent with prior work suggesting that, for relatively homogeneous samples, around twenty interviews often provide sufficient information power to capture core patterns while avoiding unnecessary redundancy (Guest et al., 2006; Hennink et al., 2017). Finally, we report semantic content alongside more latent interpretations that relate accounts to structural conditions (for example, legal status, documentation and infrastructure), while keeping

quotations close to the lived experience described by participants (Braun & Clarke, 2006; Bergin, 2018).

2.4. Ethics

This study received ethics approval from the Ethics Committee of the Research Institute on Traffic and Road Safety at the University of Valencia, supporting its adherence to the ethical principles applicable to this type of research (IRB number HE002101224). All participants provided informed consent after a plain-language overview of the study aim, procedures, potential risks, research value, and data handling. Participation was voluntary and completely independent of employers, platforms, or public authorities.

Given potential legal and employment vulnerabilities, we prioritized full confidentiality and risk minimization. Only essential identifying data were collected. Potentially identifying details in quotations were generalized or removed. When relevant (for example, when a rider had migrant status), the interviewer clarified that the study was independent of work evaluation and immigration processes.

3. Results

Before turning to the themes, it is worth briefly recalling the composition of the sample. The 20 participants (14 men, 5 women, 1 non-binary; mean age 31.2 years, SD = 5.70) reported an average of 2.75 years (SD = 1.16) of experience in last-mile food delivery. Nearly all were migrants, most of them working under informal or irregular arrangements, and only two riders self-identified as Spanish nationals (see Table 1).

The reflexive thematic analysis identified three interrelated yet distinct themes: (1) safety perceptions and risk management under digital and urban pressures; (2) social identity and recognition within cycling and urban spaces; and (3) perceived inequity and exclusion linked to legal status, protections, and institutional treatment, as well as its potential implications on safety issues.

Together, these themes addressed both individual experiences and system conditions, e.g., how riders deal with risk in daily work, how they see their place within labor and cycling frameworks, and how they understand the institutional, legal, and urban contexts shaping their jobs. To favor interpretability, each theme is presented below with selected quotations that show recurring views and relevant contrasts across respondents.

3.1. Safety perceptions and risk management

The interview contents suggested a widespread perception among riders that working in food delivery involves dealing with constant urban risks without clear institutional safeguards. Participants consistently expressed concerns about the hazardous nature of their work. Most of them described feeling physically unprotected and symbolically peripheral within the city's mobility dynamics. Safety was seen as a matter of personal improvisation rather than a right ensured by the platform or public infrastructure.

One participant captured this tension clearly: "*You're just feeling not welcome. Not by cars, not by pedestrians. You're in between. But that means no one sees you as having the right to be there*" (P11, male, 26). This quote illustrates a common experience of spatial ambiguity. Riders occupy an undefined zone between pedestrian and motor traffic, which limits their legitimacy in either space and increases their exposure to conflict.

Several participants described how repeated incidents of hostility, near-misses, and physical danger shape their routines and mindset. For some, this led to an unsettling form of normalization. "*At the beginning, I used to get scared. Now I just hope it's not serious if it happens. That's how it goes*" (P20, male, 31). The quote suggests a shift from anxiety to resignation, an emotional adjustment to occupational risks that are perceived as inescapable.

The lack of support following incidents was another consistent theme. As one rider recalled: "*I've been hit twice, and both times the platform just asked if I was going to finish the delivery*" (P17, male, 28). For many (including the quoted individual, who later reconfirmed this interpretation), this represented a broader feeling of disposability. Crashes and injuries, far from prompting concern or structural change, were viewed by the platforms as minor operational disruptions.

Some participants described a kind of double-bind when interacting with urban traffic. One interviewee explained: "*No one respects us. If you stop, they yell. If you go, they insult you. You just try to disappear*" (P12, male, 29). This suggests a coping strategy based on withdrawal: reducing one's presence, avoiding confrontation, and minimizing conflict even at the cost of personal agency. For many riders, staying safe involved not only using traffic environments but managing interpersonal friction in environments where they are not perceived as legitimate road users.

