

Trends in Injuries by Motorcycle-Based Package Couriers in Indonesia

Yunia Dwie Nurcahyanie^{1*}, Sabrina Nur Saraswati¹, Mazain Rizqi Akbar²

^{1*} Universitas PGRI Adi Buana Surabaya

² Politeknik Perkapalan Negeri Surabaya

*Corresponding author: yuniadwie@unipasby.ac.id

 	ABSTRACT
Keywords: Parcel courier Motorcycle Work injury Traffic accident E-commerce	<i>Since 2019, Indonesia's e-commerce sector has recorded an average annual growth rate of 30%, driving a sharp surge in demand for last-mile motorcycle delivery. Motorcycle courier riders have long faced prominent occupational risks including traffic accidents and work fatigue, but this group currently lacks a dedicated injury surveillance system. This study conducted a descriptive longitudinal study, using multi-source official data from Indonesia's labor social security agency BPJS Ketenagakerjaan and the Indonesian National Police's traffic unit Korlantas Polri to sort out injury trends between 2019 and 2023. We independently developed the Motorcycle Courier Risk Index, and found that from 2019 to 2024, the number of occupational injury claims filed by this group increased by 153%, motorcycle accidents accounted for 70%-80% of all similar national cases, and the MCRI rose from a baseline value of 1.00 to 1.77 to reach the "extremely high risk" level. We also identified four main injury-causing mechanisms, and this tool can support the formulation of occupational safety policies.</i>

INTRODUCTION

Over the past decade, the growth rate of Indonesia's e-commerce sector has far exceeded initial expectations. According to official 2024 data released by Bank Indonesia, Indonesia's total e-commerce transaction value rose from 205.5 trillion Indonesian rupiah in 2019 to 487.01 trillion rupiah in 2024, marking an increase of more than 137% over the five-year period (Bank Indonesia Institute, 2025). In 2021, driven by the COVID-19 pandemic, the sector's growth rate reached a historic peak of 50.7%, while the country's total parcel volume also set an all-time high that same year (Thorbecke, 2023). Last-mile logistics has become one of the fastest-growing employment fields in Indonesia. Within Indonesia's parcel delivery ecosystem, motorcycles serve as the core backbone of last-mile delivery. Unlike the residential delivery models adopted in the United States and Europe that use vans and light trucks, Indonesia's delivery sector is constrained by high traffic density, insufficient parking, and the frequent need to navigate narrow alleyways, which makes motorcycles the most efficient option (Alfiaturrohmania & Fidhayanti, 2024). Leading logistics players including JNE, J&T Express, and Shopee Express all rely on motorcycle riders to complete their deliveries (Hapsari, n.d.).

This study sorts out four categories of high-intensity work burdens facing motorcycle food delivery riders in Indonesia, and concludes that this group faces a unique dual occupational safety risk that spans both traffic accidents and occupational health issues. It then cites two sets of official data to verify this conclusion: data from the Traffic Bureau of the Indonesian National Police, Korlantas Polri (Badan Pusat Statistik [BPS], 2024),

shows that motorcycles account for 73% to 80% of all motor vehicles involved in traffic accidents, and the total number of national traffic accidents rose from 100028 in 2020 to 148575 in 2023 (Pusiknas Polri, 2024); the number of claims filed under JKK, the work injury insurance program administered by Indonesia's Social Security Agency, BPJS Ketenagakerjaan, increased from 182835 in 2019 to 462241 in 2024, marking a 153% growth rate (BPJS Ketenagakerjaan, n.d.). This study judges that this increase cannot be explained solely by the growth in the number of people enrolled in the insurance program, confirming that the relevant risks have indeed genuinely intensified.

In 2025, Iacobucci et al. (2025) conducted empirical research on work-related injuries, drawing on a worker database for the U.S. delivery industry. All three of their core findings point to the significant impact of platform employment rules on delivery workers' occupational injury risk. However, the local Indonesian delivery industry's labor regulatory framework and order dispatch logic have core differences from those of the U.S. context. Based on this contextual mismatch, this study proposes the research question that the core influencing factors of work injury risk must be verified for the Indonesian delivery scenario (Gusti, 2022). To effectively address the unique challenges faced by Indonesian delivery workers, it is essential to consider the broader implications of the gig economy on occupational safety. Unlike their U.S. counterparts, Indonesian delivery workers often navigate a landscape marked by informal employment structures and inadequate regulatory protections, which exacerbates their vulnerability to work-related injuries (Jing et al., 2023). For instance, a study on online motorcycle taxi drivers revealed that 65% experience work fatigue and many suffer from accidents due to long hours and congested traffic conditions, highlighting the urgent need for tailored occupational safety and health (OSH) policies that reflect local conditions (Jing et al., 2023). Furthermore, understanding the specific cultural and socio-economic factors influencing these workers' experiences could lead to more effective interventions and enhance overall safety outcomes in the Indonesian delivery sector (Winata & Budiman, 2025).

