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Investigation of geographical dependence of road traffic casualties in highly deprived areas of Greater Manchester

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TOPICS

1. Project NRSI
2. Methodology to investigate geographical dependence
3. Data - STATS19, Index of Multiple Deprivation and Ethnicity
4. Preliminary Results
5. Future directions

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1. Project NRSI - Motivation

- The government wants to:
  - tackle the significantly higher incidence of road traffic injuries in disadvantaged communities.
  - Reduce the number of deaths and seriously injured from road injuries by 40% (50% for children) by 2010 (compared to the average for 1994 – 1998).
- Launch of Neighbourhood Road Safety Initiative (NRSI) in late 2004 with a budget of £30M.

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1. Project NRSI – Key Facts

- Deprived wards of 8 local authorities, namely **Blackpool, Blackburn with Darwen, Bradford, Liverpool, Nottingham, Sandwell, Stoke, and the Greater Manchester.**
- Several project partners linked together by the Central Team located in Manchester.
- UCL is part of the evaluation team. Our main responsibilities include impact assessment of NRSI, understanding the causal links and more.

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1. Project NRSI- Anatomy of a road traffic accidents (RTAs)

In general, RTAs occur because of:

- Driver mistake e.g. speeding, poor judgment
- Poor road environment e.g. road engineering issues, poor lighting, poor visibility.
- Casualty mistake e.g. carelessness
- Vehicle faults e.g. brake failure, skidding
- Combination of above

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1. Project NRSI- Anatomy of RTAs

Road users in deprived areas seem to be affected more than the road users from other areas. Why?

- Road and road networks in poor areas are particularly worse?
- Lack of awareness regarding road safety?
- Socio-economic-cultural lifestyles of road users lead to more exposure?

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2. Methodology- Use of thematic overlays

- Work so far has focused on extracting the relationship between the socio-economic-cultural lifestyles and RTA types, using various spatial analyses e.g. overlays and manual cluster detection.
- **Map Themes:**
  - RTA types and Index of Multiple Deprivation
  - RTA types and Residency of Casualty
  - Spatial Distribution of Child Pedestrian Casualties
  - Child Pedestrian Casualty and Ethnicity
  - Location of different accident types amongst NRSI ward residents
  - Provenance of casualties in NRSI wards

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2. Methodology- Data and Software

- **Data:**
  - 1999 – 2001 (pre- NRSI) STATS19 collected from Local Authorities.
  - Index of Multiple Deprivation (2004) collected from ODPM at the Super Output Area level.
  - Census (2001) data from CASWEB at ward level.
  - Census boundaries at ward level from UKBORDERS.
- **Software:**
  - GMAXI and GMAPS – MS ACCESS and MapInfo GIS combo for querying, basic analysis and visualisation of STATS19 data.
  - ArcGIS GIS for making multi-thematic maps.
  - SPSS and MS EXCEL for making basic statistical charts.

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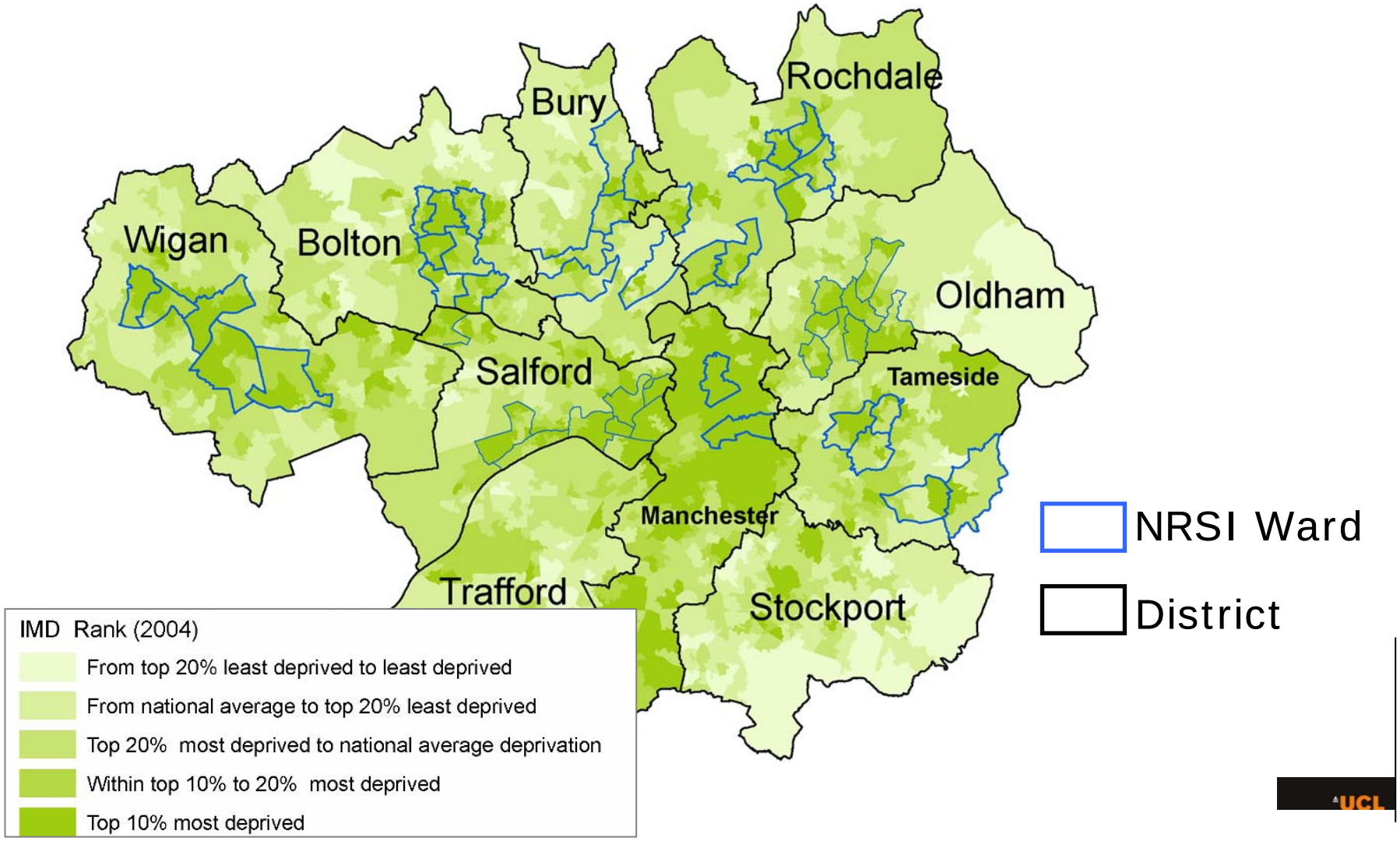
2. Methodology- Study Areas in Greater Manchester



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3. Data – STATS19

- STATS19 is the most common source of data on RTAs.
- Collected by local Police Force mostly on-site, later validated by Local Authorities and finally sent off to DfT for further validation.
- Most important STATS19 fields for spatial analyses are the location of the accident and driver/casualty residence.

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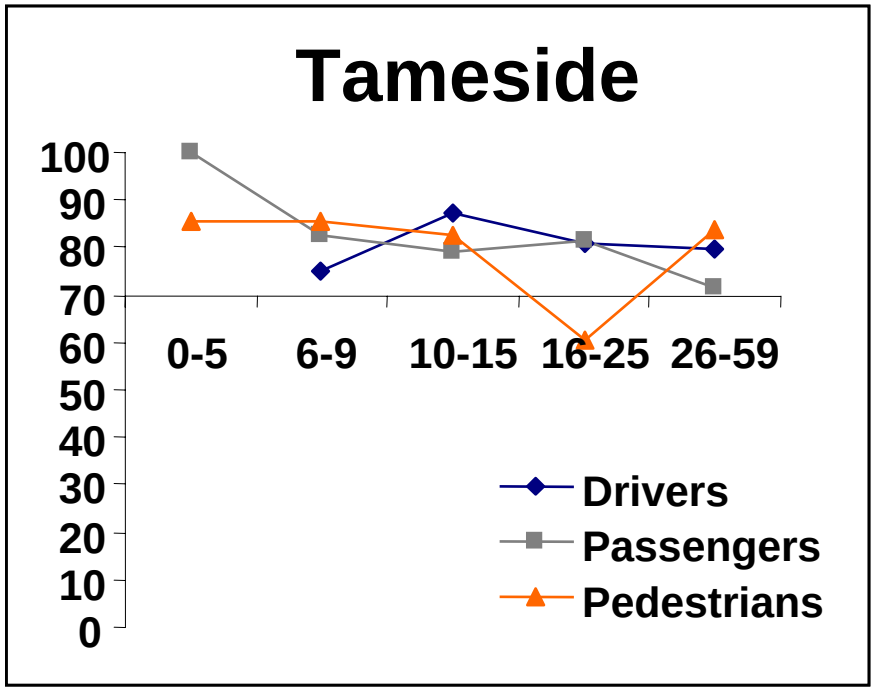
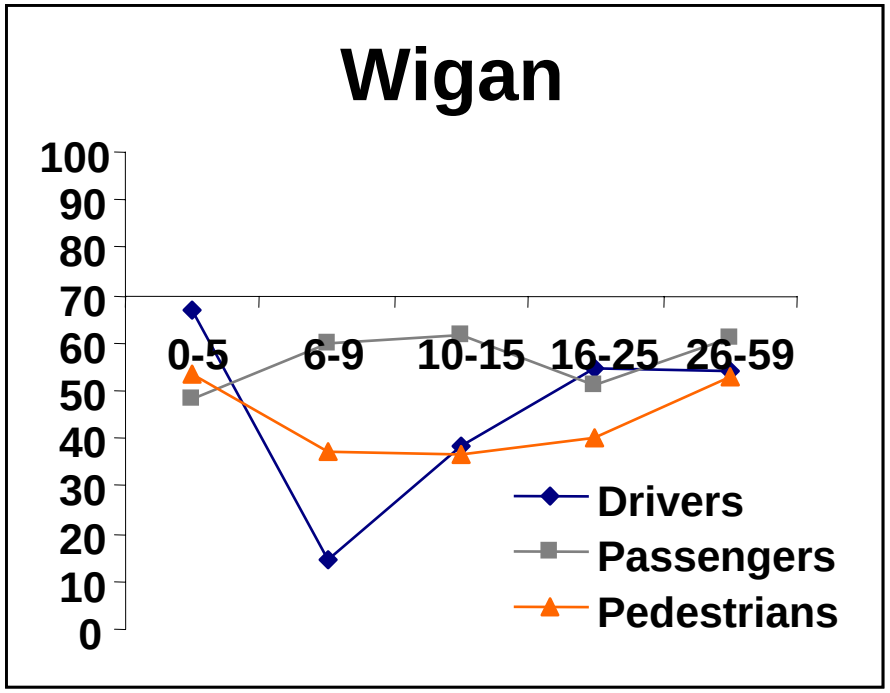
3. Data – STATS19

- The geographic location of accident is almost always available in the STATS19.
- However, there is often minor to substantial number of records with missing casualty/driver residence location.
- Within the NRSI wards, the proportion of records with casualty residence location varies from 15% to 80%.
- This introduces an uncertainty in the spatial pattern.
  - Does the uncertainty vary according to the casualty class?

