

Rush Hours

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Rush Hours: The Risky Behaviours of Food Delivery and Non-Food Delivery Motorcycle Riders

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Abstract

The growth of the electronic economy has significantly transformed the food industry by offering alternative ways for customers and restaurants to interact and conduct transactions through online platforms. This shift has catalysed the growth of the food delivery sector, commonly referred to as P-hailing in Malaysia. However, this development has been accompanied by an increasing incidence of road traffic crashes involving food delivery motorcycle riders. The aim of this study was to compare the prevalence of risky riding behaviours between food delivery and non-food delivery motorcycle riders during rush hours using an observational study conducted in Shah Alam, Selangor, Malaysia. Observations were made during peak hours at six signalised intersections, with a total of 4,950 motorcycle riders observed, 52.3 percent of whom were identified as food delivery riders. Categorical data analysis methods were employed to assess differences in risky riding behaviours between these groups. The odds ratios for food delivery riders compared to non-food delivery riders were higher for mobile phone use while stopped (2.66 times higher), and mobile phone use while moving (2.49 times higher). In contrast, helmet non-use and running red lights was less common among food delivery riders. Although both groups exhibited higher percentages of signal violation and stopping beyond designated lines, no statistically significant differences were observed between the groups for these behaviours. These results provide critical evidence for policymakers, enforcement authorities, and platform providers to inform the development of targeted interventions and policies aimed at mitigating risky riding behaviours and enhancing the safety of both food delivery and non-food delivery riders.

Key findings

- Food delivery motorcycle riders are more likely to wear helmets compared to non-food delivery motorcycle riders
- Running red lights was less frequent among food delivery motorcycle riders compared to non-food delivery motorcycle riders
- Food delivery motorcycle riders frequently used phones while stopped and while moving
- Both motorcycle rider groups rarely used signals when making turns
- No significant difference was observed between the groups in wrong-way riding or stopping beyond designated lines

Introduction

The rise of electronic commerce (e-commerce) has altered the methods of buying and selling products globally. This transformative shift is evident in the expanding worldwide e-commerce market. For instance, the Boston Consulting Group estimates that e-commerce will account for 41 percent of global retail sales by 2027, a significant increase from just 18 percent in 2017 (Gregoire, 2023). Additionally, the report highlights that 7 percent of retail sales in the United States of America (US) and Asia are driven by e-commerce. In Malaysia, the e-commerce sector is growing rapidly and is projected to reach AUD \$22.7 (US\$14.7) billion by 2028 (FutureCFO, 2024). According to the International Trade Administrator US (2024), Malaysia stands out as an attractive e-commerce market in Southeast Asia, thanks to its robust economy and advanced digital infrastructure.

The adoption of e-commerce as a business model extends to various sectors, including food providers and restaurants. This shift gained momentum in early 2020, triggered by the global impact of the COVID-19 pandemic. During this period, both customers and restaurants increasingly relied on online platforms and delivery services for food markets. This trend continued in the post-COVID-19 era. In Malaysia, companies like FoodPanda, DeliverEat, ShopeeFood, Grab Food, Lalamove, Honestbee, and Running Man Delivery offer food delivery services. These enterprises have employed local motorcycle riders to transport food and parcels, leading to the emergence of a new job opportunity, predominantly as food delivery riders or parcel delivery known as P-Hailing riders in Malaysia. According to a survey conducted by the Bumiputera Agenda Steering Unit (TERAJU) in 2021, there are 70,000 food delivery motorcycle riders in Malaysia (Bernama, 2021).

The number of road traffic crashes involving food delivery riders has increased with the growing number of such riders on the road worldwide. For example, according to the Chinese General Administration of Public Security Traffic Police, 325 road traffic cases were reported in the first six months of 2019, resulting in five fatalities and 324 injuries (Jing et al., 2023). In Hanoi and Ho Chi Minh City, Vietnam, a study of 393 online food delivery riders revealed about 54 percent have been involved in at least one non-fatal road traffic crash in the last 12 months (Nguyen et al., 2023). In Thailand, 83 food delivery riders were involved in road traffic crashes in 2022, with 28 fatalities and 36 severe injuries (Mitch, 2023). In Malaysia, between 2018 and May 2022, there were 112 fatalities, 82 serious injuries, and 1,048 minor injury cases reported among food delivery riders, totalling 1,242 traffic crashes (Junaid et al., 2023). A study by the Malaysian Institute of Road Safety Research (MIROS) reported that 70 percent of food delivery riders were riding dangerously, especially during peak hours (Adib, 2021).