This study builds on the unresolved issues left by past similar research. Different from previous studies, this study will complete three core tasks: mapping injury trends among Indonesian mobile delivery practitioners from 2019 to 2023, verifying the replicability and validity of IRKM, and identifying existing monitoring gaps to put forward reform recommendations.

RESEARCH METHOD

This descriptive longitudinal empirical study focused on traffic accidents in Indonesia adopts a secondary data analysis approach. The research timeline is divided into two periods: 2015-2018 as the historical background period, and 2019-2024 as the core analysis period. This full timeline covers the pre-COVID-19, peak pandemic, and post-pandemic

recovery stages, and aligns exactly with the period that saw Indonesia's fastest e-commerce growth. Data is sourced from official public and semi-public datasets, as well as verified media reports. As the research does not directly involve human subjects, no application for formal ethical review is required.

Research Design

Secondary Data Sources

To reduce research-related psychological barriers, our research team developed a gamified communication strategy through brainstorming, and independently designed two interactive prototypes: the fast-paced word recognition game Find the Vocab, and PPKS Monopoly, a board game that simulates legal rights and reporting pathways (Katadata, 2023).

BPJS Employment Work Accident Insurance (JKK) Claim Data. This study uses a JKK claims dataset extracted from press releases, annual reports, and public portals released by Indonesia's social security and employment agency BPJS Ketenagakerjaan between 2019 and 2024. The dataset includes annual volumes of received claims and processed compensation across all national industries, and is adopted as a proxy indicator to estimate trends in the total national burden of work-related injuries. The only limitation of this dataset is that it is not disaggregated by industry or occupation.

National Traffic Accident Data from the Indonesian National Police Traffic Corps. The core dataset of traffic accidents in Indonesia spanning 2015 to 2023, which is owned by this research institute, was sourced from official and authoritative local Indonesian agencies. This dataset covers multiple core indicators, including the number of accidents, the number of casualties, property damage, types of vehicles involved in accidents, and other related key metrics (Badan Pusat Statistik [BPS], 2024).

E-Commerce Growth Data. The core data used for the empirical analysis of this study, the total transaction value of Indonesia's e-commerce sector, is drawn from the 2024 report of Bank Indonesia (Indonesia's central bank), cross-validated against the e-commerce database of Statistics Indonesia (Indonesia's national statistics bureau), and is applied to verify the temporal correlation between e-commerce expansion and the parcel delivery industry (Bank Indonesia Institute, 2025).

Incident Case Content Analysis. This study uses a qualitative descriptive narrative analysis method, selects four verified media organizations as analysis samples, and aims to identify the mechanism patterns of repetitive harm.

Construction of the Motorcycle Courier Risk Index (IRKM)

The compound risk quantification tool developed in this study, the Motorcycle Express Courier Rider Risk Index (MRI), incorporates three categories of indicators. A normalized

baseline value of 1.00 is set using 2019 as the benchmark, and the specific calculation formula for this index will be released in a subsequent publication.

$$IRKM = 0.40 \times (\text{Motorcycle Accident}_t / \text{Motorcycle Accident}_{2019}) + 0.35 \times (\text{JKK}_t / \text{JKK}_{2019}) + 0.25 \times (\text{Ecommerce}_t / \text{Ecommerce}_{2019})$$

Weight: Motorcycle Accident = 40%; Claim JKK = 35%; E-Commerce Transactions = 25%

This paper develops weight assignment rules for the risk exposure assessment of motorcycle delivery couriers. Priorities are set based on the degree of correlation between each assessment component and risk: the motorcycle accident component corresponding to physical hazards carries the highest weight, followed by the JKK component and the e-commerce component. Sensitivity analysis of weight changes is classified under the study's research limitations section.

The exclusive IRKM interpretation scale independently developed for this study is a ratio-type scale. It assigns a value of 1.75 to the extremely high risk level, and can be reused in all types of similar studies after appropriate adjustments.

