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## Assessing the Impact of Demographic and Occupational Related Predictors on Risky Driving Behaviour Among Express Bus Drivers in Malaysia

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### ABSTRACT

*Recent express bus crashes in Malaysia have highlighted the urgent need to strengthen safety in bus operations. To address this concern, this study explores how demographic attributes (age, education level) and occupational related factors (driving experience, number of working days per week, and daily driving hours) influence risky driving behaviours among express bus drivers in Malaysia. Risky driving was assessed using two proxies: history of traffic summons and crash involvement. A total of 280 drivers participated through face-to-face structured interviews using a self-developed questionnaire. Spearman's rank correlation and binary logistic regression were employed to examine associations between these variables and the two risk indicators. Findings revealed that most demographic and occupational related factors had no statistically significant association with either traffic summons or crash involvement. However, the number of working days per week was weakly but significantly associated with crash involvement, suggesting that longer workweeks may increase crash risk, likely due to fatigue accumulation. These results indicate that commonly examined demographic and exposure variables alone offer limited insights into the complex nature of risky driving behaviour. The study underscores the need for a more holistic approach in future investigations. Integrating organisational culture, behavioural tendencies, and psychological stressors may provide a more comprehensive understanding of risk factors, ultimately contributing to more effective interventions aimed at improving the safety of commercial drivers on Malaysian roads.*

**Keywords:** *Bus express; demographic; driving related predictors; risky driving; Malaysia*

## INTRODUCTION

The recent tragic road traffic crash involving a group of Universiti Pendidikan Sultan Idris (UPSI) students sent shockwaves across the nation and once again highlighted the critical need for improving public transport safety, particularly with regards to the operations of express bus. This tragedy, which resulted in 15 deaths and multiple injuries, underscored the vulnerability of passengers in high-capacity vehicles and has reignited national discourse on the adequacy of existing safety measures, enforcement mechanisms, and industry regulations governing express bus services (Bernama 2025).

While express bus crashes occur less frequently than those involving motorcycles or private vehicles, they tend to result in disproportionately severe consequences due to the number of occupants on board. With capacities exceeding 42 passengers, a single express bus crash can

instantly endanger dozens of lives (Hamzah et al. 2012). As such, the impact of a bus crash is comparable to multiple private vehicle crashes in terms of crash output and the scale of emergency response required. For this reason, road crashes involving express buses are often considered high-profile incidents.

Numerous high-impact bus crashes have been reported in Malaysia over the past two decades, including the notorious 2013 Genting Highlands crash which claimed 37 lives, making it one of the deadliest road crashes in Malaysian history (Ministry of Transport 2014). These serious incidents have often involved contributing factors such as driver fatigue, excessive speed, brake or mechanical failure, and insufficient regulation of long-haul driving hours (Majid & Ibrahim 2017; Oluwole et al. 2015). Table 1 summarises selected major crashes since 2007, which collectively highlight structural weaknesses in operational control, regulatory enforcement, and safety culture within the express bus sector.

TABLE 1. Road traffic crashes involving express bus

Year	Road Traffic Crash Case	Number of fatalities
2007	Bukit Gantang	20
2009	Plaza Tol Jelapang	10
2010	Cameron Highlands	27
2010	Border of Negeri Sembilan – Melaka	12
2013	Genting Highlands	37
2025	Grik	15

Given the high number of casualties often recorded in express bus crashes, a more serious and systemic approach is urgently required to improve safety outcomes within Malaysia's public transport sector. In response to long-standing concerns, a series of initiatives and regulatory frameworks have been introduced over the past decade aimed at enhancing service quality and mitigating crash risks. Among the most significant was the introduction of the *Industry Code of Practice for Road Transport Activities* (ICOP RTA) in 2010 by the Department of Occupational Safety and Health (DOSH). This code replaced the earlier *Code of Practice for Safety, Health and Environment in the Transport Sector* (COP SHE), introduced in response to rising fatality and injury rates linked to public and commercial vehicle crashes (Ahmad et al. 2021).

Despite these institutional efforts, crash statistics involving buses and lorries between 2010 and 2020 have not demonstrated a consistent downward trend. This stagnation raises critical concerns about the effectiveness of the existing safety framework and its implementation. Statistics from the Royal Malaysia Police (RMP, 2021) indicate that the total number of commercial bus crashes fluctuated between 2016 and 2021, with 391 crashes

reported in 2016, peaking at 469 in 2017, and then slightly decreasing to 424 in 2021. These crashes comprised fatal, serious, and minor injuries, with fatal crashes ranging from 200 to 249 cases, serious crashes from 101 to 131 cases, and minor crashes from 50 to 95 cases over the six-year period. These findings suggest that while the ICOP RTA provides a strong regulatory foundation, its on-ground enforcement and uptake remain inconsistent and insufficient to produce measurable improvements in crash outcomes.