3. Data – STATS19



Still Okay



Uncertain

Proportion of records with residence postcodes in deprived wards of 2 NRSI districts

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3. Data – STATS19

- Does the uncertainty vary according to the socio-economic status of the area?
  - Proportion of records with residence postcodes in 31 affluent (top 30% least deprived) wards in the NRSI districts were collected.

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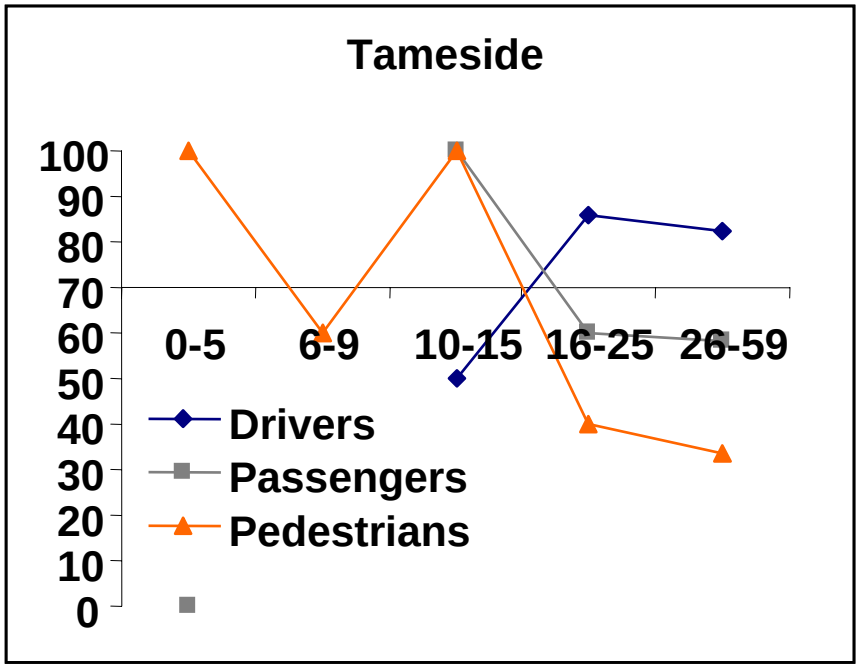
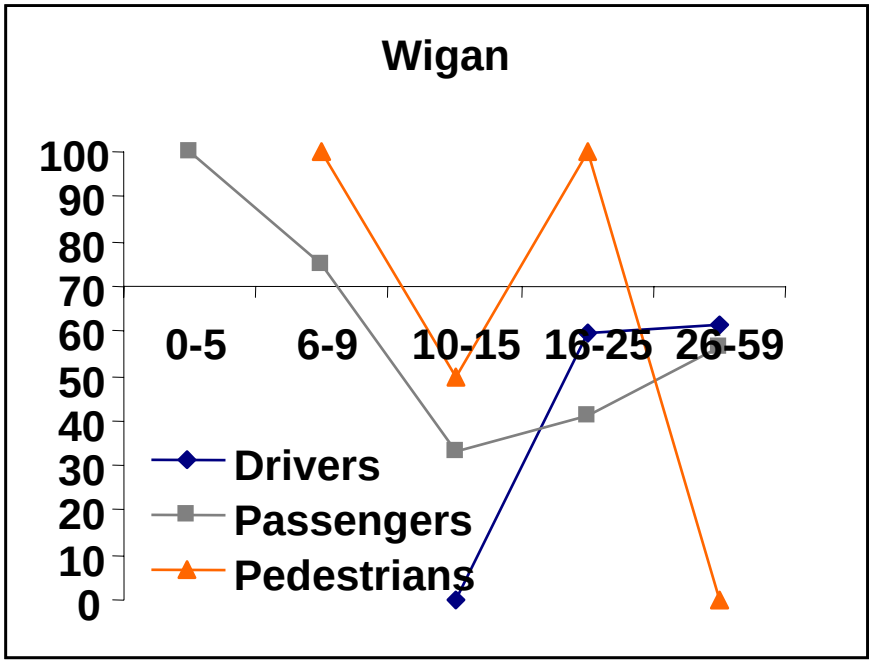
3. Data – STATS19





Proportion of records with residence postcodes in affluent wards of 2 NRSI districts

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3. Data – Index of Multiple Deprivation (2004)

- Produced by the Office of the Deputy Prime Minister in 2004, was used as a composite indicator of the socio-economic environment in the NRSI Wards.
- Derived by a combination of seven deprivation indices, namely Income, Employment, Health, Education, Barriers to Housing, Living Environment and Crime.
- Represented over the spatial extent of the Lower layer of the Super Output Area (SOA).
  - Minimum population 1000; mean 1500. Built from groups of Output Areas (typically 4 to 6) and constrained by the boundaries of the Standard Table wards used for 2001 Census outputs.

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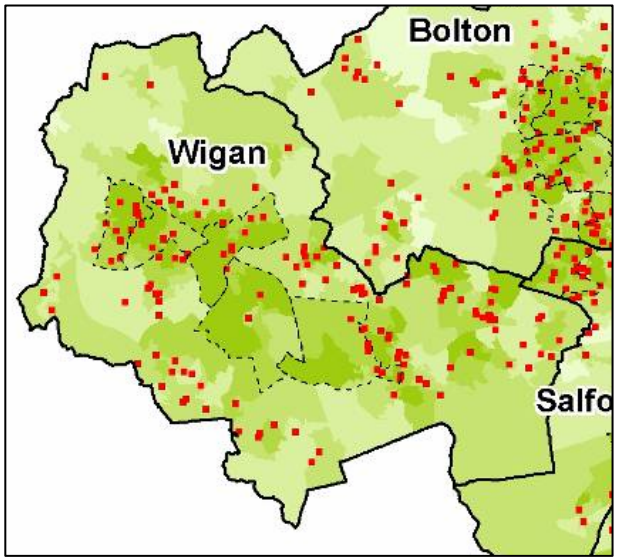
3. Data – Index of Multiple Deprivation (2004)

- Each SOA has a rank ranging from 1 (most deprived; in Liverpool) to 32482 (least deprived; in Basingstoke and Deane).
- SOA level representation provides an insight into the sub-ward level variations in the socio-economic indicators.



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3. Data – Ethnicity

Some of the highly deprived areas suffering from child pedestrian casualties also have a substantial ethnic minority population:

- Is the road environment not suitable for children?
- Are children vulnerable due to multiple journeys related to faith learning, playgrounds, school trip?
- Does the cultural background of children affect their road usage behaviour?

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3. Data – Ethnicity

Ethnicity data at ward level was collected from the 2001 Census, and a Black and Minority Ethnic Ratio is calculated by adding the population of:

- Mixed
- Asian or Asian British
- Black or Black British
- Chinese
- Other Ethnic Group

and normalising it by total population.

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4. Preliminary Results

Map Themes:

- Accident types and Index of Multiple Deprivation
- Child Pedestrian Casualty and Ethnicity
- Accident types and Residency of casualty
- Location of different accident types amongst NRSI ward residents
- Provenance of casualties in NRSI wards

