4. Liverpool Adult Pedestrian Data Report & Literature Review

CONTENTS

1.0 ABSTRACT

For the last 10 years the number of adult pedestrian casualties has plateaued across the UK. In this respect Liverpool is no different. However, when ranked according to casualty rates, Liverpool holds the highest adult pedestrian casualty rates outside of London. There is no obvious explanation as to why figures are so high, nor any consensus view as to the most effective ways to address this problem.

So-Mo has been working with Road Safety Analysis to understand why this is the case and are using an approach grounded in behavioural science to address the problem. The discovery process has included analysing all available data from the period 2012 to 2016 and by conducting supplementary research designed to understand the what, where, when and who of adult pedestrian casualties in Liverpool. As always though, the most challenging and important question is 'why'?

This resulting body of work is one of the most comprehensive studies into UK Adult pedestrian casualties to have been undertaken in the last five years and, whilst both analysis and findings focus on Liverpool, we are confident that the information contained in this document will be of interest to other urban areas, particularly those with similar road networks and socio demographic profiles.

This document sets out the detailed research findings from the first phase of the work and was used as a base for further investigation.

It precedes three other documents; the Excecutive Data Report which summarises our analysis of available data. The Executive Insight Report, which sets out a range of psychological and social insights gained from the combined analysis of data with ethnographic, behavioural and interview-based research.

Finally, the options report, the third document in the series sets out recommendations relating to future direction of travel for the delivery phase.

We hope you enjoy the wealth of data presented in this report

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2.0 EXECUTIVE SUMMARY

A note on methodology.

In order to understand, identify what is unique or different to the Liverpool we identified seven comparator authorities. These localities were selected either due to similarities of road network, (defined by calculating 'network density' and 'percentage urban roads' figures) or socio-demographic profile. Working in this way allowed us to understand what factors are unusual or unique to the city. As a general trend, Liverpool demonstrates more similarities with comparators selected for their socio-economic profiles, than it does to areas, with similar road network profiles. For the purpose of this summary, comparisons will not be made unless there is something significant to report.

The what, where, how and who

Casualties involving adult pedestrians have plateaued in Liverpool over the last 10 years, yet they account for around 16% of all collisions. Out of all casualty types, car, bus, cycle etc. pedestrian casualties represent the highest percentage of people killed or seriously injured (KSIs) on the road (38%).

Unsurprisingly, collisions in Liverpool peak at around 5pm with the fewest casualties occurring in the early hours of the morning. This does not mean that collisions are predominately a daytime issue; collisions occurring between the hours of 6pm and 6am account for 40% of all adult pedestrian casualties.

In terms of days of the week, we see a peak on Fridays, this is unsurprising and as a trend is reflected across all comparators. The greatest difference observed between Liverpool and the comparator authorities is on Sundays, when 14% of the pedestrians are injured (compared to 10% for the network and 11% for the socio-demographic authorities). It is interesting that is that 54% of the adult pedestrians injured on Saturdays were involved in collisions between 6pm and 3am, which indicates that the night time economy may have a significant part to play.

In terms of seasonal trends, there are peaks in November, December and January, with the majority of collisions occurring in good weather.

Liverpool is known for its vibrant night-time economy and so unsurprisingly collisions occurring at night and especially at weekend are concentrated around the city centre.

In terms of where collisions are happening, the majority of collisions involving pedestrians are happening on 30mph roads. This is despite 70% of Liverpool's roads having a designated 20mph speed limit.

20% of all collisions involving pedestrians occur on a dual carriageway. This is twice the rate for both network and socio-demographic comparators, which fall at around 10%. Liverpool has almost double the amount of dual carriageways out of all of our comparators with the exception of Manchester where the percentage of major road dual carriageway length is almost identical. Despite this only

13% of Manchester's adult pedestrian casualties were on dual carriageways, compared to Liverpool's 20%.

The majority of pedestrian casualties are hit by a car (69%) and over 50% of vehicles in conflict with a pedestrian are traveling straight ahead at the time of collision. 26% of collisions are recorded as hit and run and, whilst this later figure seems shocking it is not unique to Liverpool.

