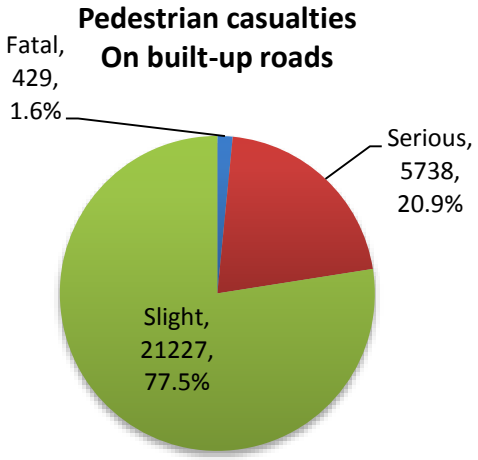
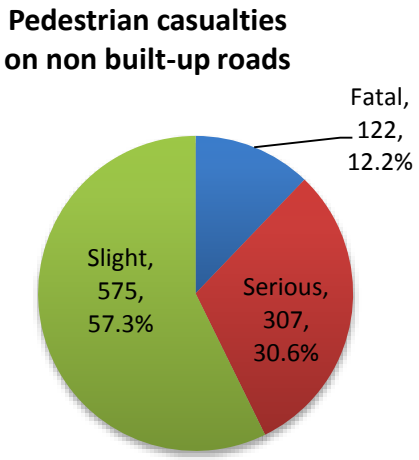
A segment-based spatial analysis of non-motorised road traffic casualties occurring in non built-up areas of England and Wales 1999-2008