The causes of road traffic crashes involving buses are multifactorial and complex, encompassing human, environmental, road, and vehicular elements. According to Khoo and Ahmed (2018), the major contributing factors to road crashes include driver characteristics, road infrastructure, environmental conditions, and vehicle condition. Among these, the World Road Association's Road Safety Manual (PIARC, 2003) highlights that 93% of road crashes globally are attributed to driver-related factors, compared to 34% linked to road and environmental conditions, and only 13% to vehicle-related issues (as shown in Figure 1). This emphasis on driver-related factors is reinforced by Gras et al. (2004), who likewise identify these as the most dominant contributors to road crashes.

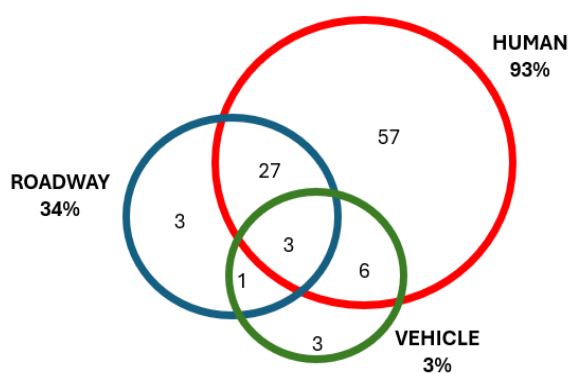


FIGURE 1. Causes of road traffic crash

Express bus drivers are exposed to higher crash risks due to prolonged working hours, irregular shift schedules, solitary driving, inadequate rest, and constant pressure to meet tight deadlines (Amodu et al. 2023; Boateng 2021). These demanding conditions often result in fatigue and diminished judgment, impairing driving performance (Useche 2018). In this context, driver-related factors encompass a broad spectrum of psychological and behavioural characteristics, such as risk perception, safety attitudes, personality traits, and driving habits. Research has shown strong correlations between these behavioural dimensions and crash involvement, particularly within public and commercial transport settings.

The role of personality traits has also been critically examined. According to Mallia et al. (2015), traits such as excitement-seeking and low altruism increase the likelihood of risky driving behaviours, whereas drivers who were more emotionally stable and conscientious were significantly involved in fewer crashes. This insight suggests that understanding bus driver behaviour is not only crucial for preventing crashes but also essential for evaluating long-term safety performance across the transport industry.

Effectively addressing unsafe driving behaviour requires a multi-dimensional approach that goes beyond punitive enforcement. It calls for a deeper psychological understanding of driver behaviour, coupled with system-based interventions to bring about lasting change. These may include structured behavioural training, psychological screening during recruitment, the use of in-vehicle monitoring systems, and the integration of behavioural science in public safety campaigns. By addressing the root cause of driver behaviour, policymakers and road safety stakeholders can craft a more targeted and effective safety strategy for the express bus industry.

Previous studies have shown that demographic characteristics play a crucial role in influencing risky

driving behaviour. Factors such as age, gender, driving experience, education level, and marital status have been widely examined in the literature. Research consistently indicates that younger and male drivers are more likely to engage in risky driving behaviours, including speeding, aggressive driving, tailgating, and traffic violations, compared to older or female drivers (Özkan & Lajunen, 2006; Lucidi et al. 2010; de Winter & Dodou, 2010). Driving experience has also been found to be inversely related to risk-taking, as less experienced drivers tend to underestimate hazards and overestimate their driving abilities (Ulleberg & Rundmo, 2003; Scott-Parker et al. 2013). In addition, educational level and socioeconomic background have been associated with differences in traffic law compliance and crash involvement (Sullman et al. 2015; Iversen & Rundmo 2004). Marital status has similarly been linked to driving behaviour, with unmarried drivers generally reporting higher levels of risky driving (Taubman-Ben-Ari & Yehiel 2012). Collectively, these studies suggest that demographic factors substantially influence both the perception of risk and engagement in hazardous driving behaviours.

