Profiling Drivers' Risky Behaviour Towards All Road Users

Adrian B. Ellison, Stephen Greaves & Rhonda Daniels
Institute of Transport and Logistics Studies
The University of Sydney

THE UNIVERSITY OF SYDNEY

ACRS Conference, 10 August 2012

› 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 assessing 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
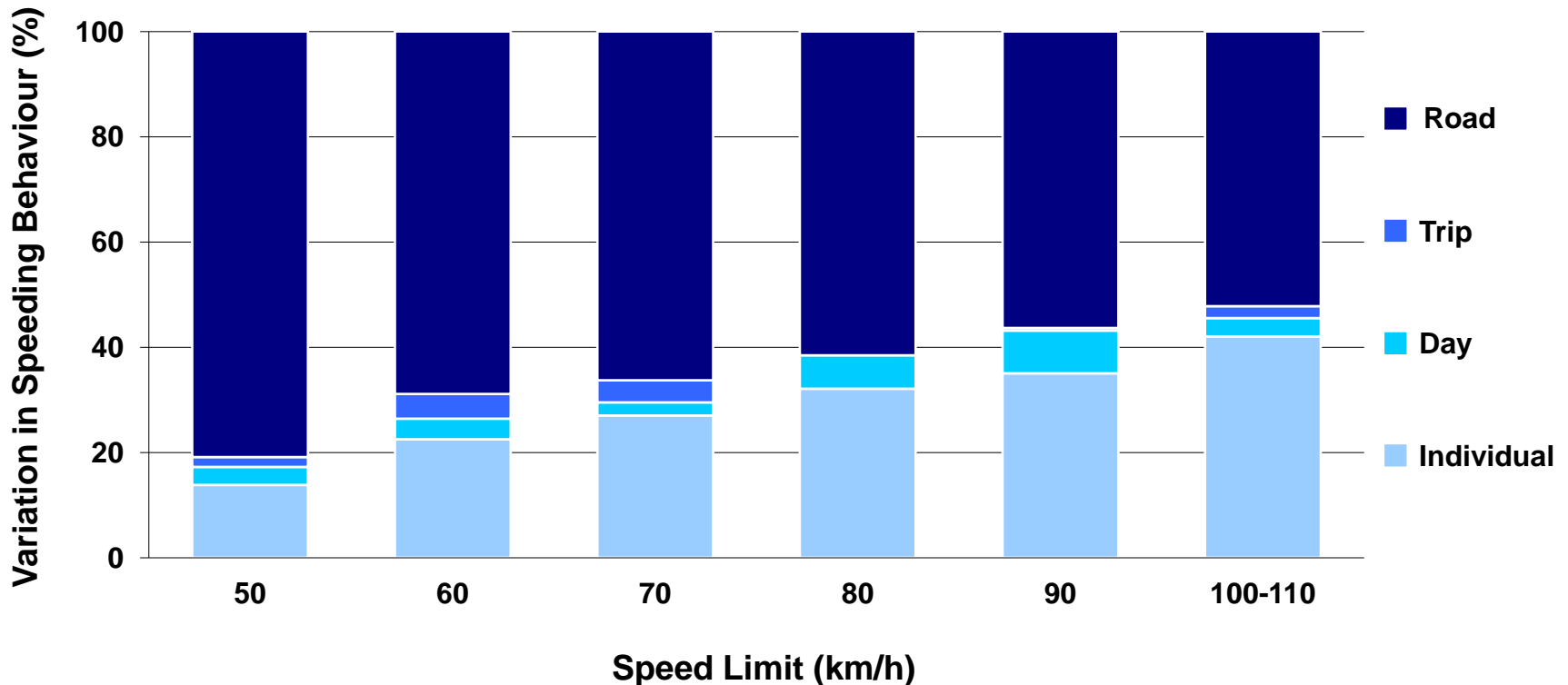
(Familar and Greaves, 2011)