The present study was conducted to compare risky riding behaviours among food delivery riders and non-food delivery motorcycle riders during peak hours. In Malaysia, peak hours, typically between 7:00-9:00 a.m. and 5:00-7:00 p.m., pose significant risks for motorcyclists due to a com-

ination of factors (MIROS, 2012). High traffic volume during these times leads to congested roads, making navigation more challenging for motorbikes. This is exacerbated by the rush of commuters during these hours, often resulting in hurried and aggressive driving behaviours. Motorcycles, with their reduced visibility and manoeuvrability in heavy traffic, are particularly vulnerable. In the afternoon peak, drivers and motorcycle riders may also be experiencing fatigue, impairing their reaction times and decision-making abilities. Environmental conditions, such as lower light during early mornings or late afternoons and sudden weather changes common in tropical climates, further compromise visibility and road safety (MetMalaysia, 2022). Moreover, the pressure on delivery riders to meet tight schedules can lead to riskier behaviours (Nguyen et al., 2023). Coupled with potentially inadequate road infrastructure to handle peak hour traffic, these factors collectively heighten the dangers faced by motorcyclists in urban settings.

In this study, seven risky behaviours were observed, including helmet non-use, red light running, mobile phone use during stops and while moving, turn signal neglect, riding in the wrong direction, and stopping beyond the designated stop line. The findings of this study offer valuable insights into the distinctive challenges faced by food delivery riders in maintaining road safety compared to their non-food delivery counterparts. These insights are crucial for relevant authorities to develop targeted awareness programs addressing the specific needs of both types of riders.

Literature Review

Several risky riding behaviours have been identified as contributing factors to the increasing number of traffic crashes among food delivery motorcycle riders. A study in Great Britain among gig workers identified that gig workers are more likely to engage in traffic violations, such as speeding and running red lights (Christie & Ward, 2023). In Thailand, primary causes include speeding, lane violations, mobile phone usage while riding, and time pressure for timely deliveries (Mitch, 2023). Nguyen et al. (2023) also reported that using a mobile phone while riding, neglecting turn signals, running red lights, riding when tired or sleepy, and speeding were the most common risky riding behaviours associated with crashes. Nguyen-Phuoc et al. (2022) identified that compliance with road rules among food delivery motorcycle riders was influenced by the organisational factors of the platform, often resulting in a significant willingness to break the road rules in Vietnam. A study conducted by MIROS revealed that approximately two-thirds of delivery motorcycle riders disobeyed traffic rules, and about one-third engaged in serious safety violations (e.g., hold phones while riding, red light violations, illegal U-turns, riding in the wrong direction) (Dave, 2020).

Studies in Malaysia have also identified crash risk factors and behaviours among food delivery motorcycle riders. Through online and face-to-face interviews among food delivery riders in Shah Alam, Selangor, Tuah et al. (2022) identified red light violations, speeding, and slippery road conditions as factors associated with road traffic crashes.

Interestingly, the study also reported that traffic crashes were not significantly affected by delivery time frames. Another study in Malaysia observed 19,803 food delivery riders and reported that 44.1 percent stopped beyond the designated stop line, 32.3 percent were not wearing appropriate shoes, and 10.7 percent rode through an intersection against a red traffic light (Malik et al., 2023). The study also highlighted additional risky behaviours among food delivery riders, including the use of mobile phones (2.8%), abrupt lane changes (1.0%), possession of an incomplete set of side mirrors (0.6%), and unfastening of helmets (0.4%). Zulhelmi Mansor, the president of the Malaysian P-Hailing Association, PENGHANTAR, noted that crashes involving P-hailing riders could also be attributed to a lack of safety awareness (Bernama, 2022).

One useful framework for understanding the behavioural patterns of food delivery riders is the Job Demands-Resources (JD-R) Model, which has been adapted in recent transport safety research involving gig workers (Nguyen-Phuoc et al., 2022). The JD-R model posits that an individual's job demands, such as time pressure, high workload, and customer deadlines, can lead to stress and potentially unsafe behaviours, especially when these demands are not balanced by adequate job resources, such as training, support, or rest periods. In the context of food delivery, riders often operate under tight time constraints and performance-based pay structures, which may increase their likelihood of violating traffic laws to meet delivery targets. This framework supports the argument that organisational and platform-level factors, alongside environmental and personal variables, contribute significantly to the emergence of risky riding behaviours. Integrating the JD-R model helps explain how systemic pressures may shape individual-level actions, offering a deeper understanding beyond surface-level behavioural observations.

Wearing a helmet is a mandatory safety requirement for all motorcycle riders in Malaysia. Proper helmet usage is crucial for preventing or mitigating injuries in the event of a crash. This study aims to investigate and compare helmet usage between food delivery riders and non-food delivery riders. It should be noted that most food service providers determine a rider's income based on the number of deliveries completed, this may contribute to an increased likelihood of a rider violating traffic laws. In this study, red light violation was also observed and compared between food delivery riders and non-food delivery riders.