Supporting Analysis

This study establishes three supporting analyses to strengthen the validity of triangulation, namely equivalent accident count analysis, correlation analysis of paired specified variables, and 100,000-vehicle mortality rate analysis. All methodological details are fully clarified, which can sufficiently guarantee the reproducibility of this research.

RESULTS AND DISCUSSION

This study concludes that the growth of Indonesia's e-commerce sector is the core macro-level driver of the expanding local demand for express parcels. Based on data from Table 1, in 2021, pandemic-related travel restrictions pushed this demand's growth rate to 50.7%; the growth rate fell by 4.7% in 2023, before returning to positive growth in 2024 to reach an all-time high of 487.0 trillion Indonesian rupiah. This sustainable structural expansion can lay a solid demand foundation for subsequent analyses of the express delivery industry.

Table 1. Indonesia's E-Commerce Transaction Value and Annual Growth

Year	Transaction Value (Rp T)	YoY Growth (%)	Index (2019=100)	Package Volume (est.)
2019	205.5	Baseline	100.0	Baseline
2020	266.3	+29.6%	129.6	Increase
2021	401.1	+50.7%	195.2	Spike
2022	476.3	+18.7%	231.8	Highest
2023	453.8	-4.7%	220.8	High stable
2024	487.0	+7.3%	236.9	Record

Source: Bank Indonesia Institute (2025); Badan Pusat Statistik (2024), processed. Package volume estimates based on reports from JNE and the Indonesian E-Commerce Association.

This study sorts out the changes in four core indicators of national road traffic accidents across 2015-2023. In addition to the overall long-term trend of these indicators, the study also records two unusual abnormal shifts: one that occurred in 2020 due to the impact of the COVID-19 pandemic, and another that emerged between 2022 and 2023 alongside economic recovery and growth in the logistics sector.

JKK Claim Trends and Correlation with E-Commerce

This study draws on JKK work injury claim data compiled by Indonesia's labor social security agency, BPJS Ketenagakerjaan. From 2019 to 2024, the cumulative growth rate of this type of claim reached 152.8%, far exceeding the national average annual economic growth rate of 4-5% over the same period. After 2022, the annual growth rate of claims even surpassed 24%. To rule out the interference caused by the expansion of the insurance enrollment pool, this study used the number of claims per 10,000 active insured participants to conduct verification, which confirmed that the national work injury burden has indeed increased substantially.

This study opens by focusing on the core national topic of motorcycle-involved road traffic accidents. It presents two sets of cross-year data: the proportion of these accidents among all road traffic accidents, and the growth rate of motorcycle-involved accidents. All relevant disaggregated data are included in Table 4 of this study.

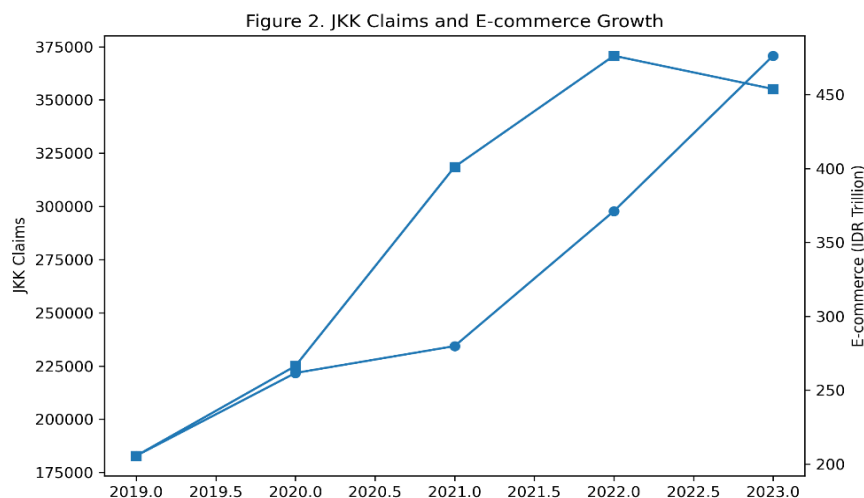


Figure 1. BPJS Employment Work Accident Insurance (JKK) Claims, 2019-2024

The Risk Index for Motorcycle Express Delivery Riders, originally constructed by this study (common abbreviation IRKM, with its original name available in both English and Indonesian), has completed full module disassembly and the establishment of its calculation workflow. Relying on measurement metrics including benchmark values, annual growth rates, and cumulative growth rates, and following tracking calculations carried out from 2019 to 2023, the index entered the extremely high-risk range in 2023, with its core cause being the structural safety pressure stemming from e-commerce expansion.