› 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

THE UNIVERSITY OF **SYDNEY**

› 147 drivers across Sydney

- Driver survey

- > 80 million GPS observations

- Five week monitoring
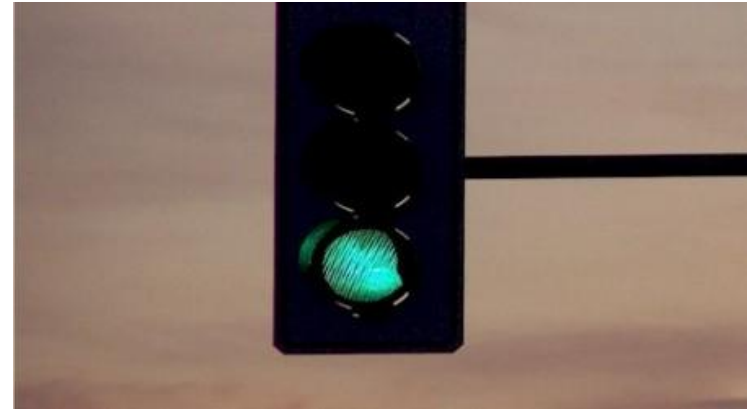
Spatial Factors	Temporal Factors	Behavioural Measures
Signalised intersection	Time of day	Absolute speed
Non-signalised intersection	Day of the week	Speeding
Roundabout	Driver	Positive acceleration
Speed limit	Trip purpose	Negative acceleration
Rain	Number of passengers	
School zone		