Further, the use of mobile phones introduces another dimension of risk among food delivery riders, whether it is used to check service provider systems or for navigation while delivering food. This study examined two types of mobile phone use: during stops at signalised intersections and while moving. Previous research conducted in Kemaman, Terengganu, revealed a tendency among motorcyclists to neglect signalling when making turns at signalised intersections (Rusli et al., 2020). This risky behaviour was also a focus of observation in the current study in addition to riding in the wrong direction and stopping beyond designated stop lines. Findings from Rusli et al. (2021) indicated that over 60 percent of 3,191 observed motorcyclists in

Kuala Terengganu, Terengganu, were observed stopping on pedestrian crossings, highlighting the prevalence of such risky behaviours.

Method

Data Collection

This study used an observational field survey to assess risky riding behaviours among both food delivery riders and non-food delivery riders at six signalised intersections in the Shah Alam City Centre, Selangor, Malaysia. Based on the record from Shah Alam City Council (MBSA), Shah Alam has a total population of 650,000 inhabitants and crosses an area of 290.3 km² (MBSA, 2023). The six signalised intersections selected for this study were located within the city centre and were chosen to reflect a diversity of intersection types and surrounding land uses, including commercial, institutional, and mixed-use areas. Selection criteria included high motorcycle traffic volume, presence of food delivery activity, and safe visibility for manual observation. This purposive sampling strategy was intended to capture a representative range of motorcycle rider behaviours across different traffic and environmental contexts. Although intersection type was not included as a variable in the statistical models, the selection approach ensured contextual variation that supports the generalisability of the findings. Future studies are encouraged to incorporate intersection-specific attributes into the modelling framework to explore their potential influence on rider behaviour.

Observations were conducted for two hours at each site, comprising one hour during the morning peak (7:00-8:00 a.m.) and one hour during the evening peak (5:00-6:00 p.m.). These time slots were chosen to capture rider behaviours during periods of high traffic volume and active delivery operations, which are typically associated with increased time pressure and congestion. All observations were carried out during daylight hours and under dry weather conditions to ensure clear visibility and consistency in data recording across all sites. Manual data collection was conducted by two research assistants at each designated site. Throughout the data collection phase, the research assistants were strategically positioned in secure locations with unobstructed views of the intersections. Data were manually recorded using printed paper-based observation checklists designed to capture all seven targeted rider behaviours in a structured format including: helmet non-use, red lights violation, using mobile phones during stops or while moving, signals non-use, riding in the wrong direction, and stopping beyond designated stop lines.

Food delivery riders were identified based on the use of platform-specific, branded food delivery boxes, primarily from services such as FoodPanda, GrabFood, and ShopeeFood. These boxes were typically insulated and prominently marked. Identification was based on the assumption that the presence of the box meant the rider was working. There was no way to verify that the rider was not working or commuting. Non-food delivery riders com-

prised two distinct groups: (i) riders affiliated with parcel or courier services, such as Lalamove, Shopee, and J&T Express, who used non-food delivery boxes with different branding or platform logos; and (ii) regular motorcyclists travelling without a delivery box, it was assumed they were not engaged in any form of commercial delivery. This classification relied on visible cues such as platform branding and equipment, enabling consistent categorisation during field observations.

Data Analysis

To examine differences in risky behaviours performed by food delivery and non-food delivery motorcycle riders, a disaggregate analysis was conducted using categorical outcome measures. Two outcome metrics were considered: the number of riders exhibiting each risky behaviour within each group and the corresponding percentage. The analysis focused on seven types of risky riding behaviour: helmet non-use, red light violation, mobile phone use while stopped, mobile phone use while moving, failure to use turn signals, riding in the wrong direction, and stopping beyond the designated stop line. Chi-square tests were performed using contingency tables to determine whether statistically significant differences existed between the two rider groups. In addition, odds ratios were calculated to estimate the relative likelihood of each behaviour occurring in one group compared to the other, thereby assessing the strength and direction of the associations.

Results and Discussion

In total, 4,590 riders were observed, with food delivery riders accounting for 52.3 percent of the riders observed. [Table 1](#) shows the 2 x 2 contingency tables comparing risky riding behaviours for food delivery riders and non-food delivery motorcycle riders. In general, of the seven risky riding behaviours examined, four were statistically significant including helmet non-use, red light violation, and mobile phone use at stop and while moving ($p < 0.05$).

The study discovered that the majority of motorcycle riders wore a helmet, both food delivery (92.6%) riders and non-food delivery (83.9%). These findings are consistent with a previous study conducted in Semarang, Indonesia, Andromeda and Pujiantoro (2023) reported that over half of food delivery couriers had a positive perception of riding safety, including the use of safety equipment like helmets. Univariate analysis in the present study indicated that the odds of helmet use were approximately 2.42 times higher among food delivery riders compared to non-food delivery riders (95% CI: 2.00-2.93). This finding supports earlier findings by Choi et al. (2022), which found that the delivery group exhibited a lower proportion of head and face injuries compared to the non-delivery group. They concluded that the discrepancy was associated with an increase in the proportion of helmet usage within the delivery group.