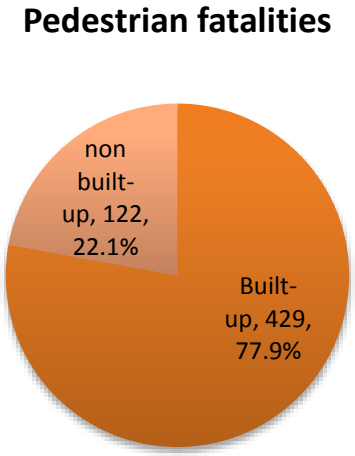
Marcus Young

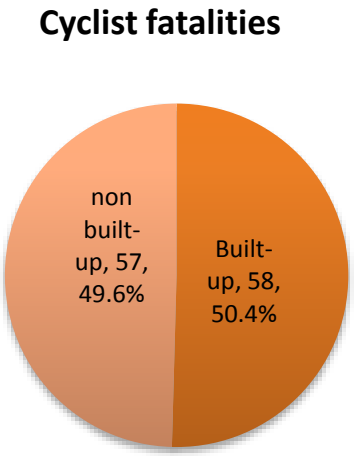
Background and Rationale

> 40mph = non built-up
<= 40mph = built-up

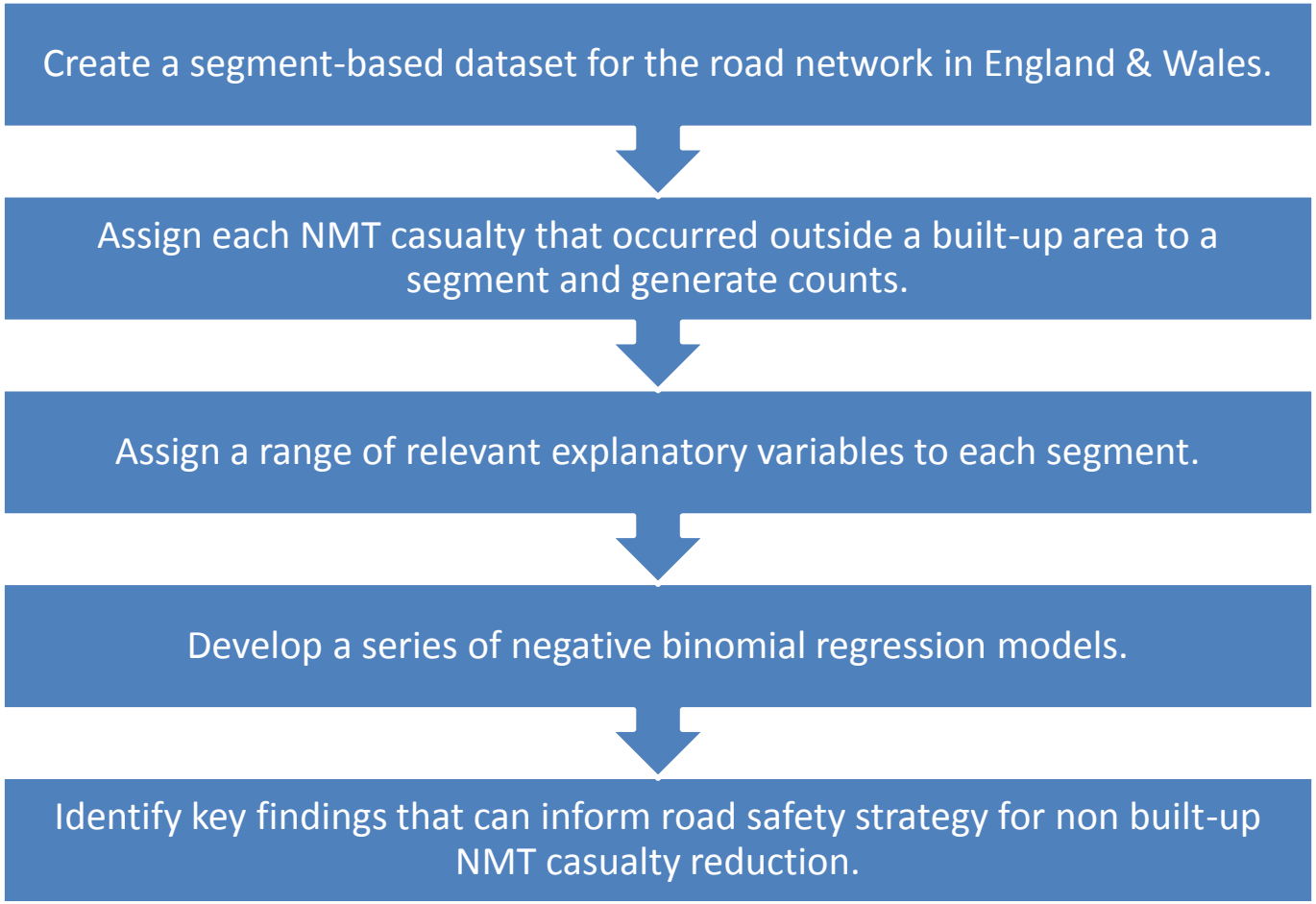






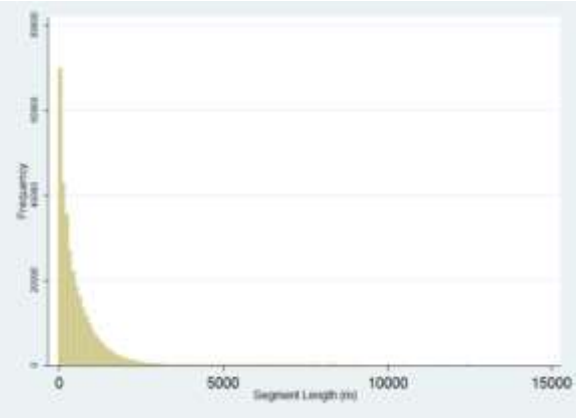


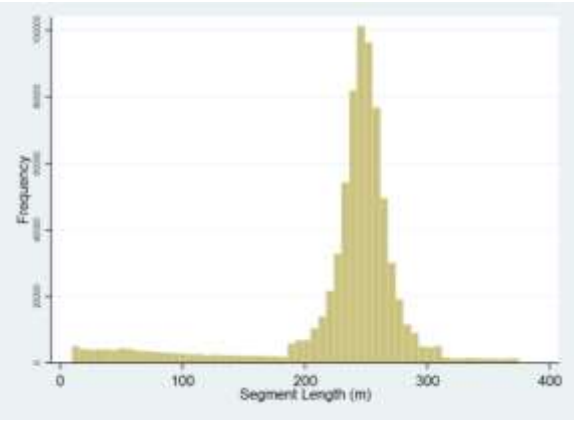
Research Aims



Segment Dataset

- OS Meridian 2 vector dataset.
- ONS urban area and settlement boundary polygon layer – to erase roads in built-up areas.
- Target a nominal fixed segment length of 250m.