Building upon this foundation, the present study aims to examine the influence of demographic factors, specifically age, gender, education level, as well as occupational related factors, on the likelihood of engaging in risky driving behaviour among Malaysian express bus drivers. It explores how these individual characteristics may relate to unsafe actions on the road that can compromise the safety of road users. In this study, traffic summons history and crash involvement were used as indirect indicators of risky driving behaviour, as both represent outcomes that may result from driver actions or negligence. By investigating these associations, the study seeks to generate insights that can inform the development of targeted safety interventions, driver training programs, and policy strategies tailored to the specific risk profiles within the bus driving population. Ultimately, the findings aim to support efforts in enhancing road safety and improving the operational performance within the express bus sector.

## METHODOLOGY

A face-to-face interview approach was employed using a structured questionnaire developed. Data collection took place at selected express bus terminals namely Hentian Bas Kajang and Terminal Bersepadu Selatan, over a ten-month period, from July 2023 to May 2024. Prior to each interview, respondents were provided with a clear explanation of the study's objectives and the purpose of

their participation to ensure informed consent and voluntary involvement.

This method was deliberately selected to optimise response rates and enhance the accuracy of the data collected. Direct, in-person interaction enabled researchers to clarify any ambiguities in the questionnaire, ensure that respondents fully understood the items, and foster sincere and thoughtful responses. This approach is particularly effective when engaging with professional drivers who may experience time constraints or have varying literacy levels in self-administered formats.

To achieve the objectives of the study, simple random sampling was utilised to recruit respondents who met specific inclusion criteria. The target sample size of 361 express bus drivers determined using the Krejcie and Morgan (1970) sample size determination table, based on the estimated population of 6,600 express bus drivers in Malaysia. However, due to challenges in accessing the target group, only 280 valid responses were obtained.

Despite this shortfall, the sample size achieved was deemed adequate. An alternative calculation using G\*Power statistical software indicated that a minimum of 172 respondents would suffice for the intended statistical analyses. Moreover, this number falls well within the generally accepted range for behavioural research, where sample sizes between 30 and 500 are considered appropriate (Sekaran & Bougie 2016; Roscoe 1975).

Descriptive and inferential statistical methods were employed to summarise key variables and to explore relationships within the dataset. Spearman's rank-order correlation was used to assess the strength and direction of associations between variables. Additionally, binary logistic regression was conducted to examine the influence of selected predictor variables on binary outcomes, such as summons history and crash involvement. Non-parametric methods were chosen based on preliminary normality assessments, which indicated that the data did not meet the assumptions required for parametric testing.

## RESULTS

### DEMOGRAPHIC AND OCCUPATIONAL RELATED FACTORS

The demographic profile of the 280 express bus drivers who participated in the study indicates that all respondents were male (100%), with no female drivers represented in the sample. In terms of age distribution, the majority of

drivers were between 35 and 39 years old (60%), followed by those aged 40 to 44 years (24%), 30 to 34 years (15%), and 45 years and above (1%). All respondents identified as Malay (100%), with no representation from other ethnic groups such as Chinese, Indian, or others.

Regarding marital status, 85% of the drivers were married, 10% were single, and 5% were either divorced or widowed. In terms of educational background, the majority (76%) had completed secondary education, while 24% had attained only primary education. None of the participants reported having tertiary education or no formal education.

With respect to occupational related factors, 59% of the respondents had five or more years of experience operating express buses, while 41% had less than five years of experience. The majority (69%) reported working more than four days per week, while 31% worked four days or fewer. Additionally, 80% of the drivers indicated that they drove more than four hours per day, whereas 20% reported driving four hours or less. These demographic and occupational related factors provide essential context for analysing the behavioural tendencies and safety-related attitudes of express bus drivers within this study. The demographic characteristics of the respondents are detailed in Table 2 below.

TABLE 2. Demographic and occupational related factors of respondents

		%
Gender	Male	100
	Female	0
Age	30 – 34 years	15
	35 – 39 years	60
	40 – 44 years	24
	≥ 45 years	1
Race	Malay	100
	Chinese	0
	Indian	0
	Other	0
Marital status	Single	10
	Married	85
	Divorced/Widowed	5
Education level	None	0
	Primary	24
	Secondary	76
	Tertiary	0
Driving experience	< 5 years	41
	≥ 5 years	59
Working days per week	≤ 4 days	31
	> 4 days	69
Driving hours per day	≤ 4 hours	20
	> 4 hours	80

In this study, driving experience, working days, and daily driving hours were categorised using thresholds from prior studies. A five-year cut-off distinguished less from more experienced drivers,  $\leq 4$  versus  $> 4$  working days reflected workload, and  $\leq 4$  versus  $> 4$  daily hours marked the critical fatigue threshold (Senserrick & Haworth 2005; Shabadin et al. 2022).