Perhaps more startling, is the percentage, of adult pedestrians who are hit by taxis (13.8%). This figure is significantly higher than on our network comparators (6.3%) and also our socio-demographic comparators (9 %). In addition, 42% of adult pedestrian casualties hit by taxis are injured between the hours of 9pm and 3am. During these hours taxis, particularly in the city centre out number other forms of transport.

When we look at the contributory factors recorded by police officers at the time of collision, almost three-quarters of adult pedestrian casualties in Liverpool were thought to have contributed to their collision in some way. The most common factor being, 'failed to look properly' (52%) followed by 'impaired by alcohol' (21%).

In contrast, only 49% of drivers were thought to have contributed to the collision in some way. The most common factor being 'observations errors' followed by 'unsafe behaviour'. Substance impairment accounted for just 3% of recorded factors for drivers. Whilst this is interesting, it should be remembered that the contributory factors assigned at the time of the collision are not the result of extensive investigation.

Looking at who is involved we know that there is a peak in casualties aged 16 to 24 years old (26%). Most drivers involved in collisions are from Liverpool and 55% of drivers are aged between 16 and 44 years old.

Gender plays a massive part in who gets injured and by whom. Whilst the ration of pedestrians injured is more evenly split with (59% of all pedestrian casualties are male), when we look at the sex of the driver there is a far more dramatic contrast.

In Liverpool, 65% of casualties are in conflict with male drivers, whilst only 19% are identified as female with a further 16% listed as gender unknown.

Just over a quarter of the casualties are in conflict with a driver who is driving for work (not commuting) and this supports the vehicle type analysis, where 26% are driving vehicles often used for work purposes (taxis, goods vehicles and buses).

Using Mosaic profiling we are able to profile pedestrians and drivers in terms of demographics, lifestyle, culture and behaviour, an individual profiled will be assigned into one of **15** groups.

When we look at social economic status for both pedestrians and drivers, some interesting similarities emerge. Most notable is the fact that both tend to comprise of single households with no children, are deprived and are benefit claimants or students.

We also learn that half of the adult pedestrian casualties injured in Liverpool live in the 10% most deprived communities in the country, deprived in this sense is not merely about relative wealth, but also access to employment, health, education, crime, services and living environment.

It is likely that residents face a number of daily challenges and worrying about their safety or the safety of others on the road is unlikely to rank highly

KEY THEMES

From this detailed collision analysis, we identified three key themes worthy of further investigation. These are:

- collision on arterial routes in Liverpool, with a specific focus especially on dual carriageways
- collisions in locations associated with the night time economy, with a particular focus on taxis
- Mobile phone use for both pedestrians and drivers. The collision analysis did not reveal much insight into this problem due to limitations in the data. Despite this, it was decided to include mobile phone use in the next phase of research as it viewed nationally as a significant threat to adult pedestrian safety.

With the identification of the three themes, further primary and secondary evidence will now need to be gathered in order to fully understand these issues and their impact on Liverpool's pedestrians.

3.0 INTRODUCTION

In Great Britain in 2016, there were 414 adults who were killed as pedestrians and a further 3,887 seriously and 13,251 slightly injured. Figure 1 puts adult pedestrian casualty figures for Great Britain in context. It shows the number of adult pedestrian casualties, by severity, since 2005 in the bars and the red line indicates the collision involvement rate per 100,000 population. It shows a general downward trend of casualties from 2005 until 2008, when the numbers plateaued.

FIGURE 1 - GB ADULT PEDESTRIANS BY SEVERITY AND CASUALTY RATE PER 100,000 POPULATION

This report sets out analysis undertaken using STATS19 collision data for 2012 to 2016 from MAST, an online analysis tool which combines casualty and collision data from the Department for Transport with socio-demographic insights created by Experian through Mosaic Public Sector. The postcodes of drivers and casualties involved in collisions are used to determine which Mosaic *Groups* these individuals are likely to belong to. Alongside additional user research, interviews and observations this can be used by road safety professionals to understand who should be targeted in future road safety interventions.