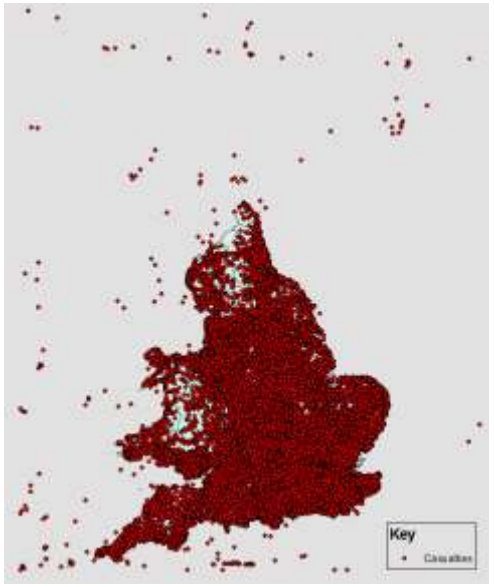


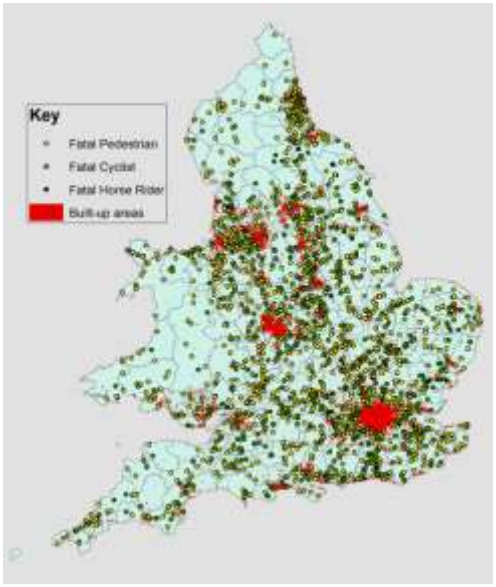


742,355 segments to use in regression models

Casualty Data

- STATS19 – form used by the police in GB to record every personal injury RTA on a public road.
- Data quality issues – accident NGR.
- Each casualty snapped to a road polyline.
- Casualty counts for each segment generated (total, by casualty type, by severity).





2.8 million total casualties

499,006 NMT

37,471 NMT non built-up

Explanatory Variables

Road Characteristics	NMT user interactions	Demographic characteristics	Spatial Factors
• A-class • B-class • Minor road (reference) • Sinuosity • Number of intersections • Steep • Traffic flow	• National Trail present • Sustrans route present • Dangerous crossing present	• Local Population	• Distance from built-up area

Statistical Analysis

- OLS regression unsuitable – can predict negatives values/assumptions violated.
- NB model common in road accident analysis literature and fits the data better than Poisson.
- Disaggregated approach with different segment casualty counts used as the dependent variable in a series of models.

Total casualties	Total casualties (A roads)	Total fatalities	Total serious injuries
Total slight injuries	Pedestrian casualties	Cyclist casualties	Horse rider casualties

- Spatial Autocorrelation - Global Moran's I indicated clustering present.
- Separate model for East Anglian region to introduce spatial lag of the dependent variable.

Key Findings

Coefficient exponentiated and expressed as an Incidence Rate Ratio

Road Class

- A-class and B-class roads show strong positive association across most models.
- Incidence rate for fatal casualties 12x greater on A-roads than minor roads.

Sinuosity

- Strong negative association in fatalities, horse rider and A-class models.
- For a one unit increase in sinuosity, casualty rate decreases by 99.9% for fatal casualties and 47.6% for A-class road.

Intersections

- Positive association in all models.
- Incidence rate for total casualties increases by a factor of 1.8 (81%) for each additional intersection.

Key Findings

NMT road user interactions

- Presence of a National Trail doubles the pedestrian casualty rate.
- A national or regional cycle route increases cyclist casualty rate by a factor of 1.31.

Distance from built-up area

- Negative association.
- For a one standard deviation increase in mean distance (2.2km) the incidence rate for total casualties reduces by a factor of -0.325 (-67.5%).

Impact of spatial autocorrelation

- Spatially lagged variable significant.
- Sinuosity changes from significant at 90% confidence level to non significant.
- Other variables that are significant remain so with coefficients slightly reduced.

Recommendations

Focus on A-class and B-class roads to have maximum impact on reducing NMT casualties.

Effect of sinuosity in reducing casualties on A-class roads suggests speed reduction measures would be effective.

Stepped reductions in posted speed limits at the edge of settlements.

Protective speed limits on stretches between nearby built-up areas.

Programme to establish alternative routes for on-road sections of flagship National Trails.