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
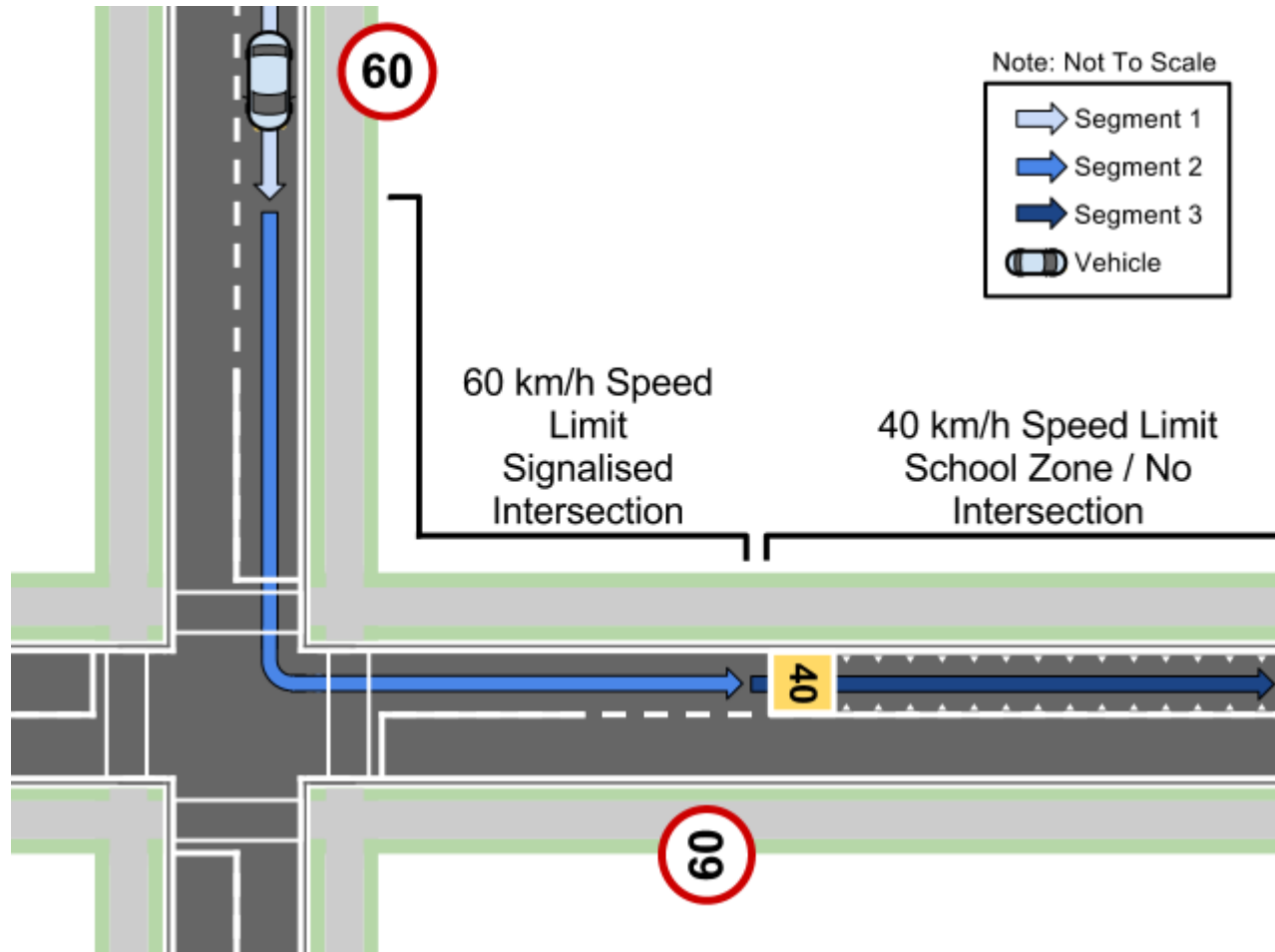
› Risk components derived from the literature
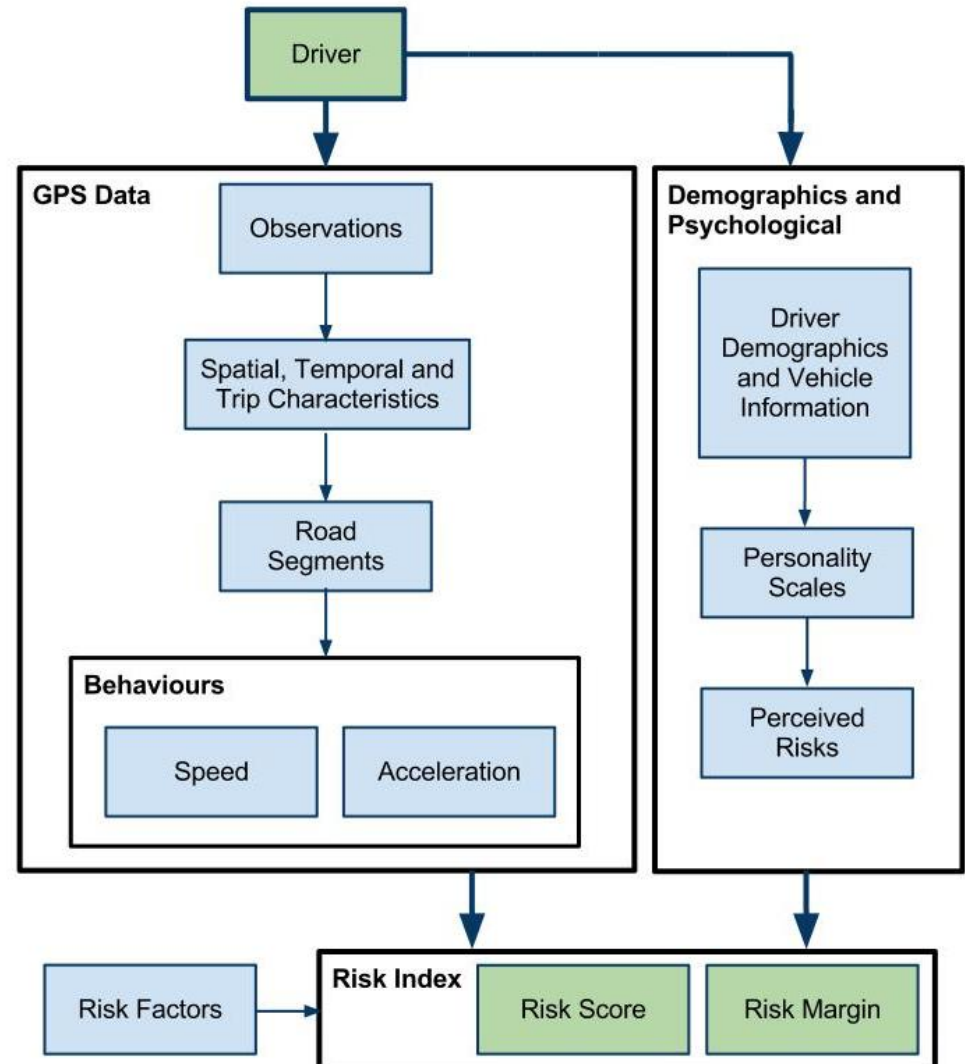
› Main output from framework