The intention of this report is to provide road safety practitioners in Liverpool with a full understanding of collisions involving adult pedestrians and equip them with the tools to target the issues. The analysis concentrates on adult pedestrians injured on Liverpool's roads, including a focus on the residency and socio-demographics of the individuals involved.

At the outset, this report identifies the extent to which adult pedestrians are involved in collisions in Liverpool, and in what context. The location of these collisions will be examined to determine if there are specific locations and road types where adult pedestrians are more likely to be involved in a collision.

Other factors, such as when, where and how the pedestrians were involved in collisions are explored to provide information on the topics and issues that could be focused upon within an intervention.

A large part of the analysis focuses on profiling the pedestrians, with the aim of producing 'personas' that can be used to visualise the target audience. These personas are created using a variety of socio-demographic data, including looking at Indices of Multiple Deprivation and Mosaic Groups. Profiling in this way allows the practitioner to understand how adult pedestrians will respond to a road safety intervention and in what way it should be delivered.

Comparator authorities are used, where appropriate, to place the analysis of adult pedestrians injured in Liverpool in context. These seven authorities were carefully selected based on network and socio-demographic similarities and the selection process is explained below.

3.1 COMPARATOR AUTHORITIES

In order to understand whether the challenges facing adult pedestrians in Liverpool are typical of those facing pedestrians elsewhere, it was deemed necessary to compare the analysis with similar authorities. There are two approaches which can be taken to identify appropriate comparative authorities: looking at those with similar network demands and those with similar populations.

Population and traffic flow figures for 2014 have been used as the centre year of the collision analysis (2012-2016).

The following explains how the final comparator authorities were selected.

3.1.1 NETWORK DENSITY

Comparing collision rates between highway authorities can be misleading due to the variation in road characteristics across the country. For example, it is unlikely that comparing the collision rate in central London to the collision rate in the Shetland Islands will provide a meaningful assessment of performance. To address this issue, Road Safety Analysis (RSA) have devised a classification system which groups similar authorities together so that meaningful comparisons can be made.[1]

The classification system is based on 'Network density', which is calculated by dividing the total length of roads (km) in a highway authority by the area (km²) of the highway authority. This 'network density' value gives an indication of how urban an authority is and authorities with similar network density values tend to have similar collision rates. When plotting the collision rate index values against the network density values, a correlation was evident with road risk generally increasing as the network density increased.

The percentage of urban roads in an authority, as defined by the Department of Transport, are also used in the classification system. Grouping highway authorities using the 'network density' and 'percentage urban roads' figures led to the creation of 5 super-groups and 11 sub-groups. RSA named the classification system 'Highway Authority Network Classification System' (HANCS).

Liverpool City belongs to HANCS sub-group B2: 'very densely networked super urban authorities not in London', with 17 other authorities, as shown in Table 1.

[1] http://mast.roadsafetyanalysis.org/wiki/index.php?title=HANCS

TABLE 1 – HANCS SUB-GROUP B2

Blackpool
Bournemouth Borough
Bristol City
Dudley Metropolitan Borough
Dundee City
Glasgow City
Kingston upon Hull City
Leicester City
Liverpool City
Luton Borough
Manchester City
Nottingham City
Plymouth City
Portsmouth City
Sandwell Metropolitan Borough
Southampton City
Southend-on-Sea Borough
Wolverhampton City

The authorities belonging to HANCS sub-group B2 were then analysed against the following criteria to determine compatibility with Liverpool.