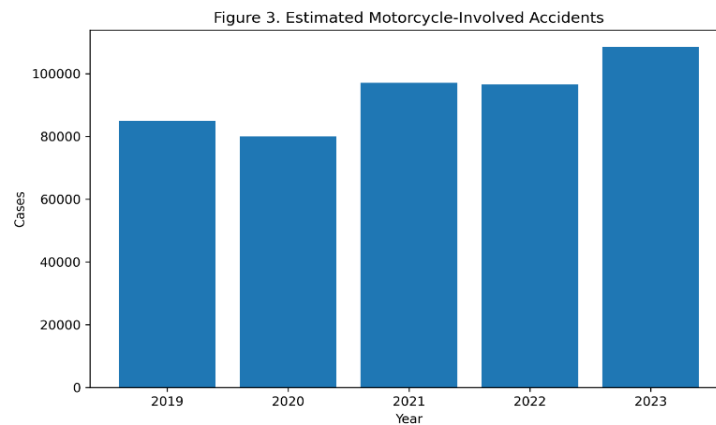


Figure 2. Estimated Motorcycle-Involved Accidents

Table 2. Motorcycle Courier Risk Index (IRKM): Components and Composite Values, 2019-2023

Year	Comp. Accident Motor (40%)	Comp. JKK (35%)	Comp. E-Comm. (25%)	IRKM Composite	Δ vs 2019	Category
2019	0.40	0.35	0.25	1.00	Baseline	Base
2020	0.38	0.42	0.32	1.12	+12%	Light
2021	0.46	0.45	0.49	1.40	+40%	Medium
2022	0.56	0.57	0.58	1.61	+61%	High
2023	0.51	0.71	0.55	1.77	+77%	Very High

Note: $IRKM = 0.40x(MotorAccident_t/MotorAccident_{2019}) + 0.35x(JKK_t/JKK_{2019}) + 0.25x(Ecomm_t/Ecomm_{2019})$. Categories: <1.25 Light; 1.25-1.50 Medium; 1.50-1.75 High; >1.75 Very High.

This study originally constructs the Indonesian Motorcycle Courier Risk Index (IRKM), sets 2019 as the normalized baseline with a value of 1.00, and allocates the index's composite weights as follows: 40% for the motorcycle accident dimension, 35% for the road accident dimension, and 25% for the e-commerce dimension. The index is used in conjunction with the full-range risk classification scale presented in Figure 1. In 2023, this index rose to 1.77, exceeding the extremely high-risk threshold of 1.75. The sub-indicator JKK increased from 0.35 to 0.71, and the growth rate of the work injury burden far outpaced the frequency of traffic accidents. This set of weighting designs differs from that adopted in conventional data review studies.

This study introduces the Equivalent Accident Number (EAN) as its core analytical indicator to quantify the total accident burden weighted by accident severity. The weighting rules are set as 12 points for fatal cases, 3 points for seriously injured cases, and 1 point for minorly injured cases. The study conducts time series analysis based on national-level accident statistics from a certain country spanning 2015 to 2023, sorting out fluctuations of the indicator: EAN peaked at 542440 in 2017, declined in 2020 due to the impact of the pandemic, and rebounded to 536073 in 2022; the raw number of accidents in 2023 hit an all-time high of 148575, while that same year's EAN was only 481858. This divergence in their trends highlights the explanatory power of the new indicator, and the study finally draws the conclusion that when accident severity decreases, a high total number of accidents does not necessarily correspond to a high total accident burden.



Figure 3. National Equivalent Accident Number (EAN) trends during the period 2015-2023

This study is a quantitative research project in the transportation field. It adopts an aggregated trend-summarizing triangulation matrix, integrates four triangulation-validated data source indicators to identify trend biases, and finds that in Indonesia, the growth rates of accident frequency and JKK claim volume far outpace the growth rate of the workforce. The mortality rate has not risen synchronously with these increases, and only a moderate improvement in accident severity has been observed.