› Used to compare between and within drivers

› Can be broken down by spatial, temporal and road user types
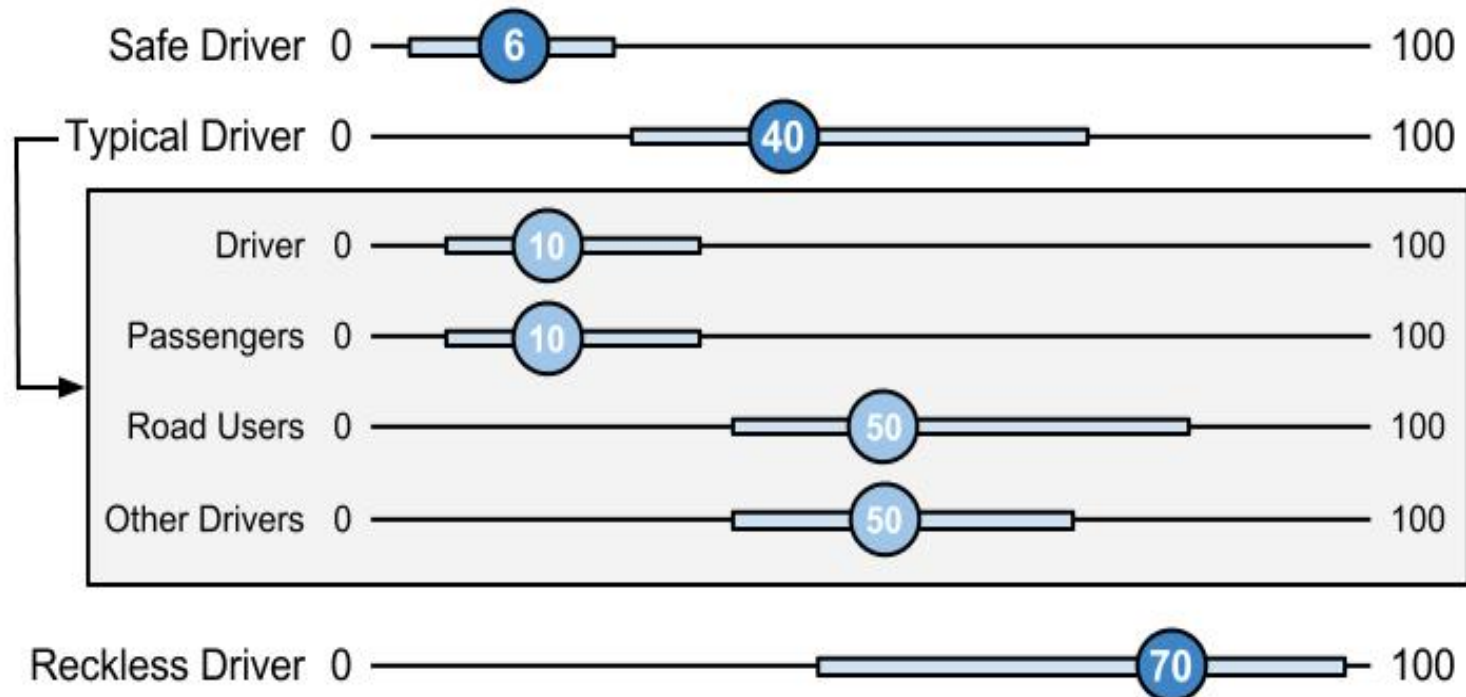