Together, these accounts suggest that for many riders, managing risk is not only physical but also psychological. Their strategies blend adaptation, resignation, and improvisation, often without external validation or support. Also, although all were experienced riders, they reported feeling vulnerable in traffic and under continuous pressure to monitor their phones for app notifications and delivery updates: "*I don't ride anymore like I used to before this job. Now I'm always checking the phone, the map, the next order… You can't pay full attention to traffic*" (P17, male, 28).

This digital pressure was often cited as a source of distraction that increased the risk of crashes. Several participants reported near-miss events or crashes directly linked to app use while riding: "*One time I crashed with a parked car because the app froze. I was looking at it, trying to refresh it, and didn't see the car*" (P14, male, 33).

Few riders wore high-visibility clothing or helmets, either due to cost or discomfort. Formal compliance with traffic safety norms was inconsistent, and most riders admitted to occasional violations, including red-light running or riding against traffic when under time pressure: "*We do what we have to do to deliver on time. No matter if you follow all the rules, the algorithm punishes you to assume some risks*" (P02, non-binary, 25).

3.2. Social identity and urban recognition

In addition to safety issues, a recurrent theme was the perceived ambiguity of riders' place within the urban and social fabric. In other words, riders articulated a sense of social invisibility – being omnipresent in urban streets but largely ignored in terms of recognition, rights, or value. The experience of working in last-mile delivery was described not just as a job, but as a condition of symbolic marginality, in which one's identity is shaped and constrained by the algorithmic logic of the platform and the ambivalence of public perception.

This was clearly expressed by one participant: "*We work in the city, but it's like the city doesn't work for us*" (P10, male, 37). Despite contributing to a visible and essential service, riders often felt excluded from the benefits, infrastructure, and civic support that other workers might take for granted. This exclusion was not just administrative but also affective – an absence of recognition from urban systems and their inhabitants.

The centrality of the app in determining one's professional fate was also emphasized. As one rider put it: "*The app decides how much I run, where I go, if I'm late, if I earn more or less. Everything depends on the app*" (P05, male, 26). For many, the platform was not simply a tool, but an opaque arbiter of value, time, and identity. Several participants spoke of the app with a mixture of resignation and dependence, seeing it as both indispensable and indifferent.

Against this backdrop, informal rider communities took on heightened importance. Many participants described a daily routine structured around relationships with other riders, which became central not only to work but also to social life. As one female rider shared: "*You ride, eat, share, even live with other riders. This work ends up deciding your whole life:*

your friends, your neighborhood, your time" (P16, female, 34). This comment points to how occupation and identity become intertwined, shaping patterns of residence, sociability, and belonging.

However, such networks also carried tensions. Some riders mentioned internal competition and fragmentation driven by the app's bonus systems and ranking metrics. Still, in the absence of institutional representation, peer connections provided a minimal sense of stability and solidarity. Recognition, when it existed, came from others in the same precarious situation – not from the system in which they operated.

3.3. Inequity, legal precarity, and structural exclusion

A third theme that emerged strongly involved feelings of injustice and structural exclusion, especially among migrant riders. Many described working under borrowed accounts due to legal or administrative barriers, which left them in vulnerable positions and without access to the limited rights afforded to officially registered riders. Delivery riders often linked their experiences to broader patterns of social inequality. Many felt that their migratory background and legal status intensified their vulnerability:

One participant explained: "*I work using someone else's account because I have no papers. If something happens, I can't report it because officially, I don't exist*" (P12, male, 29). This practice, frequently mentioned in interviews, illustrates a system where informality becomes the norm. It not only undermines safety, insurance, and legal protections but also fosters dependency on intermediaries who control account access. Riders in this situation reported a lack of control over their own status, often fearing both the platform and the account holder.

Exclusion, explicitly related by participants both to the lack of job opportunities outside this sector and to riders' position as 'very particular' road users, was not only procedural but existential. Riders described how their presence in the city was tolerated only as long as they fulfilled deliveries, but interaction with other types of users, or their companies themselves, remained in a "latent tension". One interviewee summarized this experience: "*You're only useful if you deliver. Not if you complain, not if you get injured. Same happens with cyclists and pedestrians; they will stand you as long as you don't make trouble*" (P13, male, 27). Here, recognition is framed as strictly transactional, conditioned on compliance and uninterrupted productivity.