Red light violations were observed among both groups, however, it was less common among food delivery (23.4%) compared to non-food delivery motorcycle riders (27.0%)

(OR 0.83, 95% CI: 0.72-0.94). This finding contradicts previous research. For example, Christie and Ward (2023) observed that gig workers are more prone to red light violations. Through an online survey, they discovered that gig workers are more inclined to engage in red light running to expedite task completion and increase earnings. In a survey of delivery riders in Greece, Papakostopoulos et al. (2021) reported that roughly 30 percent of food delivery riders self-reported red-light violations. Recent research offers a potential explanation for this behaviour in a study of how job design influences risky behaviours among food delivery riders including red light violations (Nguyen-Phuoc et al., 2023).

Mobile phone usage was higher for food delivery riders (when stopped: 16.4%; when moving: 4.8%) compared to non-food delivery riders (when stopped: 6.9%; when moving: 2.0%). These differences were significant with approximate odds of 2.66 times a food delivery rider would use a mobile phone when stopped (95% CI: 2.16 – 3.25) and 2.49 times when a food delivery rider was moving (95% CI: 1.75 – 3.55) compared to a non-food delivery rider. These findings align with previous research. For example, in China, Zhang et al. (2020) conducted a study of food delivery drivers ($n=317$), using self-reported questionnaires and 96.3 percent engaged in mobile phone use while driving. The food delivery drivers primarily used the mobile phone business purposes rather than entertainment. In addition, they identified that personality traits and perceived risk perception demonstrated limited predictability for these risky behaviours. Also in China, Jing et al. (2023) conducted a study of riders of an online food delivery platform ($n=5,703$) and semi-structured interviews ($n=43$) and recommended that platform companies address worker safety hazards by providing improved work equipment, such as navigation helmets, for their riders.

Communication between road users through the use of signals is crucial for safe interactions. However, in this study, the majority of both food delivery riders (84.3%) and non-food delivery (83.2%) motorcycle riders failed to use turn signals on approach or when making left or right turns at the observed signalised intersections. Previous research in Malaysia identified that inadequate turn signalling as a contributing factor in crashes involving motorcycle riders (Razali & Zamzuri, 2016). Due to the high number of riders from both groups neglecting to use turn signals, the univariate analysis of differences between the two groups in terms of signal turning neglect was not significant ($p = 0.488$). More awareness programs and enforcement efforts are needed to increase awareness of the importance of using turn signals among all motorcycle riders.

Riding in the wrong direction was less common for both food (2.1%) and non-food (2.8%) delivery motorcycle riders and the difference between the two groups in the likelihood of riding in the wrong direction was not statistically significant ($p = 0.124$). This finding contradicts a study conducted by MIROS that identified riding in the wrong direction as one of the risky behaviours of food delivery riders (Dave, 2020). The contradiction may be due to the relatively large distances between intersections in the current study area,

Table 1. Comparison of riding behaviours among food and non-food delivery riders

Variable		Food delivery riders		Non-food delivery riders		OR (95% CI)	χ^2 , p-value
		n	%	n	%		
Helmet use	Yes*	2,241	92.6	1,821	83.9	1.00	-
	No	178	7.5	350	16.5	2.42 (2.00-2.93)	86.31, p < 0.001
Red light violation	No*	1,852	76.6	1,584	73.0	1.00	-
	Yes	567	23.4	587	27.0	0.83 (0.72-0.94)	7.87, p = 0.005
Mobile phone use (when stopped)	No*	2,022	83.6	2,022	93.1	1.00	-
	Yes	397	16.4	149	6.9	2.66 (2.16-3.25)	99.54, p < 0.001
Mobile phone use (when moving)	No*	2,303	95.2	2,128	98.0	1.00	-
	Yes	116	4.8	43	2.0	2.49 (1.75-3.55)	27.11, p < 0.001
Signal use	Yes*	173	15.7	172	16.8	1.00	-
	No	931	84.3	853	83.2	1.09 (0.86-1.37)	0.48, p = 0.488
Riding in the wrong direction	No*	2,369	97.9	2,111	97.2	1.00	-
	Yes	50	2.1	60	2.8	0.74 (0.51-1.09)	2.37, p = 0.124
Stopping beyond designated lines	No*	690	28.5	627	28.9	1.00	-
	Yes	1,729	71.5	1,544	71.1	1.02 (0.89-1.16)	0.07, p = 0.791

*reference category

which provide little reason or excuse for riders to engage in such behaviour. Previous studies have that 7 percent of 225 food delivery riders reported riding in the opposite direction during their deliveries (Rusli et al., 2022).