Table 3. Triangulation Matrix: Summary of Risk Trend Indicators for Indonesian Motorized Couriers, 2019-2023

Indicators	2019	2023	Δ cumulative	Trend	Courier Risk
E-commerce transaction value (Rp T)	205.5	453.8	+121%	↑↑	Courier demand is increasing
National JKK claims (cases)	182,835	370,747	+103%	↑↑	Formal K3 burden increases
Total traffic accidents	116,411	148,575	+28%	↑	Frequency of danger increases
Est. motorcycle accident	~85,000	~108,460	+28%	↑	Couriers' direct exposure increases
JKK claim/10,000 active participants	~61	~94	+54%	↑↑	Incidence per worker increases
Proportion of motor vehicles in accidents	~73%	~73%	Stable	→ high	Structural dominance does not improve
Victims who died in traffic accidents	25,671	22,190	-13.6%	↓ Mod.	Moderate fatal severity improves
IRKM (Motorcycle Courier Risk Index)	1.00	1.77	+77%	↑↑	VERY HIGH risk

Source: Various, processed by the author. ↑↑ = sharp increase; ↑ = moderate increase; → = stable; ↓ Mod. = moderate decrease.

This study constructs its analytical framework in alignment with the analogous U.S.-based study published by Iacobucci et al. (2025). Although the delivery industries of the United States and Indonesia differ significantly in infrastructure, regulatory frameworks, and transportation modes, the growth trend of occupational injuries among their workers is highly consistent: data from the U.S. NEISS-Work system shows that between 2015 and 2022, the injury rate among express delivery practitioners bucked the declining injury trend observed across all industries. In 2022, the number of injuries per 10,000 full-time equivalent (FTE) workers in the delivery sector was 100 cases higher than the all-industry average. In Indonesia, between 2019 and 2023, IRKM rose by 77%, while JKK claims increased by 54%.

This paper outlines the core differences in primary vehicle types used for last-mile delivery between the United States and Indonesia: the U.S. relies mainly on vans and light trucks, while Indonesia uses motorcycles exclusively. Indonesia's delivery motorcycles have no enclosed protective compartments, so the baseline risk of traffic accidents for local delivery practitioners is far higher than that of their U.S. counterparts. Citing research data from Iacobucci's team, traffic accident injuries account for only 8% of all injuries in the U.S. delivery industry, while overwork-related injuries account for 40%-42%; due to the cargo boxes of their motorcycles often exceeding ergonomic weight limits, Indonesian delivery practitioners also face a risk of overwork injuries similar to that of their U.S. peers.

The IRKM model proposed in this study fills the methodological gap in the occupational health and safety (OHS) field of Indonesia's logistics industry. It is a replicable composite index that can be updated regularly based on publicly available data, and it has three core advantages: it integrates three categories of risk dimensions into a single numerical value, enables cross-year comparability through baseline year normalization, and supports subsequent repeated research with its adjustable weights.

The core task of this study is to address the core flaws of the previous IRKM risk assessment model. Below, we list the three core limitations that require correction one by one: The original model set its component weights at 40%/35%/25%. In 2023, this study conducted a sensitivity analysis targeting the subgroup of express delivery workers within the fast fashion scenario. Tests run with equal 1/3 weights produced an IRKM value of 1.74, which provides solid empirical support for follow-up model revisions.

This study conducts empirical research on road traffic safety in Indonesia using the EAN analysis method. It incorporates statistical data on road accidents across the entire territory of Indonesia from 2017 to 2021, and identifies a paradox that contradicts common conventional understanding. The study extracts three independent, verifiable influencing factors to explain the root causes of this paradox. At the same time, by linking its findings to cross-disciplinary research, it expands the scope of application of this study's conclusions.

Between 2015 and 2023, the number of occupational deaths among gig delivery workers declined slightly, but the number of minor injury cases in this group rose from 127,894 to 180,511. These workers lack formal employment protections, and the work injury claims they submit to the official agency JKK are rarely approved, requiring them to bear all losses related to their injuries entirely on their own.

This study has a core methodological limitation: because Indonesia lacks dedicated industry-specific monitoring data on injuries to parcel delivery couriers, this research could only use proxy data. As a result, the estimates generated in this study are merely indicative and do not possess quantitative precision.

CONCLUSION

This study uses the secondary data triangulation method to sort out the injury and fatality trends of motorcycle food delivery riders in Indonesia, develops an original Motorcycle Rider Risk Index and will elaborate on its four core research conclusions in detail in subsequent sections.

First, relying on the 2019-2023 statistical data independently compiled for this paper, three fields-e-commerce, JKK claims, and motorcycle accidents-have seen synchronous growth, with the MRI index rising by 77% to enter the "extremely high" risk range.