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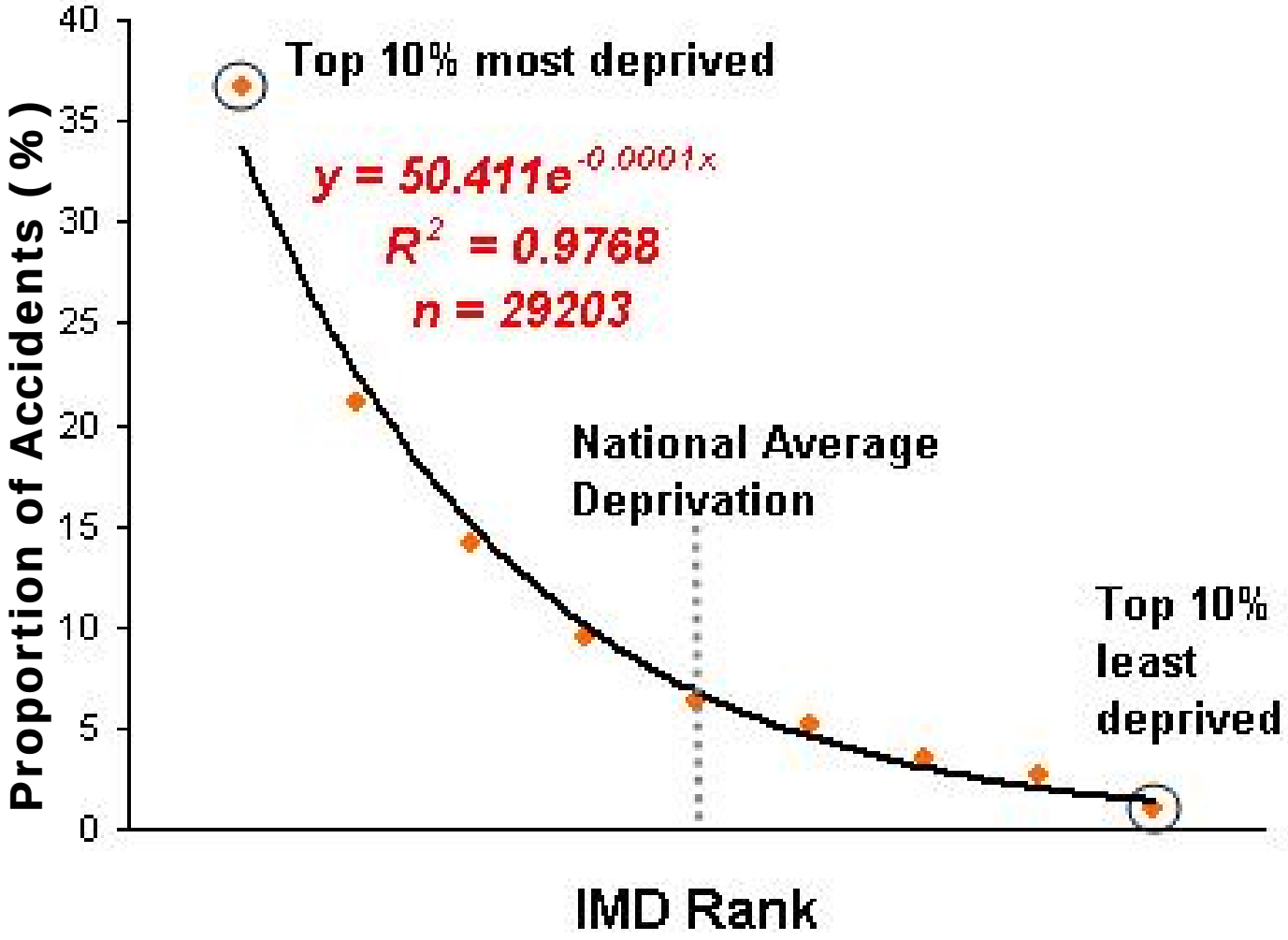
NRSI Districts in Greater Manchester (1999-2001)



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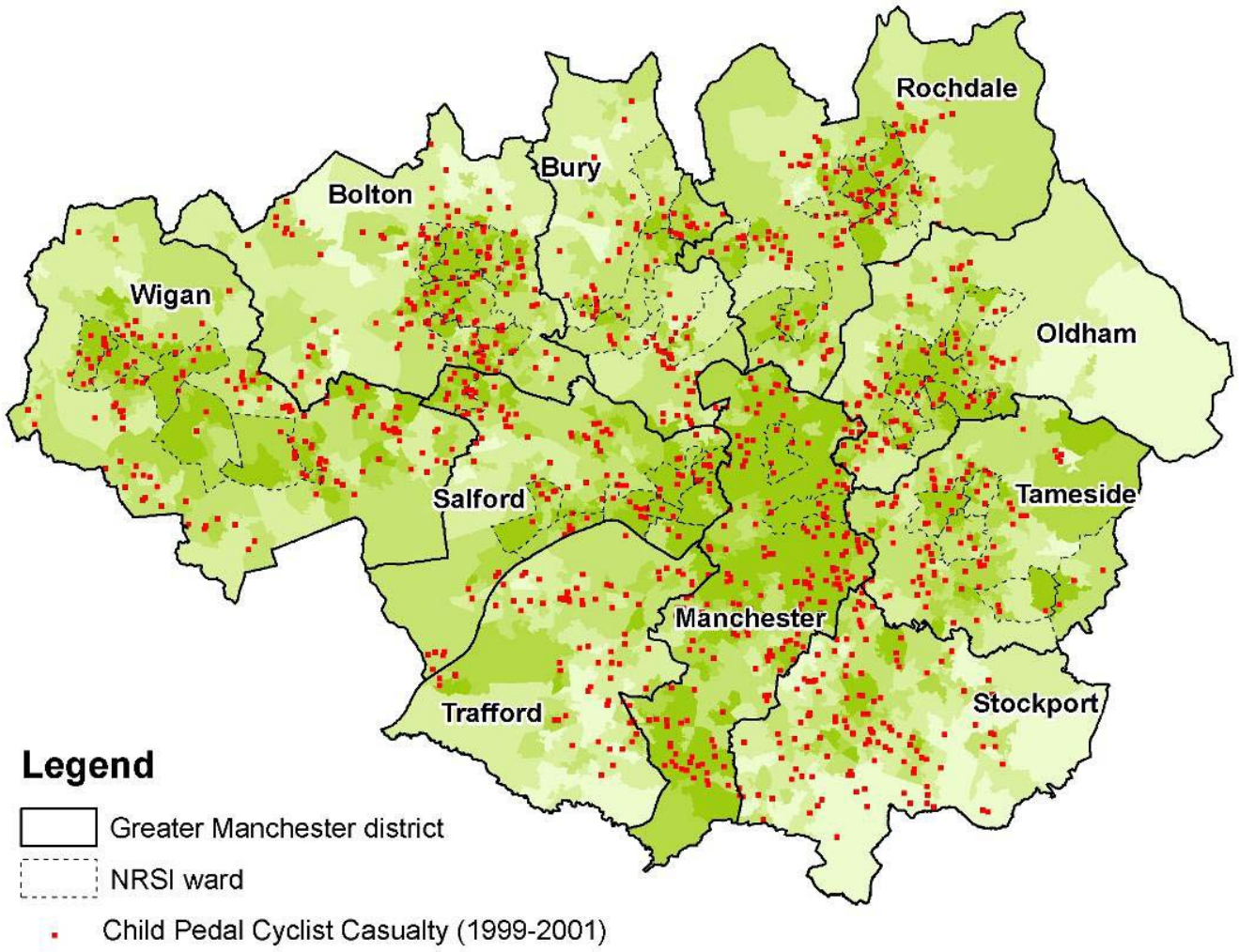
Child (0-15) Pedal Cyclist Accidents



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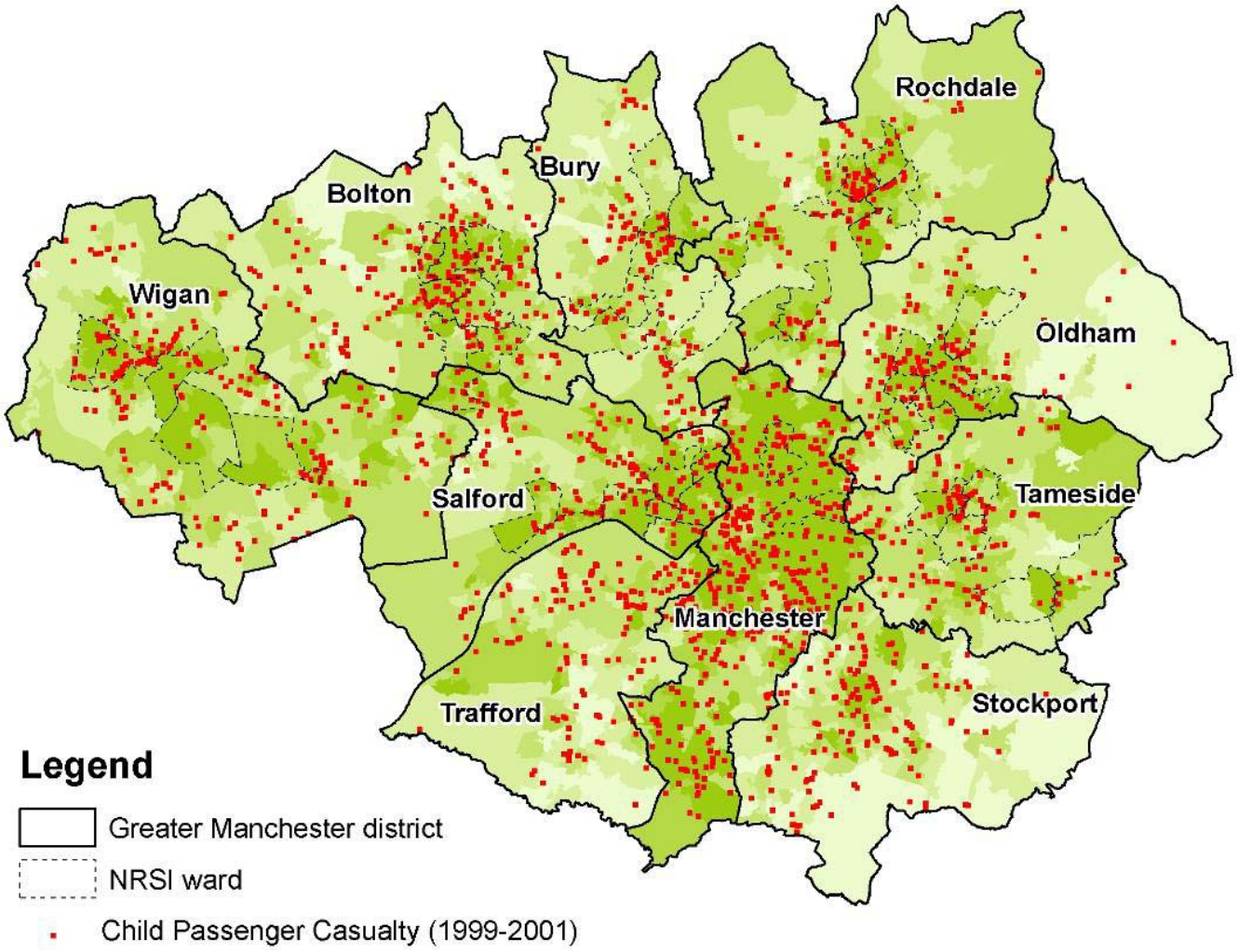
Child Passenger Accidents