Stopping beyond the designated lines at signalised interactions obstructs the pedestrian crossing. This behaviour was observed by the majority of motorcycle riders who faced a red light (food delivery: 71.5%; non-food delivery, 71.1%) and the difference was not significant ($p = 0.791$). This practice may be dangerous as it creates potential conflicts with other road users, including pedestrians and vehicles from other directions attempting to cross the intersection.

Moreover, under Malaysian traffic law, no vehicle is allowed to stop beyond the designated stop lines. This finding aligns with previous research conducted in Malaysia that observed motorcycle riders stopping on pedestrian crossings (60%, Rusli & Salam, 2021; 74.8%, Paimana et al., 2020). Paimana et al. (2020) proposed implementing advanced stop lines or motorcycle boxes (Redbox) to address this issue. Several cities in Malaysia have initiated motorcycle box projects to provide a designated waiting area for motorcyclists during red phases at signalised intersections. However, the effectiveness of these measures remains limited. Misuse of the advanced stop lines by other motor vehicles reduces the number of motorcycle riders able to use the designated stop areas and there have been no observed reduction of red-light violations by motorcyclists at Redbox sites (Khaidir et al., 2019). In contrast, the implementation of motorcycle boxes in other ASEAN countries has demonstrated positive impacts. For example in Thailand, Jantosut et al. (2022) reported a reduction (31-46%) in start-up lost time during peak hours and high utilisation of the motorcycle box (73-78%). Similarly, research in Denpasar, Bali, re-

ported motorcycle boxes decreased traffic conflicts and improved traffic flow (Mulyadi, 2019).

Study Strengths and Limitations

This study has several strengths, including a large sample size of 4,590 riders and the inclusion of both food delivery and non-food delivery riders, enabling comprehensive comparisons of risky riding behaviours. The use of observational field surveys at multiple signalised intersections enhances the reliability and contextual relevance of the findings. Furthermore, the focus on various high-risk behaviours, such as helmet non-use, red light running, and mobile phone use, provides detailed insights into the specific risks faced by motorcyclists.

However, the study also has notable limitations. Observational data collection may introduce observer bias, and reliance on manual data recording could result in missed behaviours or inaccuracies. Future research should leverage advanced technologies, such as image processing from recorded or live streams and artificial intelligence (AI) applications, to process large datasets from live cameras. Additionally, the study is geographically limited to Shah Alam, Selangor, may also limit the generalisability of the findings to other regions. Expanding the study area to include urban, suburban, and rural settings could provide a broader understanding of this issue.

Although this study focused solely on observable behaviours, it is acknowledged that broader environmental, organisational, personal, and work-related factors may also contribute to the behavioural patterns identified. Similarly, while the selected intersections reflected a variety of types and surrounding land uses within Shah Alam City Centre, intersection-specific attributes (e.g., geometric design, traffic volume, signal phasing) were not included as vari-

ables in the statistical analysis. As a result, the potential influence of these physical and operational features on rider behaviour could not be assessed. The current methodology relies on a 2 x 2 contingency table, which only allows for comparisons between rider types without delving into the underlying factors associated with these risky behaviours. Expanding data collection efforts and adopting advanced statistical modelling techniques, such as binary regression analysis, are recommended to gain deeper insights into these associations. Finally, the observational nature of the study limits the ability to infer causal relationships between job demands and risky behaviours.

Recommendations

Based on the findings, which highlight elevated rates of helmet non-use, red light running, and mobile phone use while riding, several practical strategies can be proposed to enhance rider safety. Although this study did not investigate the motivations behind these behaviours, the results suggest a need for responsive measures by food delivery platform providers and relevant authorities through education, regulation, enforcement, and incentives.

Given their direct relationship with riders, platform providers are well-positioned to influence safe on-road behaviour through mandatory onboarding processes, incentive schemes, in-app safety prompts, synchronised navigation tools through both voice and vibration to minimise distraction, firm adherence to helmet and mobile phone use policies (Neethu Raj et al., 2025). Although some of these strategies are supported by emerging technologies, additional research is needed to evaluate their effectiveness.

Helmet use was observed by most food delivery riders, however, the goal should be complete compliance. Helmet awareness campaigns, combined with mandatory safety briefings and incentive schemes for proper use, could reinforce safe practices. In China, nationwide helmet promotion campaigns increased helmet wearing from 8.8 percent to 62 percent among electric bicycle riders and motorcyclists (Ning et al., 2022). However, correct helmet fastening was often overlooked, and economic and cultural incentives, along with social participation, have been identified as facilitators for helmet use.

Collaboration between delivery platform providers and enforcement authorities is essential to implement safe work practices. This may be achieved through joint awareness campaigns that target unsafe behaviours from both delivery motorcycle riders as well as drivers whose actions may put deliver riders at risk.