#### TRAFFIC SUMMONS AND CRASH INVOLVEMENT

Traffic summons and crash involvement among respondents were examined in this study, with crash involvement defined as all crash types, including property-damage-only, serious, and fatal crashes. Among the 280 express bus drivers, 32% reported receiving a traffic summon while on duty, whereas 68% had no such history. Only 6% reported involvement in a road traffic crash during their tenure, while 94% had no prior crash record. The detailed breakdown of these findings is presented in Table 3. Overall, the results indicate that the majority of respondents maintained relatively clean driving records, which may reflect positively on their driving behaviour, adherence to road safety regulations, or the effectiveness of enforcement and monitoring mechanisms within the express bus industry.

TABLE 3. Traffic summons and crash history

		%
Traffic summons	Yes	32
	No	68
Crash involvement	Yes	6
	No	94

#### CORRELATION ANALYSIS BETWEEN DEMOGRAPHIC, OCCUPATIONAL RELATED FACTORS AND RISK OUTCOME

Spearman's rho correlation analysis was conducted to examine the relationships between selected demographic and occupational related factors with traffic summons and crash involvement among express bus drivers. As shown in Table 4, most of the variables demonstrated negligible to very weak correlations with the two outcome indicators and were not statistically significant ( $p > 0.05$ ). Variables such as age, marital status, education level, driving experience, and daily driving hours showed minimal association with both traffic summons and crash involvement, indicating that these factors are not strong predictors of risky driving behaviour in this context.

Notably, working days per week showed a weak but statistically significant positive correlation with crash involvement ( $\rho = 0.138$ ,  $p = 0.021$ ). This suggests that drivers who work more days in a week may be slightly more likely to be involved in crashes. Although the strength of the relationship is weak, this finding may reflect the effects of increased work-related fatigue or reduced rest time, which have been linked to elevated crash risk in previous research.

Overall, the analysis indicates that demographic and occupational related factors, while important to examine, may not sufficiently explain variations in risky driving behaviour. This highlights the need to consider additional factors such as organisational safety culture, driver health, stress levels, and enforcement environments in future studies.

TABLE 4. Spearman's rho correlation result

Variable 1	Variable 2	Correlation Coefficient	Significance	Interpretation
Age	Traffic summons	0.014	0.815	Negligible positive correlation; not statistically significant
Age	Crash involvement	0.022	0.709	Negligible positive correlation; not statistically significant
Marital status	Traffic summons	0.073	0.222	Very weak positive correlation; not statistically significant
Marital status	Crash involvement	0.036	0.546	Negligible positive correlation; not statistically significant
Education level	Traffic summons	-0.043	0.477	Very weak negative correlation; not statistically significant
Education level	Crash involvement	0.004	0.940	No correlation; not statistically significant
Driving experience	Traffic summons	-0.003	0.960	No correlation; not statistically significant
Driving experience	Crash involvement	0.063	0.295	Very weak positive correlation; not statistically significant

*continue...*

...cont.

Working days per week	Traffic summons	0.061	0.313	Very weak positive correlation; not statistically significant
Working days per week	Crash involvement	0.138	0.021	Weak positive correlation; statistically significant
Daily driving hours	Traffic summons	-0.011	0.856	Negligible negative correlation; not statistically significant
Daily driving hours	Crash involvement	-0.092	0.123	Very weak negative correlation; not statistically significant

### PREDICTING THE LIKELIHOOD OF TRAFFIC SUMMONS AND CRASH INVOLVEMENT

Binary logistic regression analyses were conducted to examine the influence of selected demographic and occupational related factors, namely age, education level, driving experience, working days per week, and daily driving hours on two safety outcomes among express bus drivers: receiving a traffic summons and crash involvement.

As shown in Table 5, the analysis for traffic summons revealed that none of the predictors were statistically significant ( $p > 0.05$ ). Age had virtually no effect on the outcome ( $\text{Exp}(B) = 1.001$ ,  $p = 0.989$ ), while education level, driving experience, and daily driving hours also demonstrated negligible impacts. Working days per week showed the highest odds ratio ( $\text{Exp}(B) = 1.318$ ), suggesting a minor increase in the likelihood of receiving a traffic summons with more working days per week, but this relationship was not statistically significant ( $p = 0.334$ ).

In contrast, the analysis for crash involvement, as presented in Table 6, also indicated that none of the variables were statistically significant at the conventional threshold. However, working days per week approached significance ( $p = 0.058$ ) with an odds ratio of 7.261, implying that drivers working more days in a week could be over seven times more likely to be involved in a crash. This finding may reflect the effects of cumulative fatigue or inadequate rest, both of which are recognized contributors to increased crash risk. Other variables, such as age and daily driving hours, showed negative coefficients, indicating a possible reduction in crash risk with increasing age or longer daily driving duration, though these trends were not statistically meaningful.