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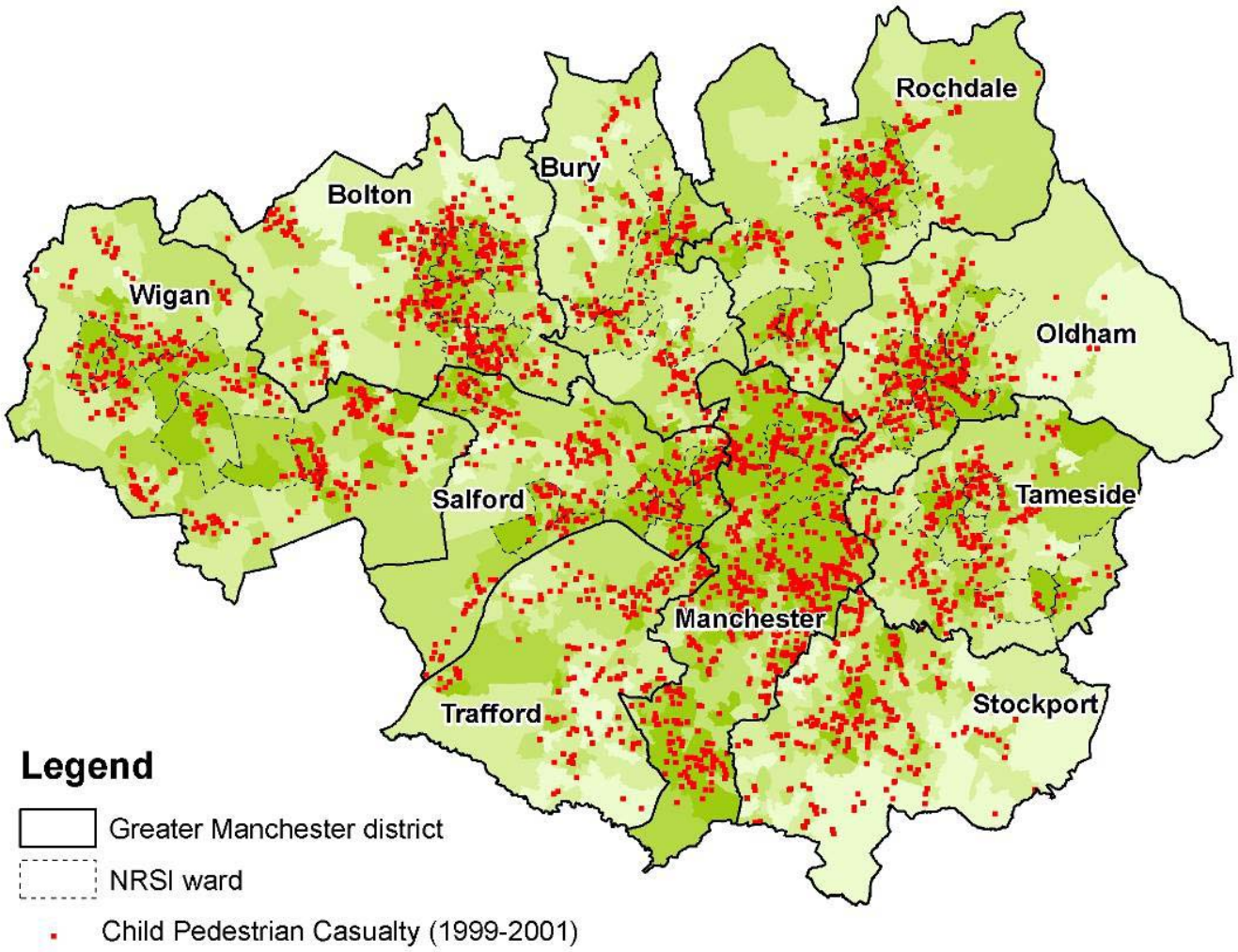
Child Pedestrian Accidents



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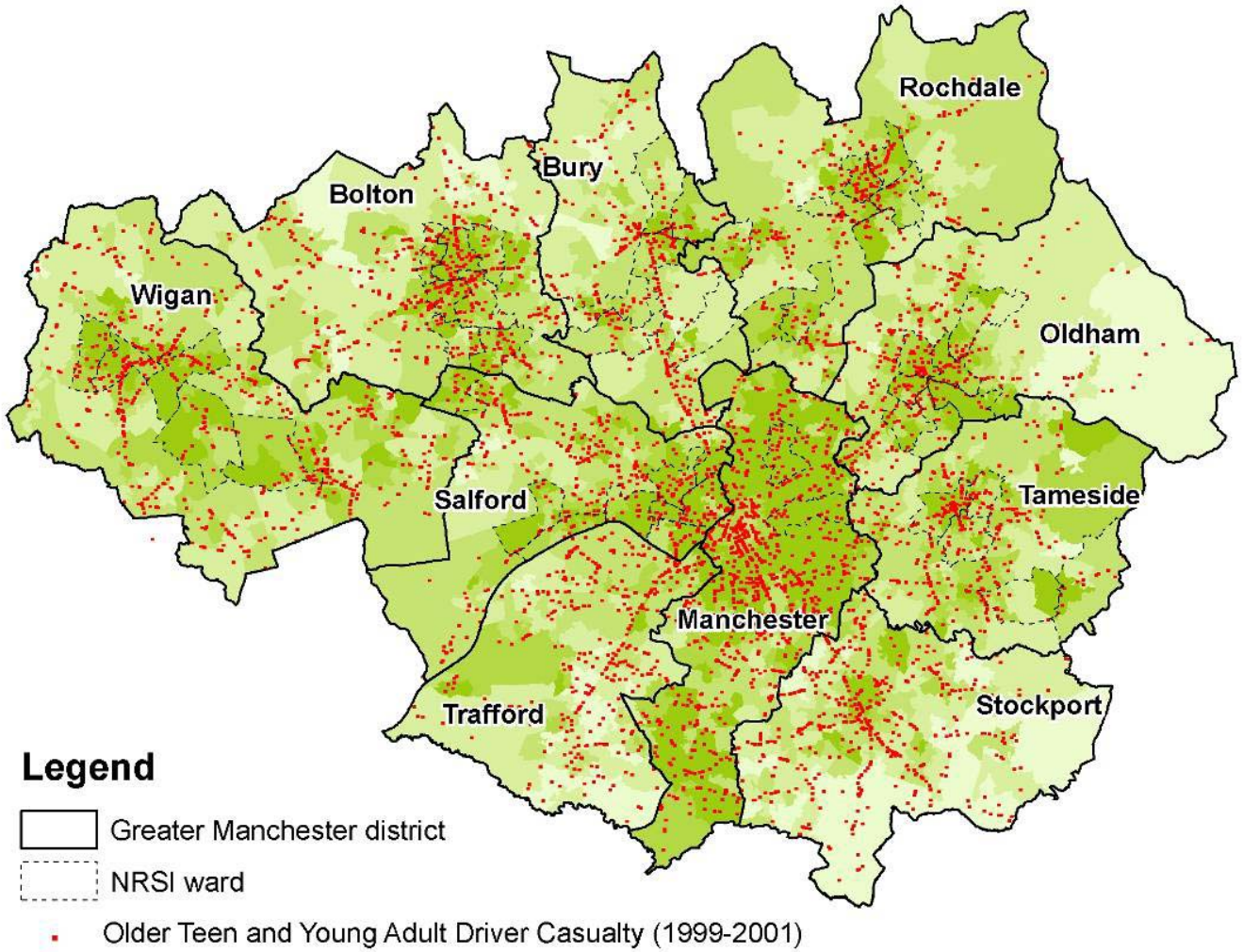
Older Teen and Young Adult (16-25) Driver accidents



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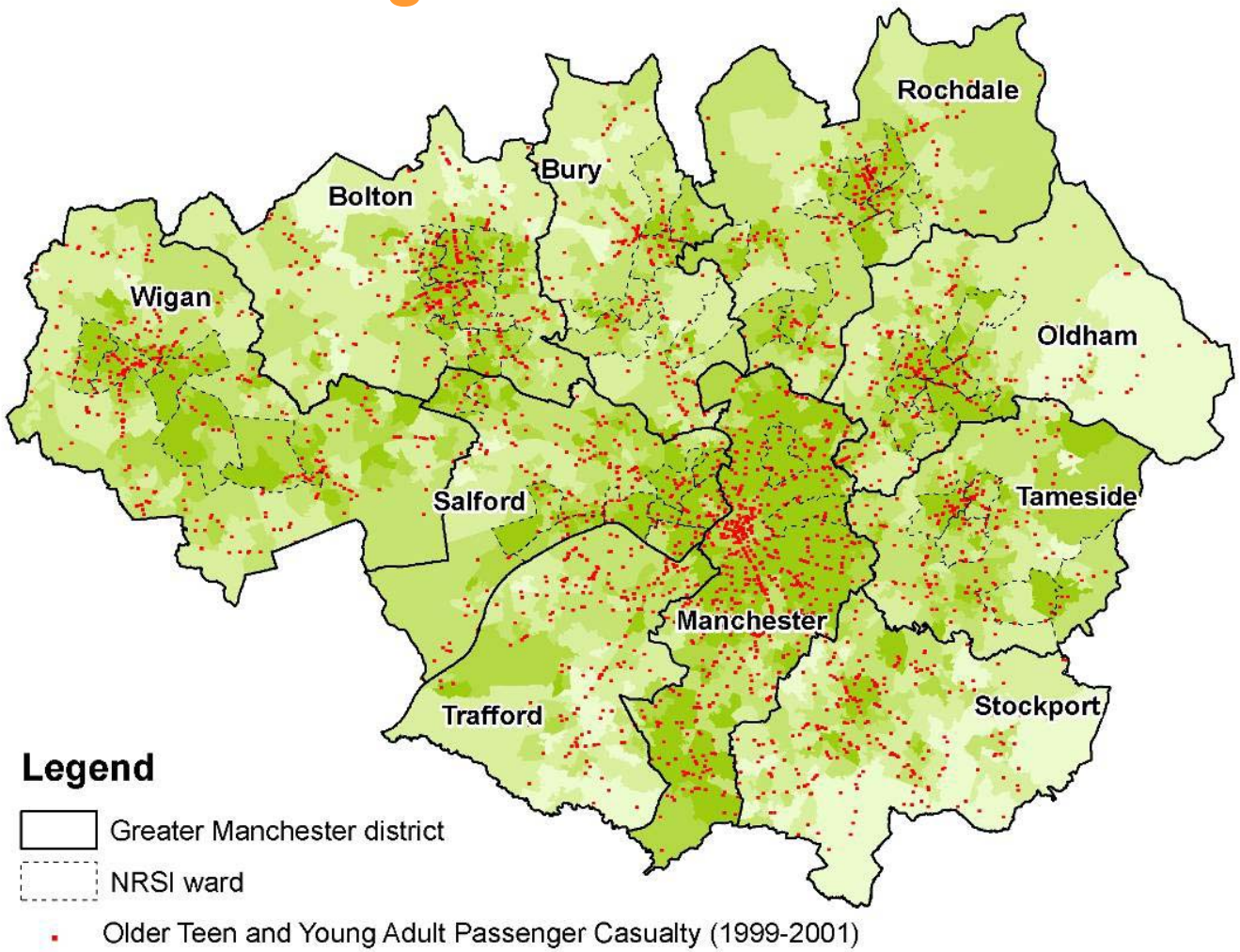
Older Teen and Young Adult Passenger accidents