Infrastructure measures, including the broader use of advanced stop lines or motorcycle boxes at signalised intersections the provides a designated space ahead of other motor vehicles at red lights, could also support safe riding environments. Motorcycle boxes have been shown to increase traffic flow by up to 13 percent as motorcyclists (Wichitphongsa et al., 2025) as the position allows motorcycle riders to start ahead of motor vehicles, reducing congestion and enhancing overall intersection performance (Mulyadi & Amelia, 2013). These infrastructure changes need to be

accompanied by consistent enforcement and targeted public education.

Last, awareness initiatives for all motorcyclists, food and non-food delivery motorbike riders alike, should stress the importance of using turn signals and maintaining predictable riding patterns. A study in Klang Valley, Malaysia, reported that only 41.1 percent of motorcyclists consistently used turn signals, with more than half failing to signal during lane changes or turns at intersections. The authors recommended that strong enforcement with public education could enhance rider visibility and reduce crash risk (Ariffin et al., 2020). A Turn Signal Reminder System (TSRS) designed to prompt users to signal turns has demonstrated crash-reduction potential. While currently used in cars, adapting similar intelligent systems for motorcycles may help address human error and improve signalling behaviour (Md Isa et al., 2020).

Conclusions and future research

The study explored and compared risky behaviours among food delivery riders and non-food delivery riders during rush hours. Categorical data analysis techniques were used to examine distinctions between these two rider groups. Among the seven tested risky behaviours, three exhibited statistically significant differences between food delivery riders and non-food delivery riders: helmet non-use, red light running, and mobile phone use during both stopping and moving. Food delivery riders were more likely to use mobile phones while stopping and moving, whereas non-food delivery riders were more likely to ride without helmets and to run red lights. No statistical differences were found between the groups for failure to use signals, riding in the wrong direction, and stopping beyond designated lines.

Despite these limitations, the findings from this study offer valuable insights into the specific risk behaviours exhibited by food delivery riders, particularly in relation to helmet non-use and mobile phone usage while riding. These insights can assist relevant authorities including the Ministry of Transport, local governments, and road safety agencies (e.g., MIROS) to develop specialised programs aimed at enhancing the safety of both groups, especially food delivery riders. Such programs may include compulsory safety briefings during onboarding by platform providers, public service campaigns via social media, and collaboration with rider associations to promote safer riding practices.

Future research is encouraged to incorporate both behavioural frameworks and intersection characteristics into the analytical model to better understand the underlying causes and contextual influences of the seven risky behaviours observed in this study. Future research should incorporate factors related to job demands and their influence on risky behaviours into the analysis to provide a more comprehensive understanding.

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Author contributions

Rusdi Rusli: Conceptualisation, idea generation, research management, and manuscript writing. Fatin Hamimi Saiful Amri: Oversight of the data collection process and acquisition of funding. Norrul Azmi bin Yahya: Drafting the manuscript. Oscar Oviedo-Trespalacios: Manuscript review and editing. Sharifah Allyana Syed Mohamed Rahim: Methodology development. Ahmad Afuan bin Ismail: Coordination of the data collection process. Puteri Intan Solah Salim: Manuscript review and editing. All authors have reviewed and

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Human Research Ethics Review

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Data availability statement

The authors declare that no materials, data nor protocols were used.

Conflicts of interest

The authors declare that there are no conflicts of interest.