For several riders, the combination of informal status, opaque rules, and public indifference produced a general sense of mistrust. As one participant put it: "*We don't trust the app, the company, the police. Only each other. That's the reality*" (P14, male, 33). This statement suggests a perception of systemic abandonment, in which riders construct their own networks of reliability in response to institutional silence.

While regulatory debates were not analyzed in depth, some participants explicitly connected these vulnerabilities to ongoing discussions about riders' rights. One rider contrasted public narratives about new protections with his own situation: "*They say there's a law now for riders, but on the street everything works the same. I'm still on someone else's account, and if something happens to me… who has to deal with it?*" (P15, male, 36). Another participant emphasized the gap between media coverage and actual street-level conditions: "*On TV they talk about new rules for platforms, but for us it's still the same story: no real formality in practice, and nobody we can go to when there's a problem, no matter if you're Spanish or not*" (P19, male, 38). For these riders, legal reforms were visible as public discourse but not yet as tangible protection, reinforcing the sense that institutional promises remain distant from street-level realities.

Finally, regarding perceived rewards at work, they overall described being paid below minimum wage after platform commissions and informal arrangements with account holders. Some worked 10–12 h a day without health coverage or formal guarantees: "*We don't have contracts, insurance, nothing. If I get injured, it's on me. And still, I have to pay a percentage to the guy whose account I use*" (P11, male, 26). For several riders, this combination of long hours, high dependence on per-order pay, and constant deductions reinforced the idea that they were "always owing something to someone" (P10, male, 37), even when their work kept the delivery system running on a daily basis.

4. Discussion

The findings of this qualitative study offer a grounded account of the working and social conditions experienced by bicycle food delivery riders in Spain and make three specific contributions to current research and practice. First, they bring together safety, identity, and equity in a single analytic frame, showing how exposure to traffic risks, experiences of stigma, and legal or institutional liminality are connected in riders' everyday work. Second, they center migrant riders' voices in a regulated European setting, suggesting that the introduction of the *Rider Law* and related reforms has not removed the structural vulnerabilities associated with informal arrangements and algorithmic management. Third, they add qualitative depth to survey-based evidence on job demands, safety climate, and health outcomes in last-mile delivery work by documenting how these processes are perceived and negotiated at the street level.

Taken together, these contributions are relevant both for debates on platform work regulation and for the design of occupational safety measures that do not reduce risk to individual behavior alone. Importantly, the voices collected in this study suggest that both riders' vulnerabilities and their influence on safety issues are neither isolated nor incidental, which aligns with prior studies indicating that last-mile delivery riders occupy one of the most precariously situated positions in contemporary urban economies (Popan, 2024; Useche et al., 2025). Rather, they appear as cumulative outcomes of interlocking constraints: the algorithmic organization of time, the absence of formal representation, and the normalization of informal work arrangements. In this sense, the experience of riding is not only occupational but existential, embedded in broader patterns of spatial, legal, and social exclusion (Christie & Ward, 2019; van Doorn, 2017). Similar perspectives have been reported in ethnographic accounts from other European and Latin American cities, where delivery riders describe precariousness as a condition that extends well beyond the scope of individual choice or risk tolerance (Boniardi et al., 2024; Haidar, 2023).

What follows is, therefore, not a call for narrow safety training or isolated behavioral improvements. Instead, it examines how the organization of platform labor shapes and sustains unequal conditions of risk and recognition. The following subsections are structured around the study's guiding questions and results, clarifying how riders' accounts point to tensions among safety, identity, and structural equity, and how those tensions emerge across organizational, legal, and urban layers without reducing them to individual behavior.

4.1. May safety be shaped by digital demands and working precarity?

The accounts provided by participants support the idea that last-mile delivery by bicycle is commonly perceived as physically and cognitively demanding, often to the point of being described as unsafe or "mentally exhausting". Consistent with the first guiding question (Q1), riders reported the need to use urban infrastructure at high speed, frequently under adverse weather conditions and in traffic environments that do not accommodate their presence. These elements were compounded by algorithmic pressures that prioritize speed and delivery volume, limiting riders' autonomy over routes and schedules. Notably, the notion of "pressure from the app" was not merely metaphorical; it was reported as a tangible force shaping behaviors, choices, and perceptions of self-worth during working hours.