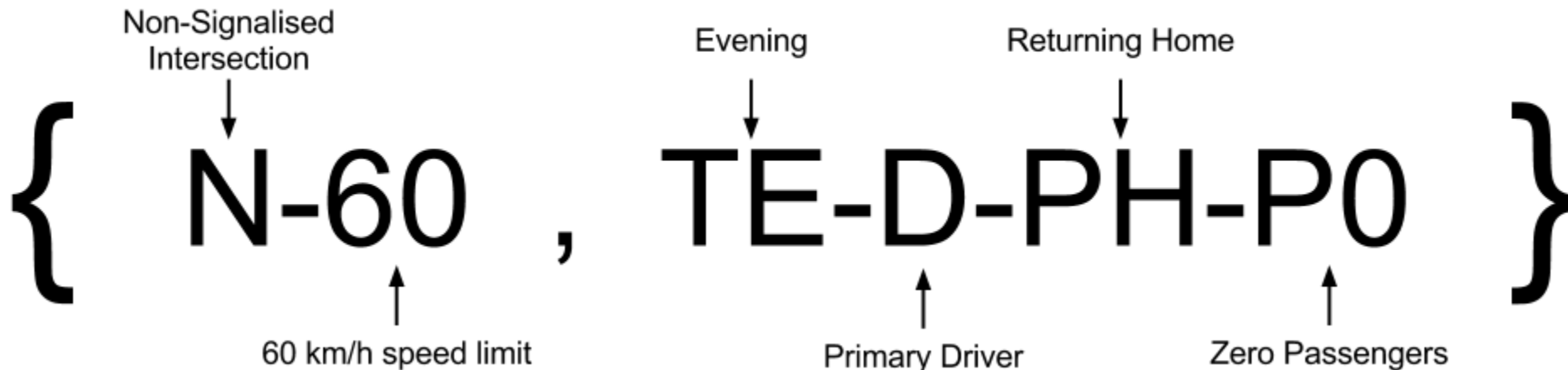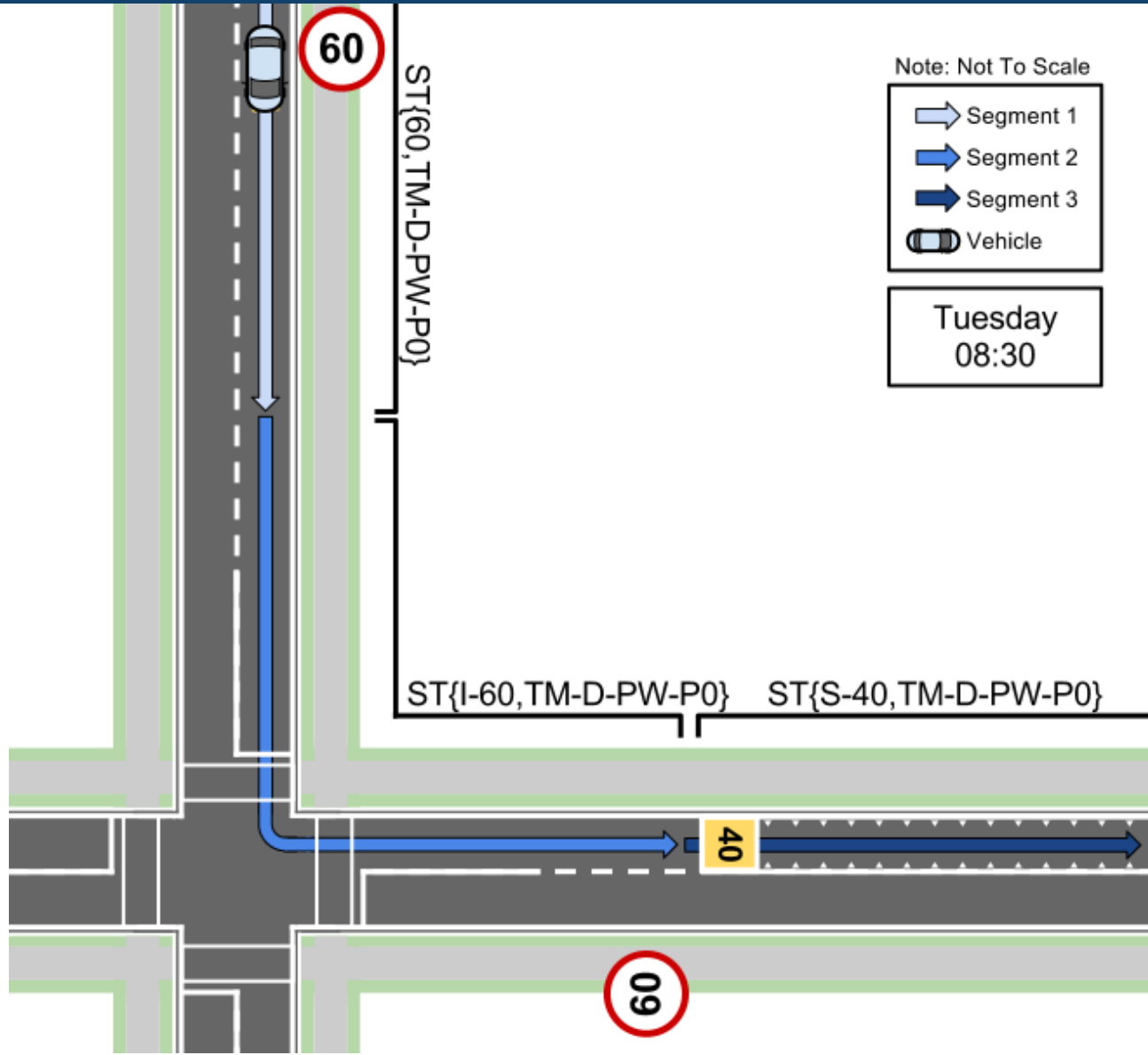› Identify road segments with the same combination of spatial and temporal characteristics