Overall, the results suggest that the demographic and occupational related factors analyzed do not significantly predict the likelihood of receiving a traffic summons or being involved in a crash. Nonetheless, the finding related to working days per week may warrant further exploration, particularly in relation to driver fatigue, scheduling policies, and enforcement of rest regulations in the express bus industry.

TABLE 5. Binary logistic regression (traffic summons) result

Variable	B	Sig.	Exp(B)	Interpretation
Age	0.001	0.989	1.001	No significant effect; practically no influence of age on the outcome
Education level	-0.210	0.487	0.810	No significant effect; slight decrease in odds with higher education
Driving experience	0.024	0.847	1.024	No significant effect; minimal increase in odds with more experience
Working days per week	0.276	0.334	1.318	No significant effect; small increase in odds with more workdays
Daily driving hours	-0.006	0.926	0.994	No significant effect; negligible decrease in odds with more driving hours
Constant	-2.024	0.470	0.132	Not statistically significant; indicates baseline log-odds when all predictors are zero

TABLE 6. Binary logistic regression (crash involvement) result

Variable	B	Sig.	Exp(B)	Interpretation
Age	-0.135	0.346	0.874	No significant effect; older drivers slightly less likely to be involved in a crash
Education level	0.92	0.880	1.097	No significant effect; minimal impact on crash likelihood
Driving experience	0.327	0.143	1.386	Not significant; slight increase in crash odds with more experience
Working days per week	1.982	0.058	7.261	Approaching significance; drivers working more days are over 7× more likely to crash
Daily driving hours	-0.195	0.138	0.823	Not significant; slight decrease in crash odds with longer daily hours
Constant	-7.848	0.267	0.000	Model intercept; not statistically significant

## DISCUSSION

The findings of this study provide valuable insights on the relationship between individual demographic factors, occupational related factors and risky driving outcomes, namely traffic summons and crash involvement. Overall, both the correlation and logistic regression analyses revealed that most demographic and occupational related factors do not significantly influence the likelihood of these outcomes among express bus drivers.

The Spearman correlation analysis revealed negligible to very weak relationships between variables such as age, education level, marital status, driving experience, working days per week, and daily driving hours with traffic summons and crash involvement. Only the correlation between working days per week and crash involvement neared significance, indicating a possible link between increased work frequency and crash risk. This finding is consistent with previous research, which identified driver fatigue, extended working hours, and insufficient rest periods as key contributors to crash involvement in the commercial driving sector (Williamson et al. 2011).

The binary logistic regression further confirmed the lack of statistically significant predictors for both traffic summons and crash involvement. Among all predictors, working days per week showed the strongest association with crash involvement (odds ratio = 7.261,  $p = 0.058$ ); however, this relationship was not statistically significant at the 0.05 level. While the result suggests a possible trend, it does not provide sufficient evidence to confirm an effect of working frequency on crash involvement.

Interestingly, driving experience and daily driving hours did not show any significant associations with either traffic summons or crash involvement. This contradicts some past findings that suggested experience might reduce

crash risk (McCartt et al. 2000), and that prolonged driving hours increase risk due to fatigue accumulation (Amodu et al. 2024). One possible explanation for this discrepancy could be the relatively homogenous nature of the sample which may have limited the variability needed to detect stronger effects.

Overall, the findings underscore the complexity of predicting risky driving outcomes based solely on basic demographic and occupational related factors. It suggests that psychosocial, organisational, and behavioural factor, such as stress, job pressure, safety culture, and enforcement may play a more prominent role in shaping driver behaviour and safety outcomes and should be explored in future research.

## CONCLUSION

This study explored the relationship between demographic and occupational related factors with risky driving outcomes, namely, traffic summons and crash involvement among express bus drivers. While most variables such as age, education level, and driving experience did not show statistically significant associations, one factor consistently showed a potential link with increased crash risk. Number of working days per week, although not significant at the conventional threshold, its consistent presence across analyses suggests that working more days per week may contribute to fatigue and heightened crash vulnerability.

These findings indicate that basic demographic and occupational related factors alone are not sufficient to explain risky driving behaviour. As such, future research should incorporate psychological, organisational, and environmental dimensions to better understand and address the root causes of unsafe driving practices. Insights from

this study may help inform policies on work-rest schedules and support the design of more targeted safety interventions for express bus drivers.

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## DECLARATION OF COMPETING INTEREST

None.

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