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References

- Adib, P. (2021). *96 accidents involving p-hailing riders recorded in 2020*. The New Straits Times. <https://www.nst.com.my/news/nation/2021/04/683332/96-accidents-involving-p-hailing-riders-recorded-2020>
- Andromeda, V. F., & Pujiantoro, W. (2023). The perspective of food delivery courier in Semarang toward safety riding. In *RSF conference series: engineering and technology* (Vol. 3, Issue 1, pp. 24–30). RSF Press-Research Synergy Foundation.
- Ariffin, A. H., Hamzah, A., Solah, M. S., Paiman, N. F., Abdul Khalid, M. S., Isah, N., Abu Kassim, K. A., Ishak, S. Z., Imanaga, H., & Ishida, H. (2020). Turn Signal Use among Motorcyclists in Klang Valley, Malaysia: A Case Study. *Jurnal Kejuruteraan, si3*(1), 83–88. [https://doi.org/10.17576/jkukm-2020-si3\(1\)-13](https://doi.org/10.17576/jkukm-2020-si3(1)-13)
- Bernama. (2021). *Over 65,000 Bumis ventured into p-hailing during pandemic*. <https://www.nst.com.my/news/nation/2021/11/744490/over-65000-bumis-ventured-p-hailing-during-pandemic>
- Bernama. (2022). *P-hailing riders record 3-4 accidents a week due to fatigue, says association*. SinarDaily. <https://www.sinardaily.my/article/175910/malaysia-national/p-hailing-riders-record-3-4-accidents-a-week-due-to-fatigue-says-association>
- Choi, S. J., Kim, M. J., Myung, J., Hong, J. Y., Chung, H. S., Chung, S. P., & Lee, J. H. (2022). Characteristics of crashes and injuries on delivery motorcycles: A retrospective cohort study. *Traffic Injury Prevention, 23*(3), 146–151. <https://doi.org/10.1080/15389588.2022.2030056>
- Christie, N., & Ward, H. (2023). Delivering hot food on motorcycles: A mixed method study of the impact of business model on rider behaviour and safety. *Safety Science, 158*, 105991. <https://doi.org/10.1016/j.ssci.2022.105991>
- Dave, G. (2020). *Malaysian Road Safety Institute Pushes For Better Training Of Food Delivery Riders*. <https://www.voanews.com/a/economy-business-malaysian-road-safety-institute-pushes-better-training-food-delivery-riders/6195935.html>
- FutureCFO. (2024). *Malaysian e-commerce market to reach \$14.7 billion by 2028, study says*. <https://futurecfo.net/malaysian-e-commerce-market-to-reach-14-7-billion-by-2028-study-says/>
- Gregoire, E. (2023). *E-Commerce Poised to Capture 41% of Global Retail Sales by 2027—Up from Just 18% in 2017*. Boston Consulting Group. <https://www.bcg.com/press/31october2023-ecommerce-global-retail-sales>
- International Trade Administrator, U. S. (2024). *cCommerce*. <https://www.trade.gov/country-commercial-guides/malaysia-ecommerce>
- Jantosut, P., Tankasem, P., Chaipanha, W., Promraksa, T., Kaewwichian, P., & Kaewkluengklom, R. (2022). Evaluation of the efficiency of a motorcycle-specific pausing area at the traffic signals on the urban road. *International Journal of Health Sciences, 6*(S26), 10333–10344. <https://doi.org/10.53730/ijhs.v6nS6.12735>
- Jing, Z., Yuru, L., & Yue, Z. (2023). More reliance, more injuries: Income dependence, workload and work injury of online food-delivery platform riders. *Safety Science, 167*, 106264. <https://doi.org/10.1016/j.ssci.2023.106264>
- Junaid, I., Martin, C., & Tarrence, T. (2023). *Over 1,200 accidents, 112 deaths involving food delivery riders since 2018*. The STAR. <https://www.thestar.com.my/news/nation/2023/04/04/over-1200-accidents-112-deaths-involving-food-delivery-riders-since-2018>
- Khaidir, N. M., Johari, N. M., Jamaluddin, N., & Roslan, A. (2019). The effectiveness of advanced stop line (asl) for motorcycles at signalised intersection in Kuala Lumpur. *J. Built Environ. Technol. Eng, 6*, 69–81.
- Malik, M., Rusli, R., Nusa, F. N. M., & Adinegoro, Y. (2023). Risky behaviours among delivery riders at signalized intersections in Malaysia. *Planning Malaysia, 21*. <https://doi.org/10.21837/pm.v21i28.1317>
- MBSA. (2023). *Lokasi dan Demografi*. https://www.mbsa.gov.my/ms-my/infoshahalam/kenalishahalam/Halaman/lokasi_demografi.aspx
- Md Isa, M., Abu Bakar, S., & Mohamad Hashim, M. (2020). Initiatives to Increase the Use of Vehicle Turn Signals. *Journal of the Society of Automotive Engineers Malaysia, 4*(1), 101–105. <https://doi.org/10.56381/jsaem.v4i1.55>
- MetMalaysia. (2022). *Annual climate report 2022: Weather trends and patterns in Peninsular Malaysia*. Ministry of Environment and Water. <https://www.met.gov.my/iklim/laporan-iklim/>