› 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

{ N-60 , TE-D-PH-P0 }

Non-Signalised Intersection

Evening

Returning Home

60 km/h speed limit

Primary Driver

Zero Passengers

Note: Not To Scale

Segment 1
Segment 2
Segment 3
Vehicle

Tuesday
08:30

60

ST{60,TM-D-PW-P0}

ST{I-60,TM-D-PW-P0}   ST{S-40,TM-D-PW-P0}

40

60

› 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
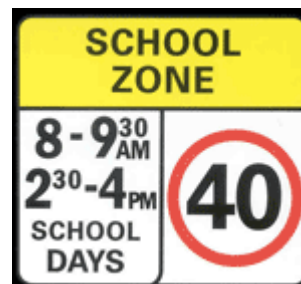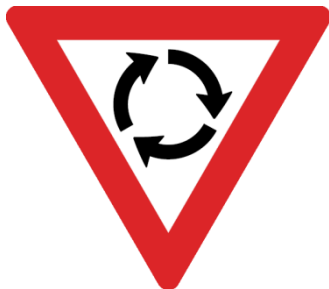
INTRA vs. INTER-<u>ENVIRONMENT</u> VARIABILITY
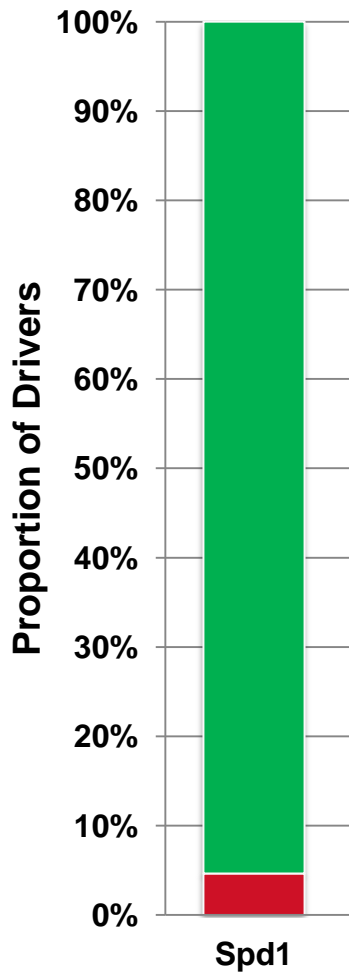
› Speeding by 1 km/h or more:

  › 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

› More variability = Greater intra-environment (within-environments) variability
› Less variability = Greater inter-environment (between-environment) variability
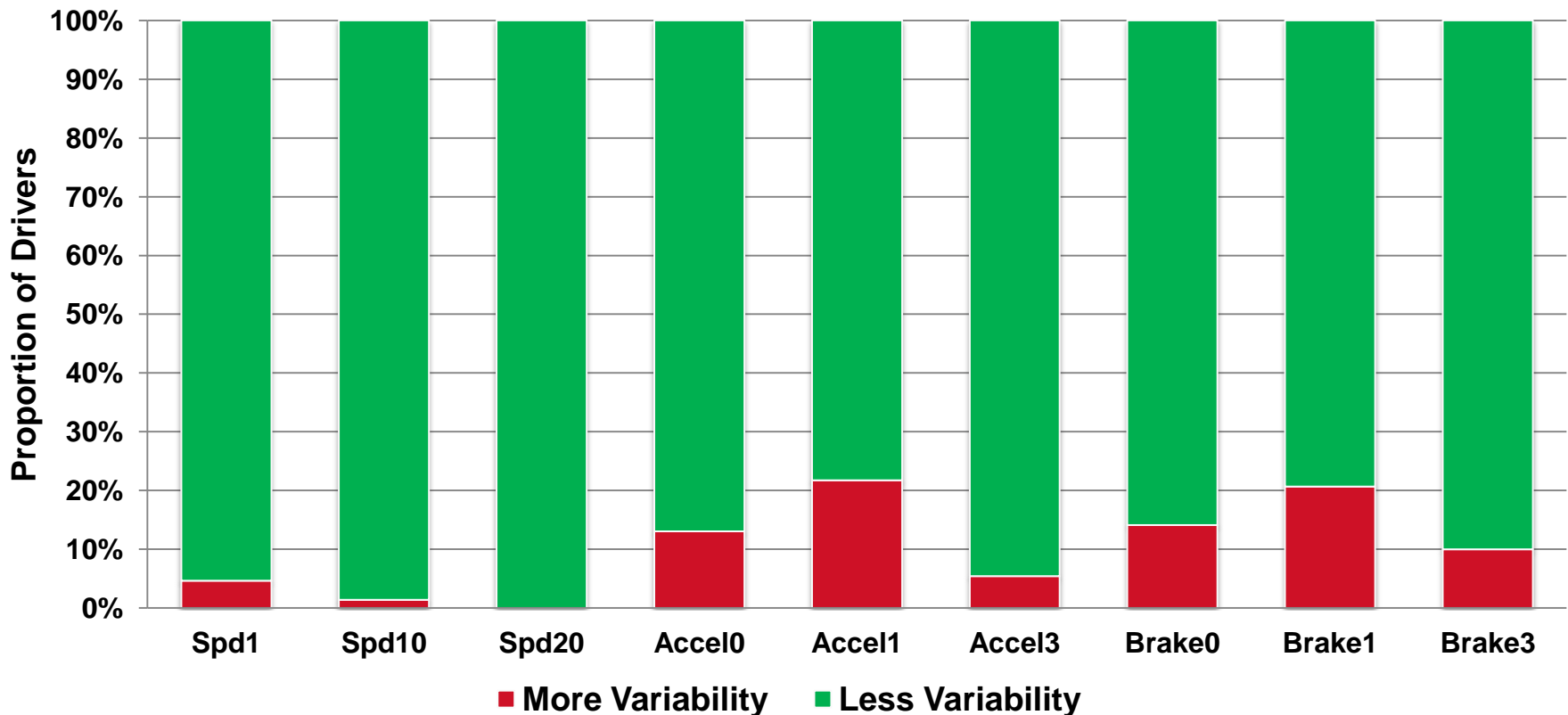
INTRA vs. INTER-<u>DRIVER</u> VARIABILITY