Empirically, this aligns with evidence indicating that platform-driven time pressure increases crash risk and risky behaviors among riders (Lin & Jia, 2023; Oviedo-Trespalacios et al., 2022; Nguyen-Phuoc et al., 2022), in addition to fatigue and poor recovery time between shifts (Apouey et al., 2020). This is coherent with riders' perceptions of exposure and stress, which show predictive links to self-reported crash

rates in interview and survey studies of urban cycling risk (Gregory, 2021; Useche et al., 2024). Several participants described adopting unlawful maneuvers, such as using sidewalks or ignoring traffic lights, not as disregard for rules but as coping strategies within a system that incentivizes speed over safety.

Regarding other fatigue-related factors for riding safety, mental overload was a recurring theme. Riders described an "invisible tension" of constantly checking the app, staying alert to orders, and avoiding fines or penalties, while facing risky road conditions. These findings resonate with research on digital fatigue and cognitive strain in platform work (Graham et al., 2020; Useche et al., 2024; Zheng et al., 2019), where real-time monitoring and algorithmic nudging impose continuous attentional demands. Some participants noted that interface features (sound alerts, countdown timers, notification pings) contributed to heightened stress and a reduced sense of control.

In sum, the perception of safety among bicycle delivery riders cannot be understood independently from the digital and urban environments in which they operate. It is not merely about traffic or helmet use; it involves a broader set of pressures, precarity, and spatial exclusion, as discussed in recent literature on gig work and occupational risk (Rosenblat and Stark, 2016; Yoo et al., 2024). Riders' accounts suggest that safety is experienced not only as a physical condition but also as a relational and psychological burden mediated by platform dynamics, which invites individual and collective risk-handling strategies that are still unevenly developed.

Finally, while some riders reported informal strategies to manage risk (for example, slowing down during rain, coordinating breaks with peers), the absence of formal guidelines or platform accountability creates an unstable safety environment. These patterns are consistent with findings from other European settings, where riders similarly reported self-managed coping mechanisms in the absence of employer safeguards (Boniardi et al., 2024).

4.2. Fragmented identity and exclusion from social frameworks

The second guiding question (Q2) examined whether delivery riders experience identity fragmentation and exclusion from both labor frameworks and urban cycling cultures. In our results, participants repeatedly conveyed the idea that they "do not belong" (neither to mainstream labor structures nor to traditional cyclist communities).

This tension between visibility and invisibility has been discussed as a marker of precarious mobile work (Popan, 2024). The riders' accounts suggest identities shaped at once by economic need and social othering: wearing the brand of a well-known delivery platform becomes a temporary gateway to income and a signifier of marginal status. These descriptions reflect symbolic marginalization that extends beyond occupational status and into the urban fabric. In line with this, van Doorn (2017) has pointed to the construction of "disposable labor" identities among platform workers, especially in cases involving migrant status or irregular work conditions.

Moreover, as noted in the results, several riders reported that their presence on the road is misunderstood or ignored, with some feeling excluded from recognition as legitimate road users. In this sense, the data aligns with prior evidence indicating that gig-economy labor often lacks the symbolic frameworks of value attributed to traditional employment (Apouey et al., 2020; Popan, 2024). The sense of not being acknowledged (as workers, as traffic participants, or as members of the broader community) reinforces perceptions of occupational and civic invisibility.

Regarding social cohesion, the collective relationships forged through this type of work were frequently described as shaped by isolation. While some riders reported forming networks with others in similar situations, many spoke of solitary routines and limited interpersonal recognition. This finding echoes Rosenblat & Stark's (2016) analysis of Uber drivers, where algorithmic control systems eroded traditional forms of worker solidarity and social cohesion.

Notably, identity also intersected with gender. Female and non-binary riders, though fewer in number, described more frequent episodes of road harassment (Laskaris et al., 2024), feelings of vulnerability, and a lack of legitimacy as cyclists, echoing evidence from collective experiences such as the COVID-19 pandemic (Beckman et al., 2021; Nguyen et al., 2023; Vecchio et al., 2022). While some participants emphasized resilience and adaptability, others highlighted the toll of interacting with urban space and social identity under precarious and sometimes hostile conditions.