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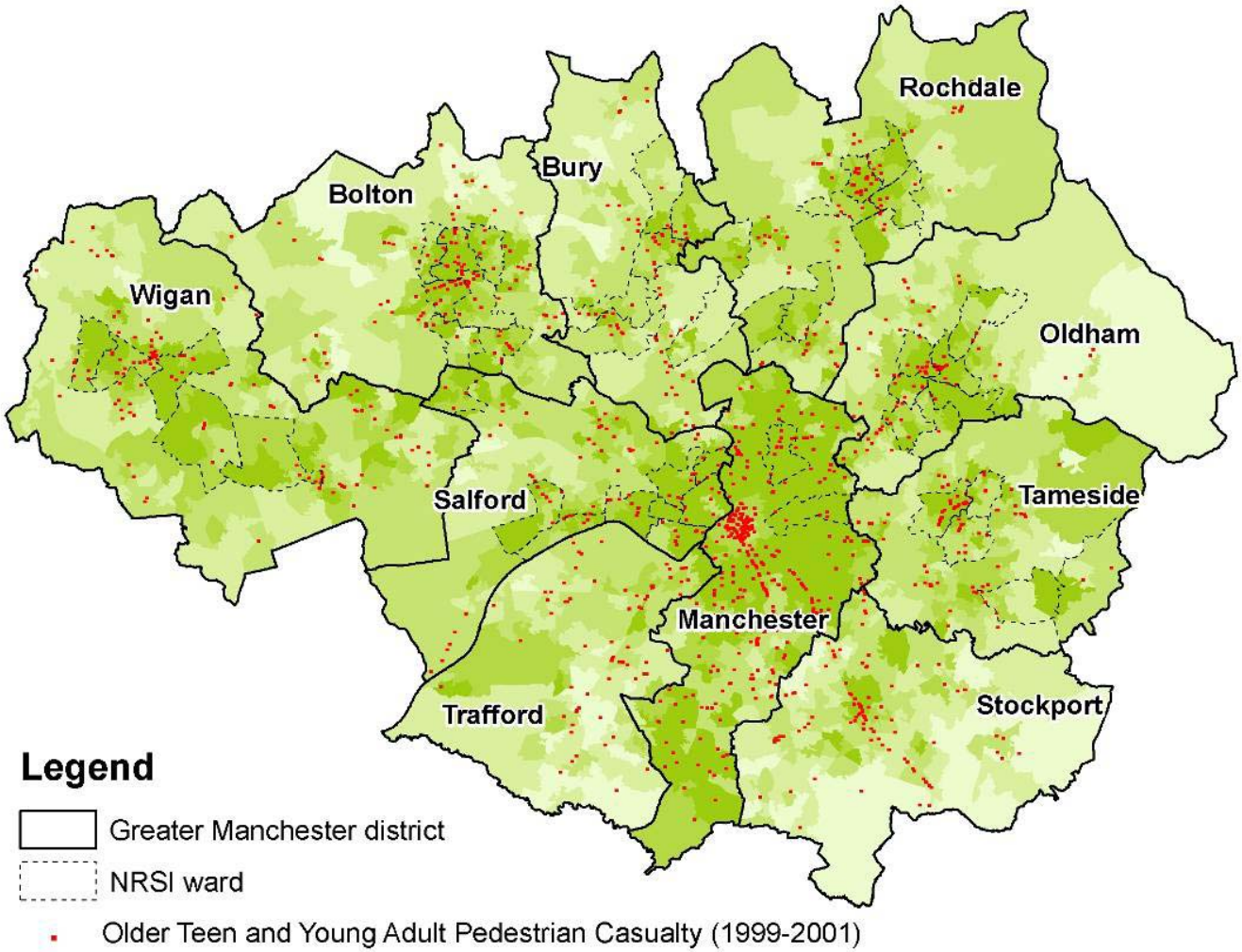
Older Teen and Young Adult Pedestrian accidents



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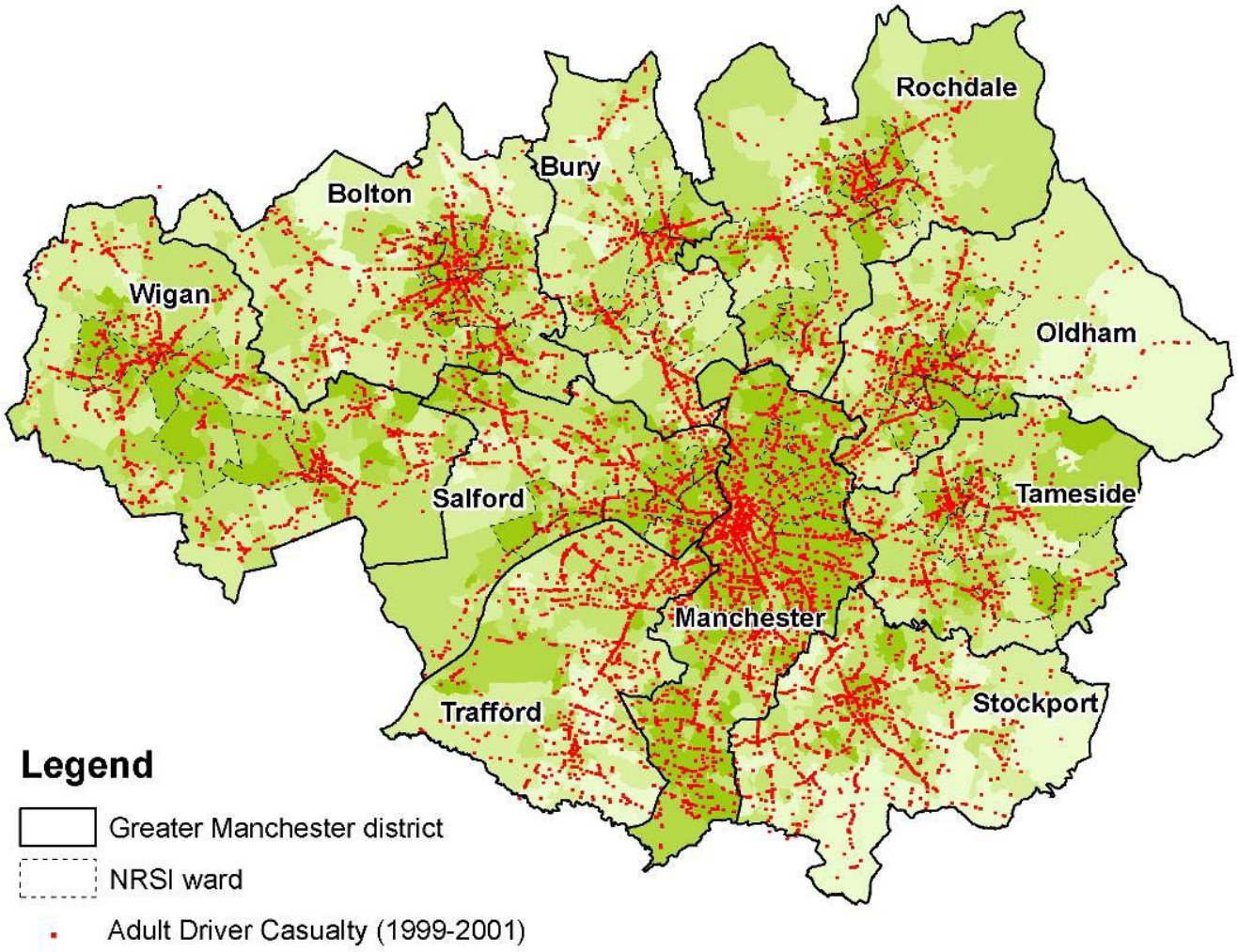
Adult (26-59) Driver accidents



