Profiling Drivers’ Risky Behaviour Towards All Road Users

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Much of the understanding of risks associated with driver behaviour is derived from police crash records:

- Represent a fraction of all crashes
- Represent an even smaller proportion of all driving activity
- Do not account for behaviour which results in ‘near crashes’

Second-by-second GPS monitoring records all driving behaviour:

- Includes events not recorded using other methods
- Comparing before and after an intervention requires a systematic method of assess driver behaviour
Considerable heterogeneity in driver behaviour both within and between drivers
Source of heterogeneity can be attributed to driver, temporal and spatial variables
Need to control for temporal and spatial variables to isolate driver element

(Familiar and Greaves, 2011)
AIMS

› Test a methodology that controls for the road environment to isolate for the inherent characteristics of the driver

› Present a framework for assessing the risks of injuries or fatalities occurring to all road users due to individual drivers’ behaviour

   › Used to allow for comparisons before and after an intervention

   › For the same driver across time; and

   › Between different drivers
METHODOLOGY

- 147 drivers across Sydney
  - Driver survey
  - > 80 million GPS observations
  - Five week monitoring

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<th>Spatial Factors</th>
<th>Temporal Factors</th>
<th>Behavioural Measures</th>
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DRIVER RISK PROFILING FRAMEWORK

- Can be used to assess injury or fatality risk on multiple dimensions
  - Driver behaviour
  - Attitudes
  - Temporal and spatial factors
- Isolates factors internal and external to the driver
- Risk components derived from the literature
RISK SCORES AND MARGINS

› Main output from framework
  › Used to compare between and within drivers
  › Can be broken down by spatial, temporal and road user types
STEP 1: IDENTIFYING ROAD SEGMENTS

› Identify road segments with the same combination of spatial and temporal characteristics
STEP 2: CATEGORISING ROAD SEGMENTS

- Temporal and spatial identifier (TSI) assigned to each second-by-second observation
- Over 5,400 unique combinations across all drivers
- Most frequent TSI associated with 12,483 road segments
STEP 2: CATEGORISING ROAD SEGMENTS

Note: Not To Scale

- Segment 1
- Segment 2
- Segment 3
- Vehicle

Tuesday
08:30
Temporal and spatial identifiers (TSI) are used to control for temporal and spatial factors.

If effective, would expect that variability of individual behavioural measures will be less in road segments with the same TSI.

Note: Variability does not indicate anything about frequency or magnitude of behaviours.
Speeding by 1 km/h or more:

- 95% of drivers have less variability in speeding behaviour within the same road environment than for all driving activity
  - Greater inter-environment variability

- 5% of drivers have more variability in speeding behaviour within the same road environment than for all driving activity
  - Greater intra-environment variability
INTRA vs. INTER-ENVIRONMENT VARIABILITY

- More variability = Greater intra-environment (within-environments) variability
- Less variability = Greater inter-environment (between-environment) variability

Proportion of Drivers

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

Spd1 Spd10 Spd20 Accel0 Accel1 Accel3 Brake0 Brake1 Brake3

More Variability Less Variability
INTRA vs. INTER-DRIVER VARIABILITY

- More variability = Greater intra-driver (within-driver) variability
- Less variability = Greater inter-driver (between-driver) variability
Identifying and controlling for spatial and temporal variables helps deal with the inherent variability in driver behaviour.

Works across a number of behavioural measures:
- Speeding, acceleration, negative acceleration

Enables like-for-like comparisons between time periods and drivers.

Permits assessment of driver behaviour including all driving activity.

Specific road environments, road users or behaviours can be studied in isolation or in comparison to others.
CURRENT WORK

› Refine algorithm to identify common patterns in driving behaviour within and between drivers

› Incorporate proxies for immeasurable road environment characteristics (congestion, etc.)

› Include additional individual-spatial factors (proximity to home, familiarity)

› Particular emphasis on ‘extreme’ behaviours
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