These accounts point to a degree of ambiguity in how society positions app-based delivery riders. Overall, participants described not being treated as workers in the conventional sense nor as ordinary users of public infrastructure. In this light, the occupational identity portrayed in these voices may be read as grounded less in formal contracts and more in everyday experiences linked to moving through the city, platform rules and metrics, and forms of social exclusion. Work on self-representation among Spanish riders is consistent with this reading, showing how digital spaces are used to seek belonging while simultaneously exposing precarity (Pires et al., 2024). Also interestingly, the narratives here also make one think of limited integration with other urban users; where affinities appear, they seem contingent and mode-related, for example with cyclists or e-scooter riders. Taken together, the outcomes for this question can be interpreted as a common sentiment: riders seldom feel acknowledged as fellow users of public space, and they report remaining largely absent from urban policy frameworks and mobility planning (Zheng et al., 2019).

4.3. Systemic inequity and structural marginalization

A substantial share of the testimonies collected suggests a perception of systemic unfairness in how delivery riders are treated by both platforms and broader institutional systems. Participants often described working conditions marked by instability, exploitation, and limited access to basic protections (see Mao et al., 2025; Useche et al., 2025). While focused on a small sample of delivery riders (this must be accounted for at interpreting this study's data), these narratives are consistent with prior evidence documenting health and social vulnerabilities among workers in app-based delivery, particularly those operating under informal arrangements or without documentation (Apouey et al., 2020; Bajwa et al., 2018).

Moreover, beyond platform design, a considerable proportion of the interviewed riders pointed to legal and administrative status as a source of exclusion. Several reported lacking valid documentation or working through borrowed accounts, a practice that appears to foster informal arrangements with minimal legal protection. This precariousness, often normalized by both users and riders themselves (see Belanche et al., 2021; Yoo et al., 2024), can be interpreted as part of broader structural inequalities in access to secure employment and social rights. Connections among documentation status, economic dependence, and marginalization have been noted in comparative studies across multiple countries (Gregory, 2021; Christie & Ward, 2019).

Importantly, these perceptions of exclusion do not seem confined to work-related conditions. Many participants described feeling unsupported by institutions, with little or no assistance in cases of road crashes, wage disputes, or work-related stress. Their accounts align with findings that suggest gig workers, especially those engaged in delivery work, frequently remain beyond the reach of formal labor protections and occupational safety enforcement mechanisms (Boniardi et al., 2024; Mai et al., 2025). Also remarkably, participants also indicated that perceived inequity is not solely about low wages or long hours. Rather, it includes a broader sense of being kept at a distance from both labor protections and civic recognition. This reading echoes arguments that precarity and exclusion may be features of platform design and governance, particularly for racialized and migrant workers (van Doorn, 2017).

Several participants also linked these experiences of marginalization

to recent regulatory debates, echoing the views reported in Theme 3. While some were aware of the Rider Law and the EU Directive, they often perceived limited concrete change in their day-to-day conditions and expressed uncertainty about how strongly these measures would be enforced. In their view, improved legal status would only mitigate feelings of invisibility if accompanied by effective enforcement, access to protections regardless of documentation status, and meaningful inclusion in urban mobility planning and occupational safety policies. For many, possible solutions involved not only clearer contracts and insurance coverage, but also being recognized as legitimate users of public space and as workers whose safety and dignity merit institutional attention.

Bearing in mind previous experiences in other sectors of the gig economy (see Kaviani et al., 2025; Salmon et al., 2023; Vallas & Schor, 2020), these patterns are compatible with broader analyses of further groups that describe power imbalances between platforms and workers and limited institutional channels for redress or advocacy (Jing et al., 2023; Muntaner, 2018). As some participants noted, the structure of the work can influence "where they live", "how they relate to others", and even "how they appraise future prospects", which seems to have equity implications worth exploring further in subsequent studies. In other words, these results lend support to the view that rider marginalization is not simply an occupational matter, but a socially reproduced condition with potential long-term implications (Laskaris et al., 2024).