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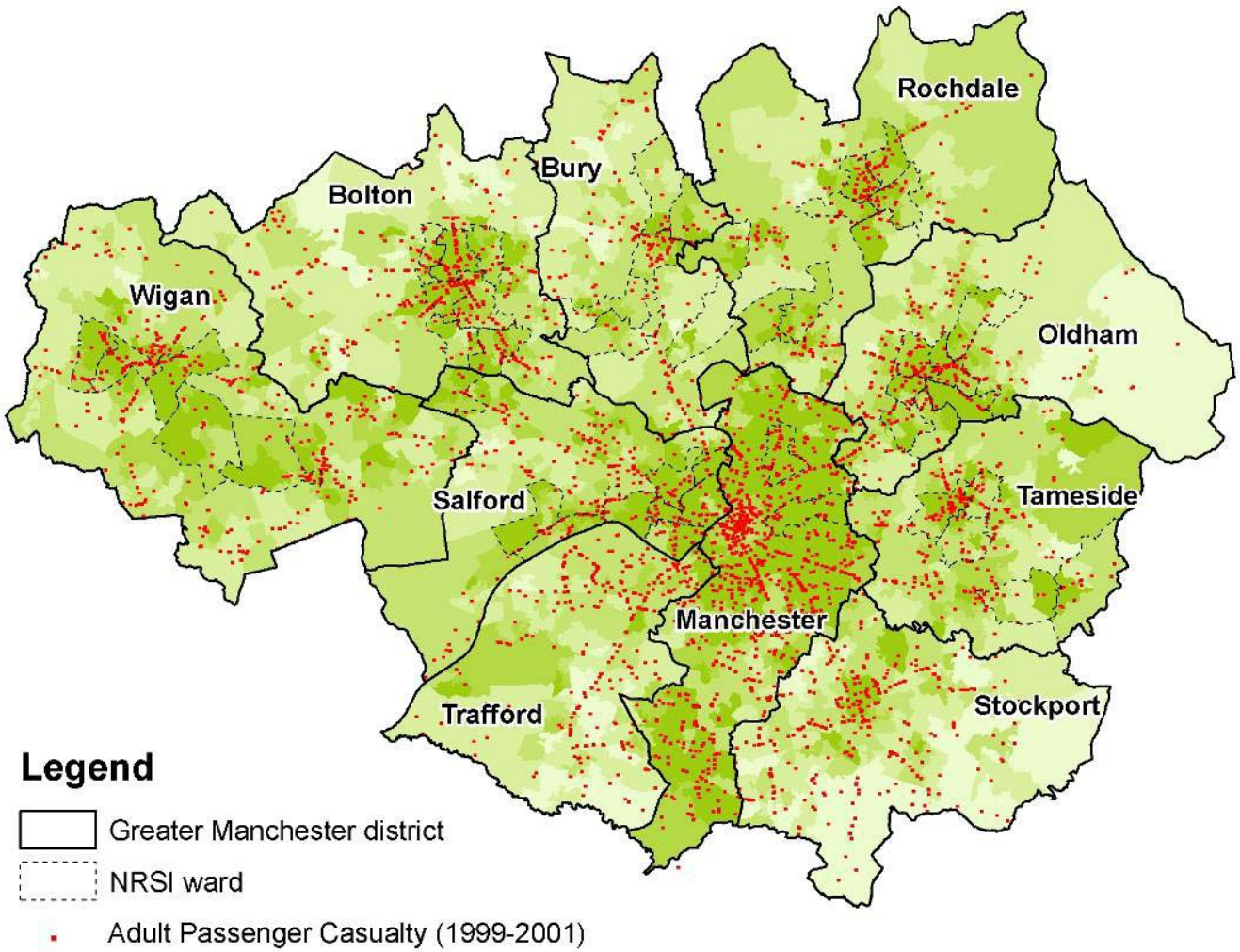
Adult Passenger accidents



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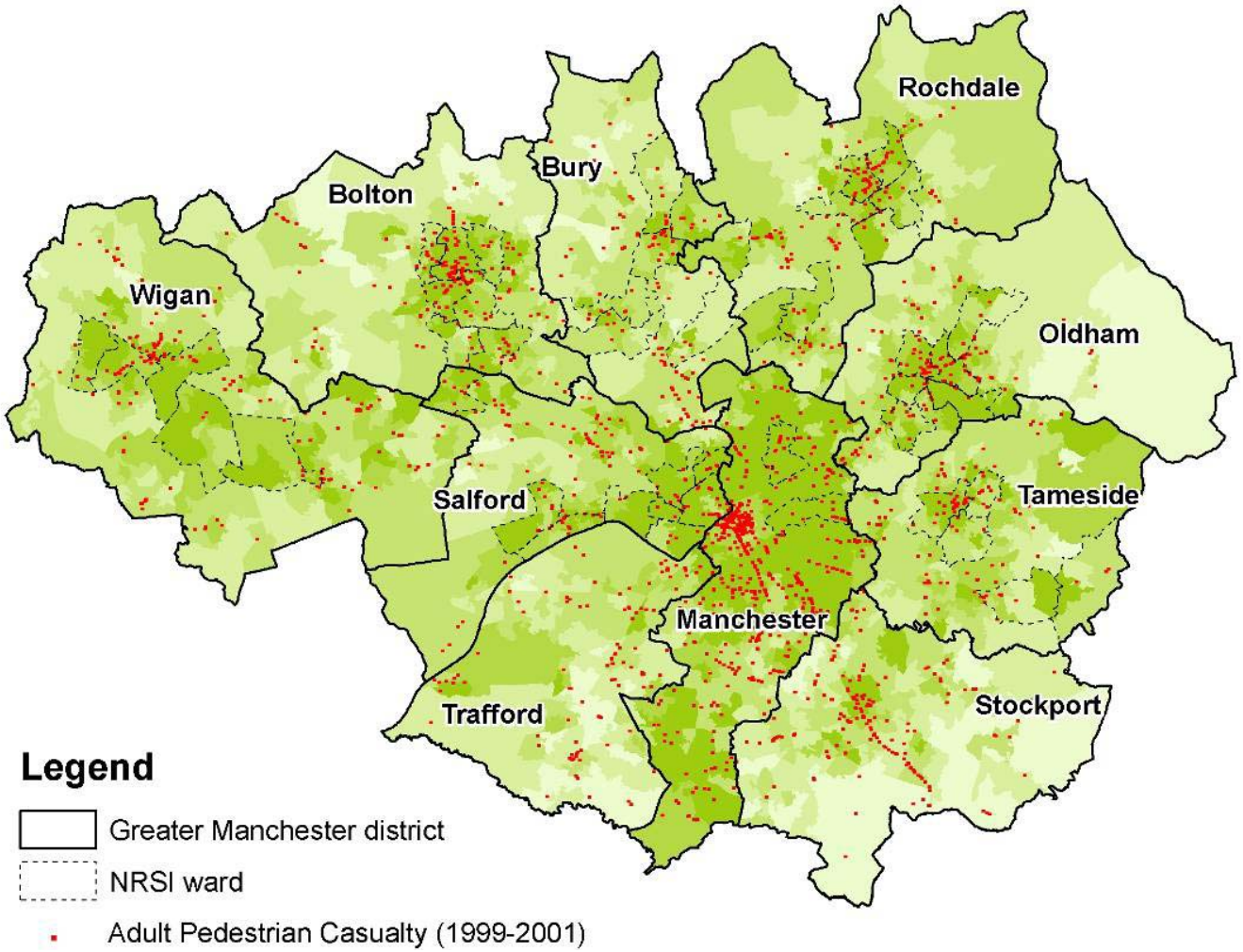
Adult Pedestrian accidents



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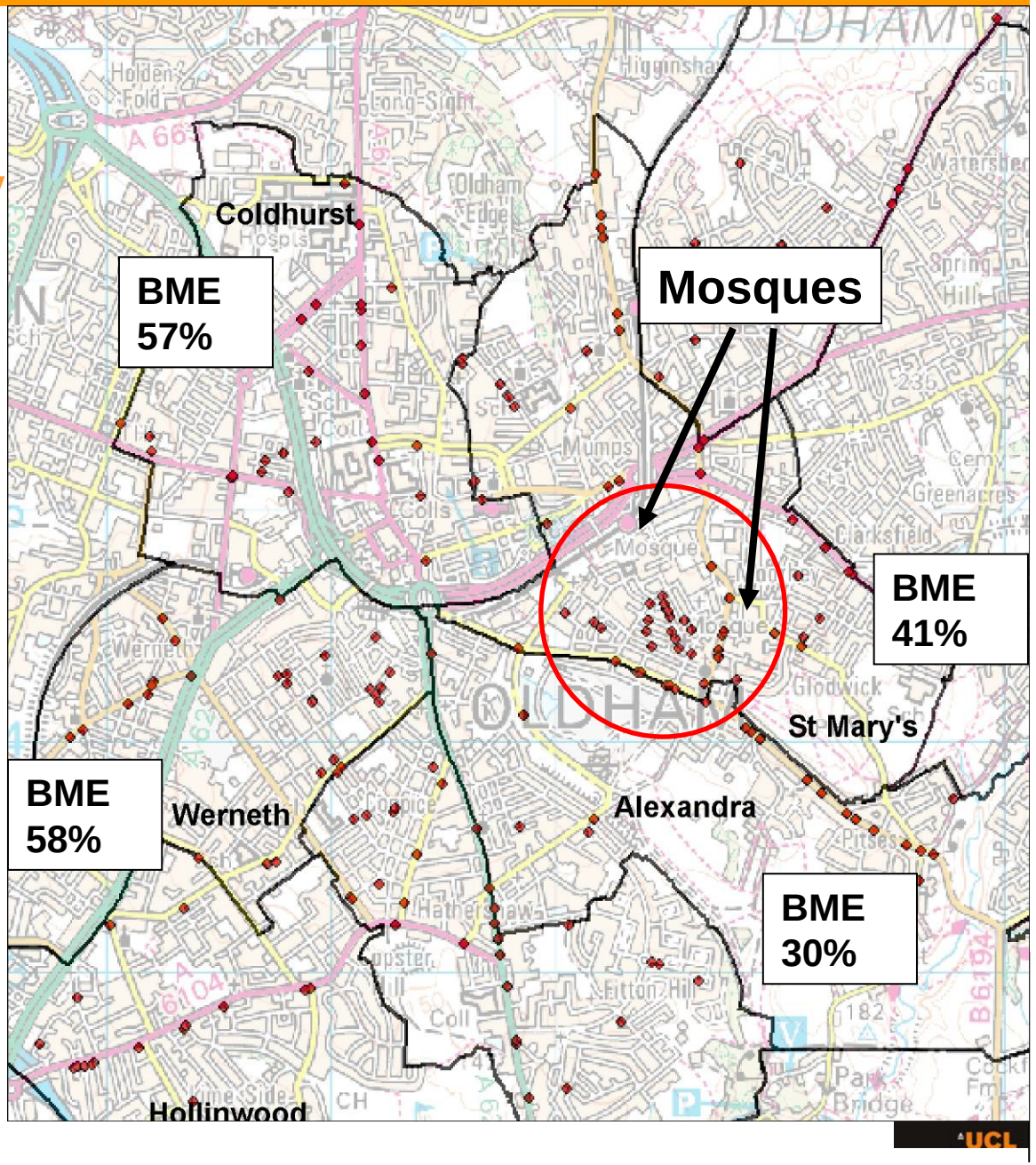
Spatial proximity of religious sites and a cluster of child pedestrian casualties in Oldham