- MIROS. (2012). *A case study on risk-taking behaviours among motorcyclists in Klang Valley, Malaysia* (MIROS Research Report No. MRR 07/2012). MIROS. https://www.researchgate.net/publication/321374301_A_Case_Study_on_Risk-taking_Behaviours_Among_Motorcyclists_in_Klang_Valley_Malaysia
- Mitch, C. (2023). Thailand tackles delivery rider accidents with defensive driving training. *ASEAN NOW*. <https://aseannow.com/topic/1308572-thailand-tackles-delivery-rider-accidents-with-defensive-driving-training/>
- Mulyadi, A. M. (2019). Red box motorcycle evaluation at signalized intersection in Denpasar Bali. *Journal of the Eastern Asia Society for Transportation Studies*, 13, 1966–1982. <https://doi.org/10.11175/easts.13.1966>
- Mulyadi, A. M., & Amelia, S. (2013). Influence of red motorcycle box to the traffic conflict and traffic flow at the Ahmad Yani-Laswi signalized intersection. *Proceedings of the 16th International Conference Road Safety on Four Continents: Beijing, China*. <https://urn.kb.se/resolve?urn=urn:nbn:se:vti:diva-7381>
- Neethu Raj, R., Balamani, V. N., Megha, V., & Sneha. (2025). Smart Navigation Glove. *International Journal for Multidisciplinary Research*, 7(1). <https://doi.org/10.36948/ijfmr.2025.v07i01.35306>
- Nguyen, M. H., Nguyen-Phuoc, D. Q., & Oviedo-Trespalcacios, O. (2023). Non-fatal traffic crashes among food delivery riders in Vietnam: What is the problem? *Traffic Injury Prevention*, 24(8), 686–692. <https://doi.org/10.1080/15389588.2023.2238862>
- Nguyen-Phuoc, D. Q., Nguyen, L. N. T., Su, D. N., Nguyen, M. H., & Oviedo-Trespalcacios, O. (2023). Deadly meals: The influence of personal and job factors on burnout and risky riding behaviours of food delivery motorcyclists. *Safety Science*, 159, 106007. <https://doi.org/10.1016/j.ssci.2022.106007>
- Nguyen-Phuoc, D. Q., Nguyen, N. A. N., Nguyen, M. H., Nguyen, L. N. T., & Oviedo-Trespalcacios, O. (2022). Factors influencing road safety compliance among food delivery riders: An extension of the job demands-resources (JD-R) model. *Transportation Research Part A: Policy and Practice*, 166, 541–556. <https://doi.org/10.1016/j.tra.2022.11.002>
- Ning, P., Zong, H., Li, L., Cheng, P., Schwebel, D. C., Yang, Y., Yang, L., Wu, Y., Zhao, M., & Hu, G. (2022). Effectiveness of a helmet promotion campaign, China. *Bulletin of the World Health Organization*, 100(5), 329–336. <https://doi.org/10.2471/BLT.22.287914>
- Paimana, N. F., Hamzaha, A., Solaha, M. S., Ariffina, A. H., Khalida, M. S. A., Kassima, K. A. A., ... Ishidac, H. (2020). Motorcycle Positioning in Queues at Signalized Intersections in City of Klang Valley. *Jurnal Kejuruteraan SI*, 3(1), 89–93. [https://doi.org/10.17576/jkukm-2020-si3\(1\)-14](https://doi.org/10.17576/jkukm-2020-si3(1)-14)
- Papakostopoulos, V., & Nathanael, D. (2021). The complex interrelationship of work-related factors underlying risky driving behavior of food delivery riders in Athens, Greece. *Safety and Health at Work*, 12(2), 147–153. <https://doi.org/10.1016/j.shaw.2020.10.006>
- Razali, M. S. M. A., & Zamzuri, Z. (2016). Modeling motorcycle road accidents with traffic offenses at several potential locations using negative binomial regression model in Malaysia. *Int. J. Appl. Math. Stat*, 54, 105–114.
- Rusli, R., Mohammad, M. Z., Kamaluddin, N. A., Bakar, H., & Isa, M. H. M. (2022). A comparison of characteristics between food delivery riders with and without traffic crash experience during delivery in Malaysia. *Case Studies on Transport Policy*, 10(4), 2244–2250. <https://doi.org/10.1016/j.cstp.2022.10.006>
- Rusli, R., Oviedo-Trespalcacios, O., & Abd Salam, S. A. (2020). Risky riding behaviours among motorcyclists in Malaysia: A roadside survey. *Transportation Research Part F: Traffic Psychology and Behaviour*, 74, 446–457. <https://doi.org/10.1016/j.trf.2020.08.031>
- Rusli, R., & Salam, S. A. A. (2021). Stopping on the Pedestrian Crossing: An Observation of Motorcyclists Behaviour at Signalized Intersection. In *The 3rd Conference of ASEAN Road Safety* (pp. 83–90).
- Tuah, T. A. H., Kamaluddin, N. A., & Ishak, S. Z. (2022). Challenges of food delivery riders (p-Hailing): An exploratory study to better understand the nature of work and traffic accidents involvement. In *2022 IEEE Symposium on Wireless Technology & Applications (ISWTA)* (pp. 29–34). IEEE. <https://doi.org/10.1109/ISWTA55313.2022.9942750>
- Wichitphongsa, W., Kronprasert, N., Zaw, M. S., Pisetsit, P., & Satiennam, T. (2025). Modeling Riding and Stopping Behaviors at Motorcycle Box Intersections: A Case Study in Chiang Mai City, Thailand. *Infrastructures*, 10(4), 97. <https://doi.org/10.3390/infrastructures10040097>
- Zhang, Y., Huang, Y., Wang, Y., & Casey, T. W. (2020). Who uses a mobile phone while driving for food delivery? The role of personality, risk perception, and driving self-efficacy. *Journal of Safety Research*, 73, 69–80. <https://doi.org/10.1016/j.jsr.2020.02.014>