Contributing Factors to Fatal Crashes

Project Outline

Road deaths in New Zealand remain stubbornly high, with significant societal and economic costs. A continued understanding of the contributing factors to fatal crashes is needed to inform evidence-based actions that have the greatest chance of reducing them.

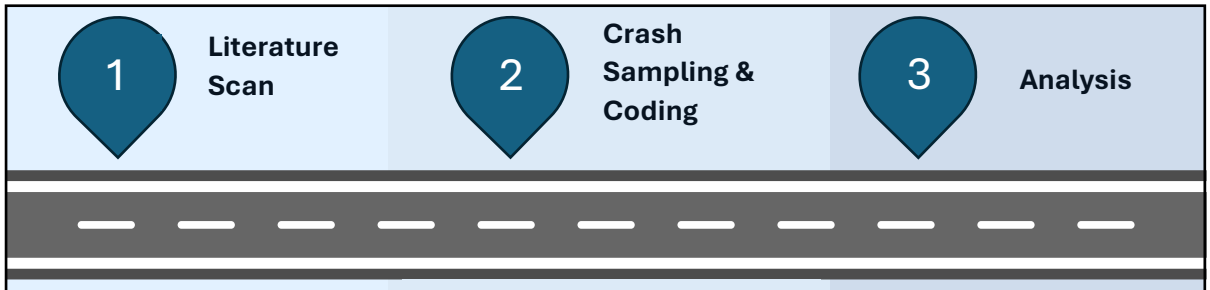
This research aimed to build on and update previous work **investigating the contributing factors and 'nature' of fatal crashes** using a Safe System analysis approach. The analysis was designed to allow comparison to previous and overseas work.

The Safe System approach focusses on both deaths and serious injuries. However, serious injury data in New Zealand does not distinguish between relatively minor medical treatment and potentially life changing injuries. A focus on fatal crashes was chosen to better understand the most severe crashes within a relatively homogeneous dataset.

The following research questions underpinned the research:

1. What are the Safe System determinants of fatal road crashes in New Zealand, as defined by previous research?
2. What proportion of crashes result from everyday mistakes and 'system failures', compared with crashes where illegal or reckless/extreme behaviour was involved?
3. What are the implications of the findings for policy, and practice?

Research Approach



A brief **literature scan** was conducted to identify similar studies for comparison of findings, and to aid in the development of the Safe System analysis framework.

Two hundred fatal crashes from across New Zealand in 2024 were **randomly sampled** into two cohorts: 100 'light-vehicle-only' and 100 "all-other crashes'.

Crashes were coded to identify the presence of contributing factors, grouped under the four pillars (roads and roadsides, speed environment, vehicle and user), as outlined in a Safe System framework.

Descriptive statistics were produced for the full sample and each crash cohort.

A **cluster analysis** was also conducted to identify groups of crash factors that commonly co-occur. This allowed typical profiles of crashes to be developed.

Crashes were also classified based on the presence of different road user behaviours in the crash circumstances. The definition of each of these classifications is provided below:

- **'System failures alone'** - everyday people making mistakes and the wider Safe System not preventing a fatality.
- **'Involves illegal behaviour'** - an illegal but not reckless/extreme behaviour, such as driving without a license but otherwise compliantly, contributed to the fatality.
- **'Involves reckless/extreme behaviour'**- multiple illegal behaviours or deliberate violations such as exceeding permitted alcohol levels or significant speeding.

Findings - Literature Scan

The scan identified literature assessing the contributing factors to road crashes, but focused on pinpointing **system analysis methods** and **key findings** from previous Safe System analyses.

System analysis methods

Methods identified include Safe System and socio-technical approaches.

Nine studies using a Safe System framework to analyse road crashes were identified. Methods from earlier analyses were gathered to inform this study's analytical approach.

Safe System analysis findings

Multiple system failures were evident in almost all fatal and serious crashes.

Fatal crashes were also more likely to involve reckless/extreme behaviour than less severe crashes, which more often occur due to everyday mistakes and system failures.

Findings – Safe System Analysis

The analysis found that road fatalities almost always involved **multiple system failures** (99% of sample crashes), with *56% of crashes indicating failures in all four Safe System pillars*, reflecting the findings of previous Safe System analyses.

The **key findings** for each Safe System pillar are presented below:

Roads and roadsides pillar

- The majority of crashes (65%) occurred in rural areas, with the proportion higher for the light vehicle only cohort (78%).
- Half of fatal crashes involved a vehicle leaving the lane on a >80 km/h rural road that was undivided or lacked roadside barriers.
- While there were only 23 crashes involving pedestrians and cyclists, 63% involved a lack of infrastructure or adequate safety features.

Speed environment pillar

- Half of the fatal crashes were on >80km roads without barriers suggesting a mismatch between the road and speed environment.
- 45% of fatal crashes occurred on roads where the mean operating speed (average speed of vehicles travelling on the road) was much lower than the speed limit.

Vehicle pillar

- Vehicles driven by the victim were, on average, older than the NZ light vehicle fleet, often had low safety ratings and were missing basic (ABS or ESC) and advanced safety features.
- In crashes involving multiple vehicles, the victim's vehicle was always of equal or lesser weight to the colliding vehicle.
- 70% of vehicles involved in collisions with VRUs (pedestrians, cyclists and motorcyclists) had poor VRU protection safety ratings.

User pillar

- 45% of the crashes involved drivers on their learner, restricted, or overseas license or driving illegally (e.g while disqualified, etc.)
- 57% of crashes involved a road user with alcohol over the legal limit, and/or illegal/ pharmaceutical drugs that affect driving.
- 47% of crashes involved speeding over 10 km/h or travelling too fast for the conditions.
- 40% of crashes involved distraction or inattention.
- In 34% of 'light vehicle only' crashes, the victim wasnt wearing a seatbelt.