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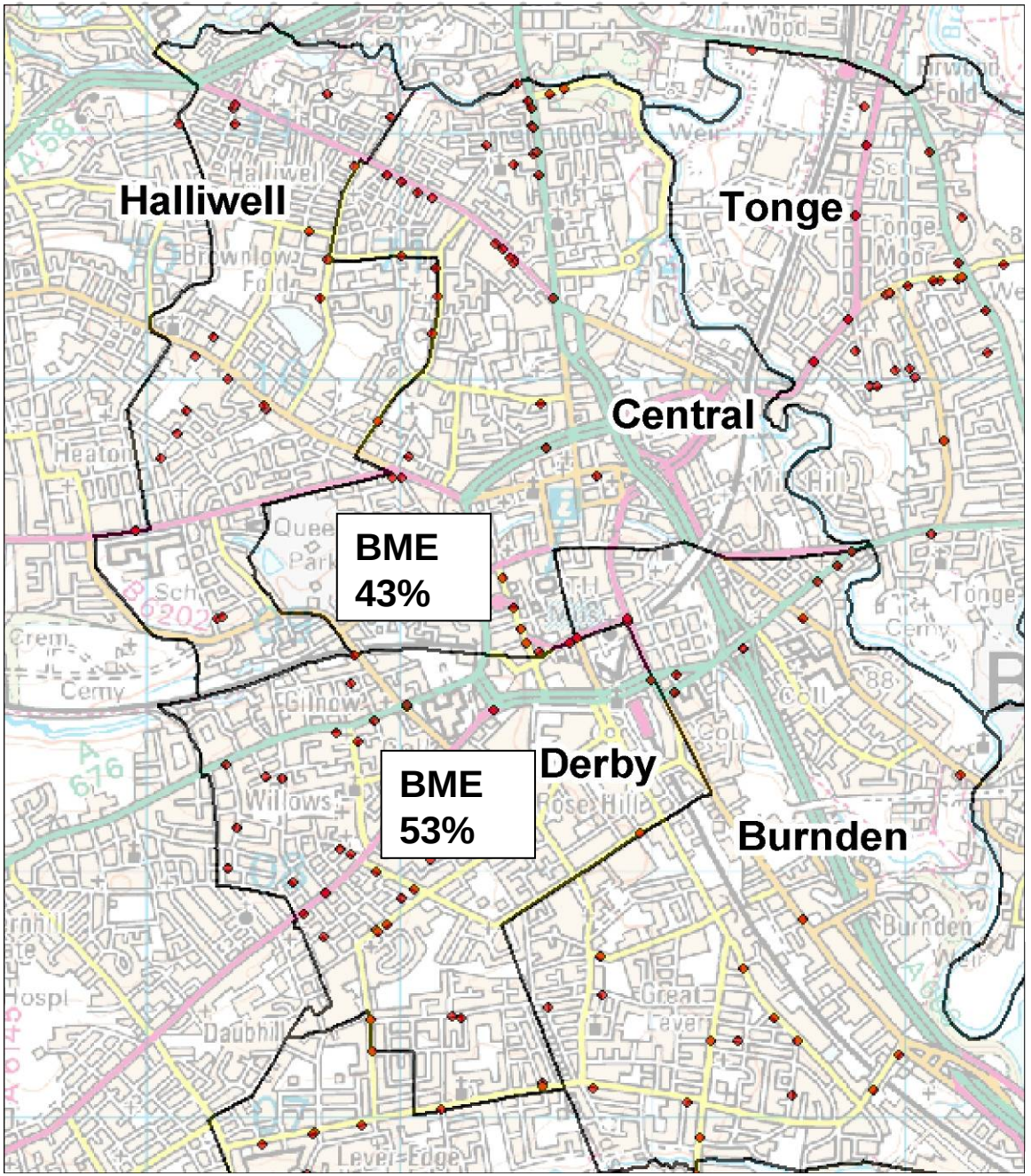
Lack of clusters of child pedestrian casualties in Bolton with high BME population



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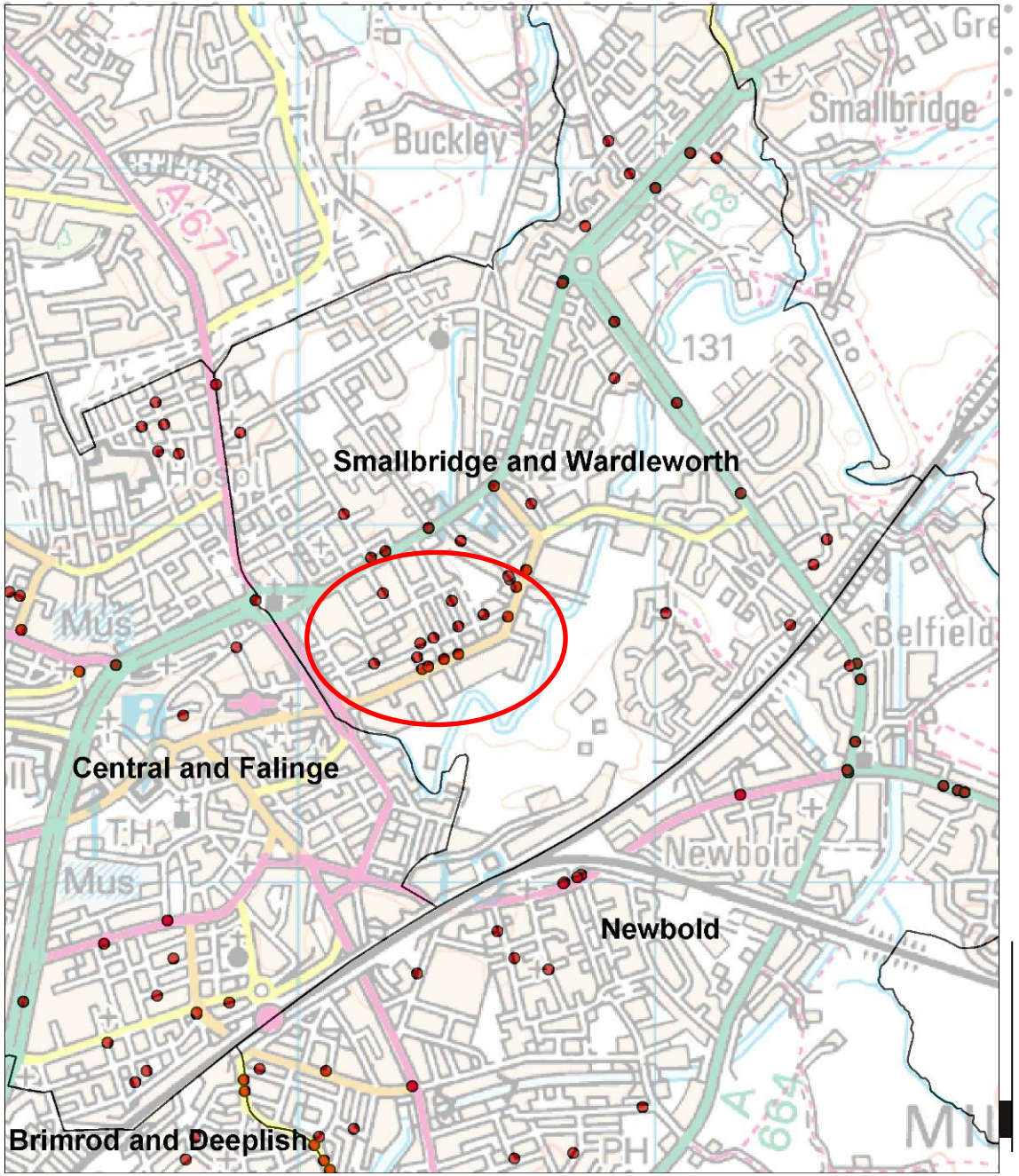
Cluster of child pedestrian accidents in Rochdale close to a green space