4.4. Limitations and further research

While this study contributes novel insights into the occupational and psychosocial experiences of food delivery riders in Spain, several limitations warrant attention. First, the small sample size (while typical in qualitative research) limits broader generalization and may underrepresent relevant subgroups, such as riders using different delivery modes or working under distinct platform conditions. In this case, our aim was not to establish saturation in a narrow, positivist sense but to reach adequate information power for a reflexive thematic analysis focused on riders' shared and divergent experiences (Hennink et al., 2017; Wutich et al., 2024). Moreover, our direct street-based recruitment strategy may have inadvertently excluded riders operating in more peripheral areas or those whose schedules prevented participation, a limitation also noted in comparable qualitative work (Gregory, 2021; Pires et al., 2024).

Second, although gender and migration status were considered in sampling, the resulting composition (i.e., mostly male, migrant, and young-mid adult) exposes existing gendered and racialized patterns in the sector (Bajwa et al., 2018; van Doorn, 2017). As a result, the specific experiences of women, non-binary riders, or riders with regularized legal status remain underexplored. Future studies should address this imbalance using purposive sampling strategies or co-designed methodologies that better include underrepresented voices (Apouey et al., 2020; Christie & Ward, 2019).

Third, Spanish fluency was an inclusion criterion to ensure depth and accuracy in data collection. While justified on methodological grounds, this may have led to the exclusion of some of the most precarious riders that might remain underrepresented, even though they may face even greater risks and structural barriers, such as linguistic margination and isolated working. Thus, considering these dynamics using culturally adapted approaches could enrich future findings and may benefit similar research in other contexts (Beckman et al., 2021).

Additionally, as in many interview-based studies on sensitive topics, the possibility of recall bias, memory distortions, or socially desirable responding must be considered. Riders may have omitted, downplayed, or reformulated specific episodes (consciously or not) due to social pressure or the psychological processing of distressing experiences (Deeb et al., 2024; Montes et al., 2024). While the rapport established during interviews aimed to reduce this bias, future work could consider complementary strategies such as repeated sessions, visual elicitation, or participant journaling to enhance data accuracy.

Further research is needed to deepen the understanding of platform-mediated work risks by triangulating qualitative evidence with quantitative measures (e.g., survey-based assessments or administrative data) and by comparing diverse regulatory contexts, including traffic safety enforcement (Alonso et al., 2025). In particular, the intersection of algorithmic control, occupational precarity, and health risks among migrant delivery riders remains an underdeveloped but pressing area of inquiry (Dong et al., 2025; Vignola et al., 2023).

Moreover, although the study focuses on Spain, several of the mechanisms described here are likely to be relevant in other countries where platform-mediated delivery work is being regulated under similar principles, particularly within the EU. Pressures arising from algorithmic allocation of tasks, informal account arrangements and migrant riders' limited access to protections have been documented in different settings and do not depend exclusively on the specifics of the Spanish *Rider Law*. At the same time, transferability should be judged in light of local institutional details, such as the strength of labor inspection, the configuration of social protection systems, and the availability of cycling infrastructure. Our findings, therefore, offer analytical cues rather than ready-made generalizations.

5. Implications for policy and practice

At a practical level, the results of this qualitative study stress the need to reconsider how last-mile delivery riders are positioned within urban and labor policy, in line with systems analyses of gig-economy delivery work and precarious employment more broadly (Bajwa et al., 2018; Muntaner, 2018; Salmon et al., 2023). Based on these results, measures aimed at increasing road safety for cyclists should incorporate the specific needs and working patterns of platform riders, who often operate under different logics of time, visibility, and risk. Similarly, labor protections should extend to informal workers operating "on behalf" of others, acknowledging the legal gray zones many occupy and the consequences this has for access to insurance, safety training and follow-ups, equipment, and representation. This direction is consistent with systems analyses of gig-economy delivery work and precarious employment, which suggest that meaningful improvements in safety and health require strong formal protections and active enforcement rather than informal delegation of risk to individual workers (Christie & Ward, 2019; Muntaner, 2018; Vignola et al., 2023).