› More variability = Greater intra-<u>driver</u> (within-driver) variability

› Less variability = Greater inter-<u>driver</u> (between-driver) variability
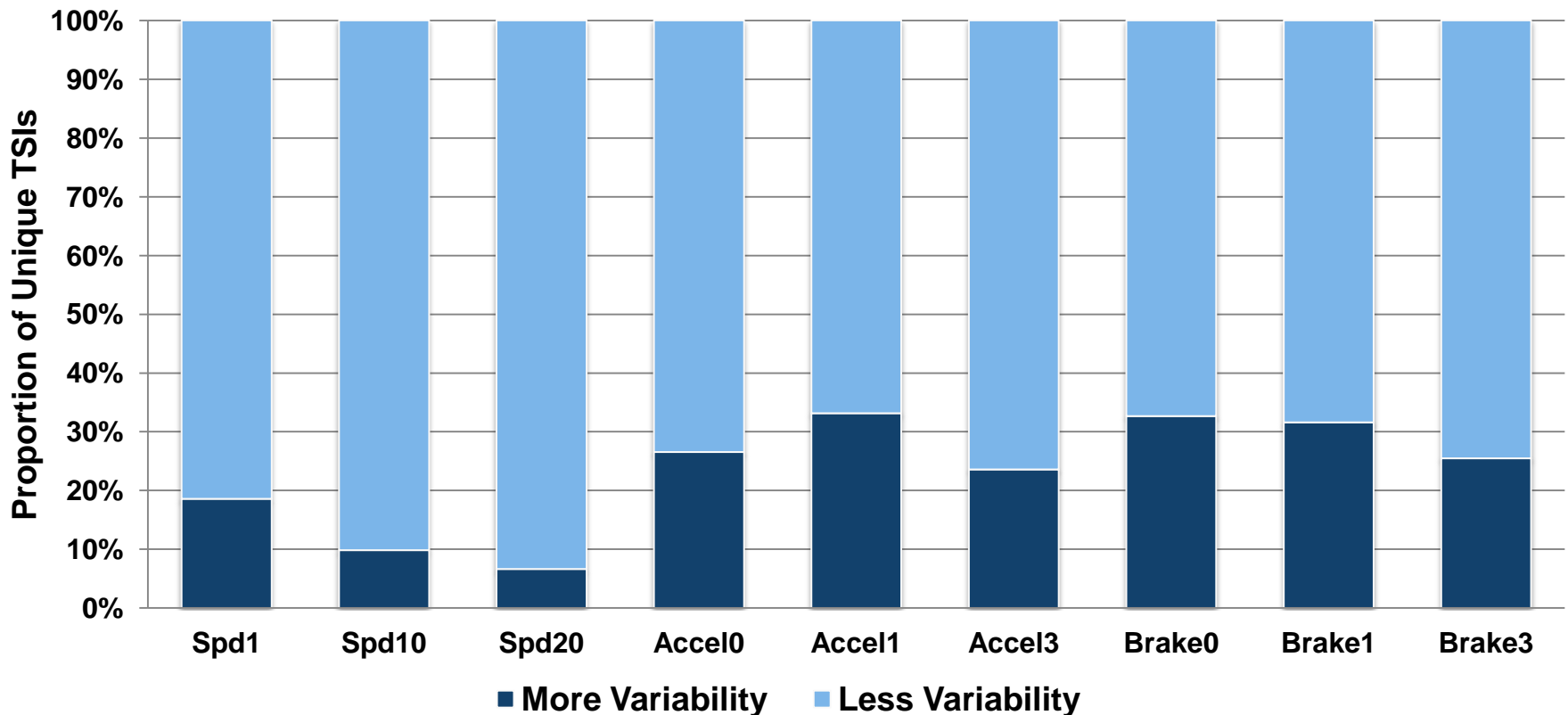
› Identifying and controlling for spatial and temporal variables helps deal with the inherent variability in driver behaviour

› 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

› 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

Profiling Drivers' Risky Behaviour Towards All Road Users

Adrian B. Ellison, Stephen Greaves & Rhonda Daniels
Institute of Transport and Logistics Studies
The University of Sydney

THE UNIVERSITY OF SYDNEY

ACRS Conference, 10 August 2012