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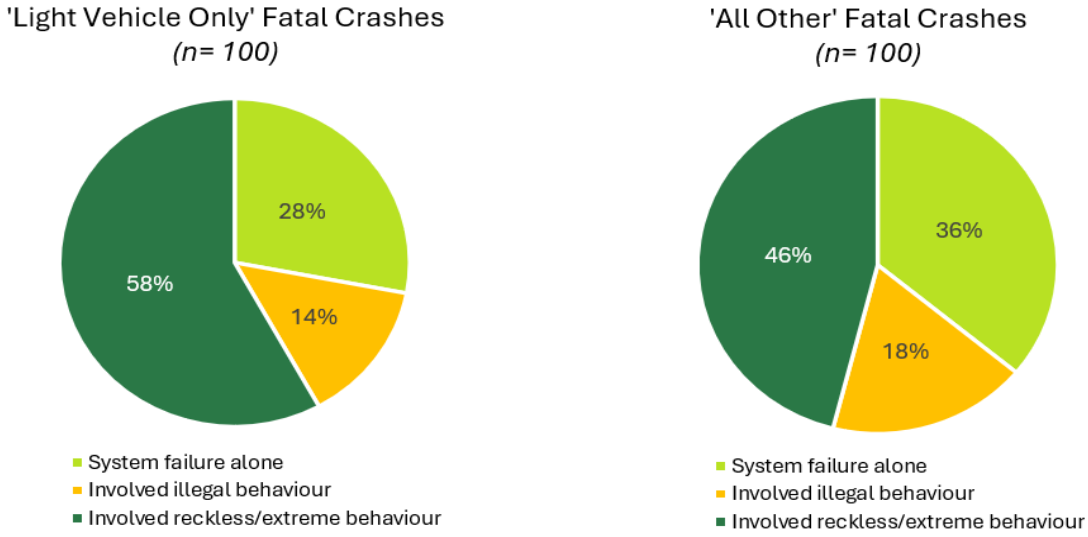
The 'light vehicle only' cohort involved a greater proportion of 'reckless/extreme' behaviours compared to the 'all other' crashes cohort (as shown below). Importantly, most crashes involving 'reckless/extreme' or 'illegal' behaviour also exhibited multiple Safe System failures, suggesting the wider system context also needs to be considered.



Findings – Fatal crash profiles

Six fatal crash profiles were identified through a statistical cluster analysis:

Single vehicle- run off road (28% of crashes), after losing control on high-speed rural roads lacking roadside barriers and with operating speed much lower than the speed limit. Majority at night. Young developing drivers were overrepresented. Intoxication, speeding and seatbelt non-use common. Reckless behaviours in over half of cases.

Light vehicles (25% of crashes), mostly head-on impacts on high-speed rural roads lacking centre barriers. Young drivers and those driving with illegal licenses were overrepresented. Often intoxicated with speeding and distraction. Strongly shaped by reckless or illegal behaviour with other system failures.

Large vs small vehicles (15% of crashes). High mass vehicles colliding with light vehicles in head-on crashes mostly on high-speed rural roads lacking centre barriers and less so at intersections. Mostly middle aged full licensed drivers. Frequently involved distraction/inattention and/or speed. Mostly mistakes and system failures.

Vehicle struck pedestrian/cyclist (11% of crashes), predominantly on urban arterial roads at intersections or driveways. Infrastructure such as such as safe crossings and footpaths often missing. Middle aged and fully licensed drivers. Distraction/ inattention (and possibly 'failed to notice' situations) was common. Mostly system failures alone.

Vehicle struck motorcycle (11% of crashes), most often at intersections on urban and rural roads. Riders and drivers often inexperienced with illegal licenses. Intoxication and distraction/inattention (and potentially 'failed to notice' situations) dominant, with speeding and extreme behaviour often implicated. Mostly, illegal/reckless behaviours.

Motorcycle- run off road (10% of crashes), after losing control on rural and urban roads with operating speeds often much lower than the speed limit. Most were middle-aged, with inexperienced riders notably overrepresented. Speed and intoxication were frequent contributors. Reckless/illegal behaviour more common than system failures alone.

Conclusions and Implications for Policy & Practice

This research shows that **fatal crashes occur when multiple system failures coincide**, underscoring the need to address all Safe System areas to reduce fatal crashes. Other highlights include:

Road users make mistakes which can inadvertently lead to severe consequences. However, a more nuanced understanding of the road user contribution to the Safe System is also suggested.

Increased **illegal or reckless/extreme behaviour** in fatal crashes is a possible trend, as is the changing nature of these behaviours, particularly the increased presence of drugs. Attention should be given to better understand reckless/extreme behaviours, the trends that drive them, and interventions to reduce these behaviours among road users. Other system approaches such as socio-technical system methods may be better placed for this.

There are many fatal crashes where **road infrastructure or speed limit shortcomings** have been present. This suggests a strong road safety infrastructure programme is needed so that consistency and minimum levels of safety at a national scale can be achieved.

The **vehicle contribution** to fatalities is also clear. There is a need for greater clarity about vehicle safety issues, and associated education, incentives, and changes to regulatory settings. Vehicle age and safety features, mismatches between vehicle masses in collisions, and the aggressivity of vehicle frontal shape in vulnerable road user collisions should be a focus.

Future analyses might include serious injuries, especially if the more severe serious injuries can be identified. Wider system analyses, using socio-technical methods, are suggested to provide an understanding of the societal, policy, and organisational arrangements that set the foundations for delivering on the Safe System.