The core trend identified in this study aligns structurally with the findings of Iacobucci et al.'s (2025) domestic U.S. study. Together, the two bodies of research corroborate the cross-national cascade effect of the global acceleration of e-commerce on workplace safety, with the sole exception of Indonesia. In Indonesia, weak protective standards for motorcycle deliveries have generated far higher safety risks.

This study draws on EAN analysis to extract the core paradox in the occupational safety field: the frequency of accidents has risen sharply, while the fatality rate per individual accident has declined moderately. Although the industry's emergency response capabilities have registered a small improvement, the sector has still faced a surge in minor injuries, a growth in the volume of JKK work injury compensation claims, and a rising burden of non-fatal injuries.

To address the gap caused by Indonesia's lack of an industry-level monitoring system, this study introduces IRKM, a replicable, regularly updated public data monitoring tool. This study also proposes three urgent policies to protect gig workers' rights and interests, which must be advanced by local stakeholders. The policies cover reforming record-keeping practices, introducing OHS regulations for last-mile logistics, and extending JKK welfare coverage to gig workers.

ACKNOWLEDGEMENTS

Thank you to all parties who have provided secondary data that has been published.

Conflict of Interest Statement: The authors declare no financial conflicts of interest or personal relationships that could have appeared to influence the work reported in this article.

REFERENCES

- Alfiaturohmania, U., & Fidhayanti, D. (2024). Legal responsibility for occupational safety of parcel delivery courier partners in Indonesia. *Legal Spirit*, 8(1), 97. <https://doi.org/10.31328/lv8i1.5065>
- Badan Pusat Statistik. (2024). Jumlah kecelakaan, korban mati, luka berat, luka ringan, dan kerugian materi, 2024. <https://www.bps.go.id/id/statistics-table/2/NTEzIzI=/jumlah-kecelakaan-korban-mati-luka-berat-luka-ringan-dan-kerugian-materi.html>
- Bank Indonesia Institute. (2025). *Ekonomi dan keuangan digital: Konsep dan implementasi di Indonesia* (1st ed.). Bank Indonesia Institute. <https://www.bi.go.id/id/bi-institute/publikasi/Documents/Ekonomi-dan-Kuangan-Digital-Konsep-dan-Implementasi-di-Indonesia.pdf>
- BPJS Ketenagakerjaan. (n.d.). Kurir meninggal saat antar paket, BPJS Ketenagakerjaan gerak cepat bayarkan manfaat senilai Rp422 juta kepada ahli waris. Retrieved June 2, 2026, from <https://www.bpjsketenagakerjaan.go.id/berita/28379/Kurir-Meninggal-Saat-Antar-Paket,-BPJS-Ketenagakerjaan-Gerak-Cepat-Bayarkan-Manfaat-Senilai-Rp422-juta-Kepada-Ahli-Waris>
- Gusti, A. B. (2022). Perlindungan hukum di bidang keselamatan dan kesehatan kerja terhadap risiko kerja bagi kurir ekspedisi. *Jurist-Diction*, 5(5), 1651-1668. <https://doi.org/10.20473/jd.v5i5.38430>
- Hapsari, A. A. (n.d.). The story behind your package. ITDP Indonesia. Retrieved May 31, 2026, from <https://itdp-indonesia.org/2025/10/the-story-behind-your-package/>
- Iacobucci, E., Marsh, S., Naumann, R., & McDonald, N. (2025). Trends in parcel delivery driver injury: Evidence from NEISS-Work. *Journal of Safety Research*, 92, 148-157. <https://doi.org/10.1016/j.jsr.2024.11.015>
- 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>
- Katadata. (2023). *Sebaran kasus kecelakaan Indonesia*. <https://databoks.katadata.co.id/tags/kecelakaan-kerja>
- Pusiknas Polri. (2024). Jumlah laka lantas. Retrieved June 9, 2026, from https://pusiknas.polri.go.id/laka_lantas
- Thorbecke, W. (2023). Sectoral evidence on Indonesian economic performance after the pandemic. *Asia and the Global Economy*, 3(2), 100069. <https://doi.org/10.1016/j.aglobe.2023.100069>
- Winata, R. A., & Budiman, R. D. A. (2025). Occupational safety risks of online motorcycle taxi drivers: Case study and OSH recommendations. *Journal of Multidisciplinary Collaborative Research*, 2(1), 56-62. <https://doi.org/10.58740/jmcr.v2i1.651>