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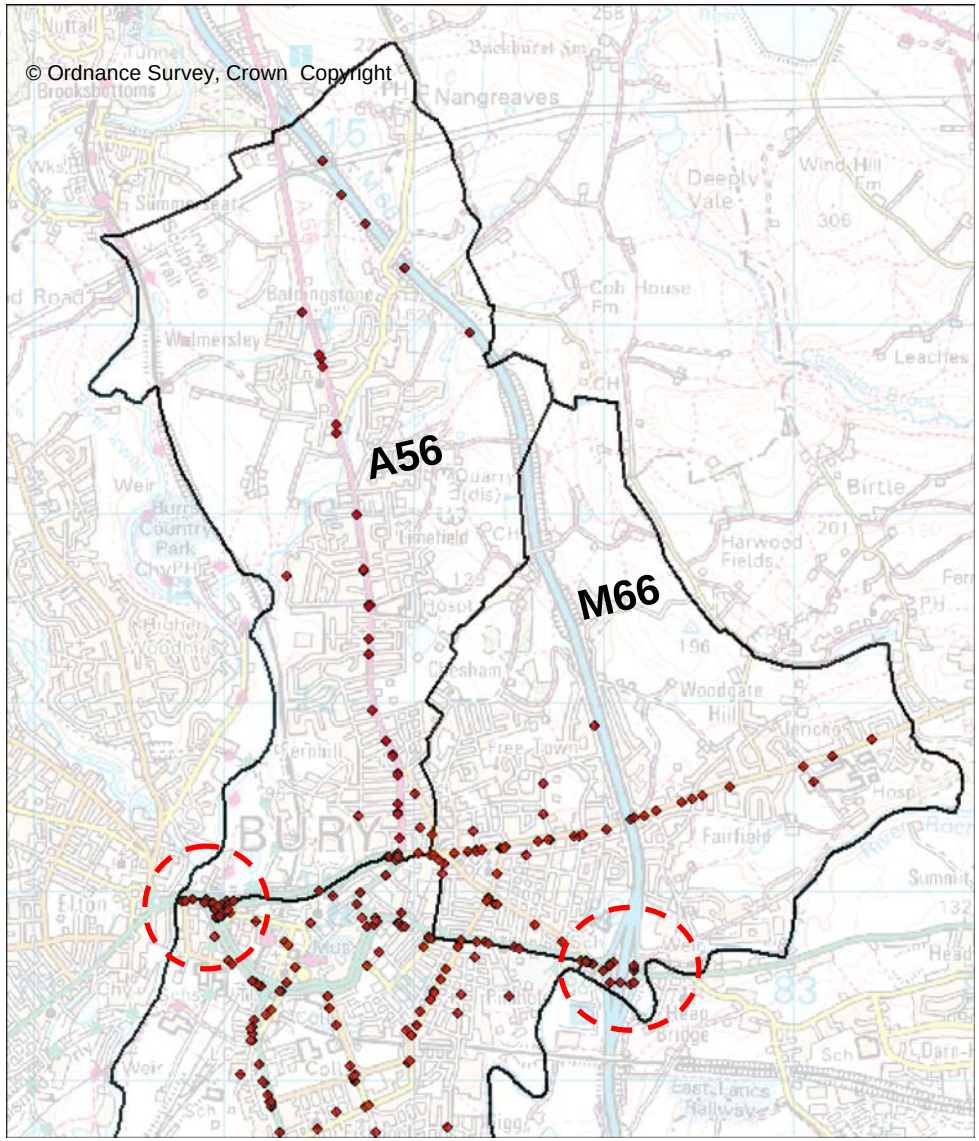
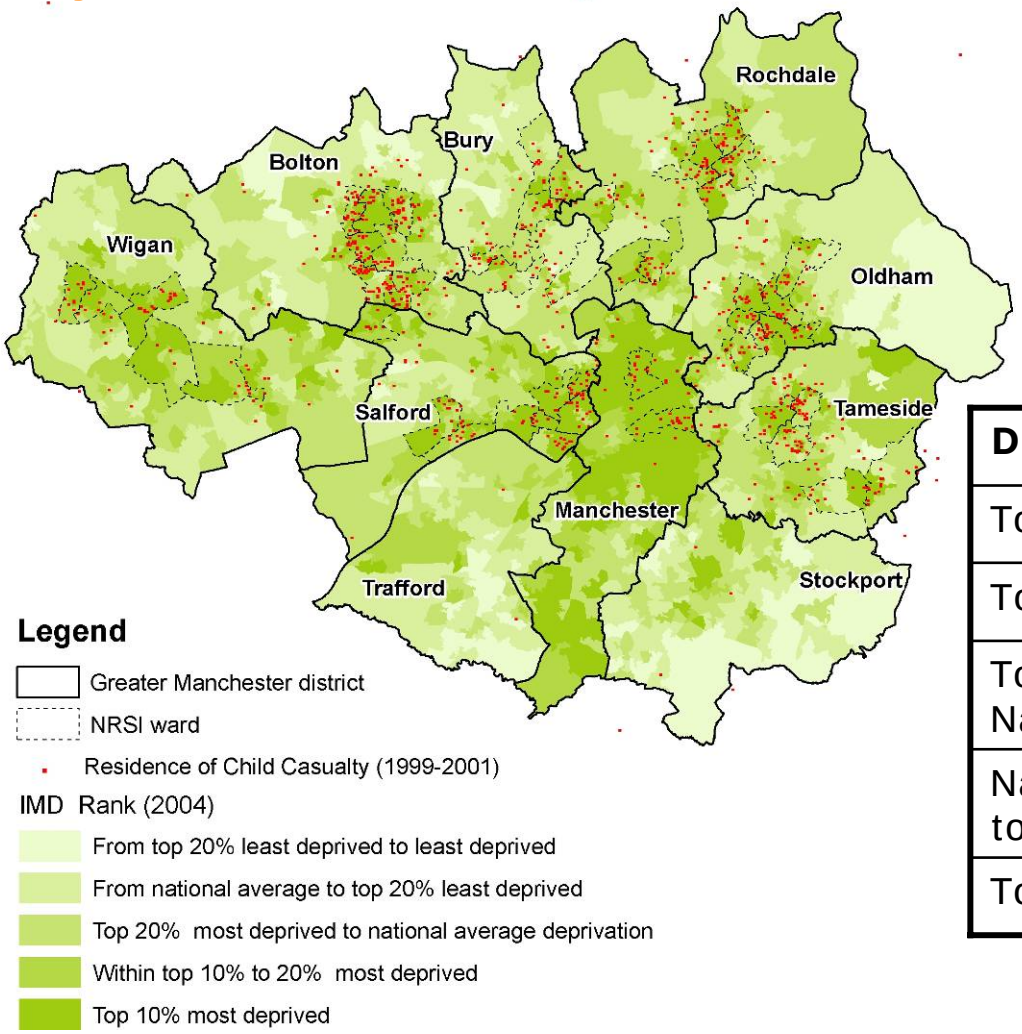
Adult Driver Casualties in Bury

Influence of road types and traffic conditions on adult driver casualties.



Residence locations of child casualties –where do the children injured in NRSI areas live?



~70% casualties were NRSI wards residents.

Non-NRSI ward residents Socio-economic background:

Deprivation Rank	%
Top 10% most deprived	~18.2
Top 10-20% most deprived	~16.2
Top 20% most deprived to National Average Deprivation	~40.2
National Average Deprivation to top 20% least deprived	~22.2
Top 20% least deprived	~3.2

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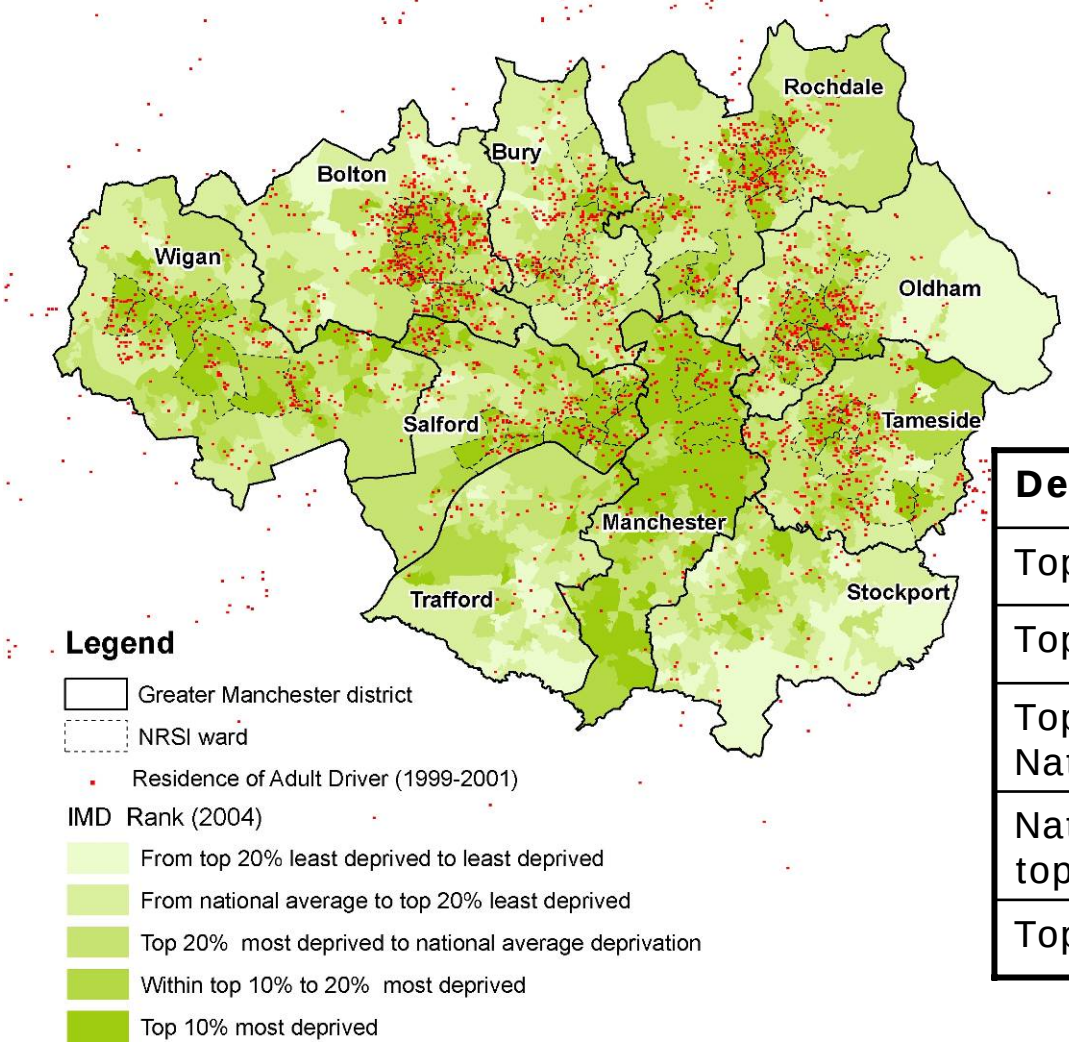
Residence locations of adult drivers – Do drivers from affluent areas cause / suffer accidents in deprived areas?



41% drivers were NRSI wards residents.

Non-NRSI ward residents Socio-economic background:

Deprivation Rank	%
Top 10% most deprived	~28%
Top 10-20% most deprived	~20%
Top 20% most deprived to National Average Deprivation	~30%
National Average Deprivation to top 20% least deprived	~19%
Top 20% least deprived	~3%

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5. Future Directions – Only Short Term

- Establishing the relationship between proximity to certain land use and casualty classes e.g. are children and older people injured more near shops, playground, schools etc.?
- Implementing clustering algorithms for an automated detection of accident hotspots.

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