From an occupational safety standpoint, interventions should not focus only on individual behavior but also address the conditions that encourage unsafe practice (e.g., strict delivery windows, rating penalties, or lack of recovery time), as highlighted in studies linking job demands, safety climate, and risk outcomes in last-mile delivery workers (Nguyen-Phuoc et al., 2022, 2025; Oviedo-Trespalacios et al., 2022; Useche et al., 2025). In concrete terms, jurisdictions and platforms might benefit from reviewing time targets, ensuring support for injured riders regardless of documentation status, facilitating incident reporting without penalty, and including rider representatives in local transport planning (particularly around pickup zones, curb access, and high-demand corridors). These recommendations are consistent with studies showing that job demands, safety climate and road infrastructure jointly shape risk in last-mile delivery work (see Nguyen-Phuoc et al., 2025; Useche et al., 2025).

In practice, the study suggests that promoting safer, fairer conditions for bicycle food delivery riders is more likely when actions operate on several levels at once: legal recognition and clear status determination; mobility design that considers riders as regular users of public space; and platform policies that promote transparency, adequate protections, and a reframing of platform work as a legitimate component of the urban labor force. In line with previous research, this perspective supports the view that improvements in riders' safety and health are more likely when regulatory, infrastructural, and organizational measures are implemented together rather than in isolation (Bajwa et al., 2018;

Salmon et al., 2023).

6. Conclusions

This study examined the perceived challenges faced by food-delivery riders in Spain (with particular attention to migrant voices) by gathering accounts of safety, identity, and exclusion. The analysis speaks to the three guiding questions proposed and suggests that digital labor sits within, and is conditioned by, broader social and infrastructural arrangements that shape everyday mobility and work.

First, participants' accounts indicate that perceived safety is influenced not only by traffic and road conditions, but also by systemic pressures such as time constraints, algorithmic demands, and limited access to formal training or protection. Taken together, these factors can be read as shaping risk exposure more strongly than individual behaviors or attitudes, which helps explain why safety concerns are often managed under precarious and externally imposed constraints.

Second, riders frequently reported a sense of invisibility, stigma, and racialization in interactions with other road users and institutional actors, and linked it with safety-related practices and outcomes. These accounts make one think that occupational identity in platform work is tied to social and ethnic background, suggesting that food-delivery riders may experience economic precariousness alongside symbolic marginalization in urban space.

Third, voices in the sample often pointed to structural inequity, especially regarding institutional recognition, access to supportive urban infrastructure, and protection in the event of crashes or disputes. Many described a lack of support and representation, which can be interpreted as evidence that exclusion here is not merely a by-product of platform employment, but a more persistent condition shaped by legal, spatial, and discursive dynamics.

Overall, platform work is better understood when situated in its social and legal context. Riders' safety decisions appear conditioned by algorithmic incentives; compliance can be constrained when documentation is uncertain; and identity is negotiated amid limited formal representation. Improving conditions for food-delivery work therefore calls for measures that go beyond individual behavior and address the structural flaws that sustain inequality.

Funding disclosure

This work has been supported by the Project PID2023-152606OA-I00, funded by MCIN/AEI/10.13039/501100011033/ and by FEDER 'A way of making Europe', EU (Grant Recipient: Sergio A. Useche).

CRediT authorship contribution statement

Sergio A. Useche: Writing – review & editing, Writing – original draft, Visualization, Validation, Supervision, Resources, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Francisco J. Llamazares:** Writing – review & editing, Validation, Supervision, Resources, Methodology, Investigation. **Cristina Marin:** Writing – review & editing, Validation, Software, Resources, Project administration, Methodology, Investigation. **Oscar Oviedo-Trespalacios:** Writing – original draft, Visualization, Validation, Supervision, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation.

Declaration of competing interest

The authors declare the following financial interests/personal relationships which may be considered as potential competing interests: Sergio A. Useche and Oscar Oviedo-Trespalacios report a relationship with Elsevier that includes: board membership. If there are other authors, they declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgements

The authors of this manuscript would like to thank the participants and all those who contributed to the development of this research, particularly Teresa Ballester and Sergio Traficante, for their input and technical assistance, fieldwork, and validation of the protocols used. A special mention also goes to the TU Delft (The Netherlands) team for their methodological contributions to the data approach. Finally, the authors also thank the delivery platforms, whom we hope will ultimately benefit from the findings of this study, for their growing commitment to improving the safety, dignity, and welfare of their workers.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.ssci.2026.107180.

Data availability

Data will be made available on request.

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