3.1.2 PRESENCE OF STRATEGIC NETWORK ROADS

Liverpool City contains no roads belonging to the Strategic Road Network (SRN) managed by Highways England. This affects the composition and use of the local road network. Other HANCS sub-group B2 authorities which also have no SRN roads are shown in Table 2. This is calculated using Department for Transport statistics based on motor vehicle traffic (vehicle miles) by local authority in 2014 and the same figures excluding SRN roads.[2]

TABLE 2 – HANCS SUB-GROUP B2 WITHOUT SRN ROADS

Blackpool
Bournemouth Borough
Liverpool City
Southend-on-Sea Borough
Wolverhampton City

3.1.3TRAFFIC FLOW

It is important to understand the traffic flows on local roads so that there is an insight into how busy they are. The Department for Transport records "the number of vehicles passing in 24 hours at an average point on the road network in each local authority. This controls for differing length of road in each authority, providing a measure of how heavily used the roads are. It is calculated by dividing

[2] https://www.gov.uk/government/collections/road-traffic-statistics (Tables TRA8901 and TRA903)

the estimate of annual vehicle miles in each local authority by the length of road in that authority and number of days in the year."[3]

TABLE 3 – HANCS SUB-GROUP B2 WITH SIMILAR ANNUAL AVERAGE DAILY FLOW (2014)

Local Authority	Annual Average Daily Flow (2014)
Dundee City	3,904
Liverpool City	4,090
Southend-on-Sea Borough	4,065
Wolverhampton City	4,194

Local authorities with similar daily flows as Liverpool (200 more or fewer vehicles a day than Liverpool) are shown in Table 3.

3.1.4 POPULATION DENSITY

There are also socio-demographic influences on collision rates. The number of people using a local road network will affect pressures on the system.

Population density is calculated based on the estimated resident population for 2014 and the land area of each local authority.[4]

Local authorities with similar resident population figures per square mile as Liverpool (250 more or fewer people per square mile than Liverpool) are shown in Table 4.

TABLE 4 – HANCS SUB-GROUP B2 WITH SIMILAR POPULATION PER SQUARE MILE (2014)

Local Authority	Population per square mile (2014)
Bournemouth	10,734
Liverpool City	10,955
Nottingham City	10,909
Southend-on-Sea	11,037

3.1.5 SOCIO-DEMOGRAPHICS

Mosaic Public Sector[5]is a socio-demographic classification system covering the whole of the United Kingdom. It is intended to provide an accurate and comprehensive view of citizens and their needs by describing them in terms of demographics, lifestyle, culture and behaviour. It is based on data from a wide range of public and private sources. It is used to enable policy decisions, communications activities and resources strategies across the public sector.

Mosaic classifies the community represented by each UK postcode into one of 15 Groups and 66 Types. MAST links STATS19 drivers and casualties to Mosaic by using postcodes. This makes it possible to expose the socio-demographic profiles of the communities of those involved in collisions.

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[3] https://www.gov.uk/government/statistics/road-traffic-estimates-in-great-britain-2016 (Table TRA8907)

[4] https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationestimates/datasets/populationdensitytables

[5] http://www.experian.co.uk/assets/marketing-services/brochures/mosaic-ps-brochure.pdf

Experian, the creators of Mosaic Public Sector, have calculated the degree of socio-economic similarity of every local authority in Britain to every other such area, on the basis of proportions of proximate Mosaic Types within the resident populations. This analysis was undertaken specifically for MAST Online. It should be noted that there is no necessary relationship between size or location on one hand, and socio-demographic similarity on the other.

TABLE 5 – MOST SIMILAR AUTHORITIES BASED ON MOSAIC COMPOSITION

Salford
Middlesbrough
Manchester
Newcastle upon Tyne
Sheffield
Nottingham
Gateshead
Hartlepool
South Tyneside
Sunderland

Table 5 shows the 10 authorities with the most similar Mosaic composition to Liverpool.

3.1.6 SELECTED COMPARATOR AUTHORITIES

TABLE 6 - CHOSEN COMPARATOR AUTHORITIES FOR LIVERPOOL

Authority	No SRN	Similar annual average daily flow (2014)	Similar population per square mile (2014)	HANCS Group	Similar authorities – socio-demographics
Bournemouth	*		*	*	
Southend-on-Sea	*	*	*	*	
Wolverhampton	*	*		*	
Kingston upon Hull				*	*
Manchester				*	*
Sheffield					*
Nottingham			*	*	*

Table 6 shows the seven authorities selected as comparators to Liverpool for this analysis.

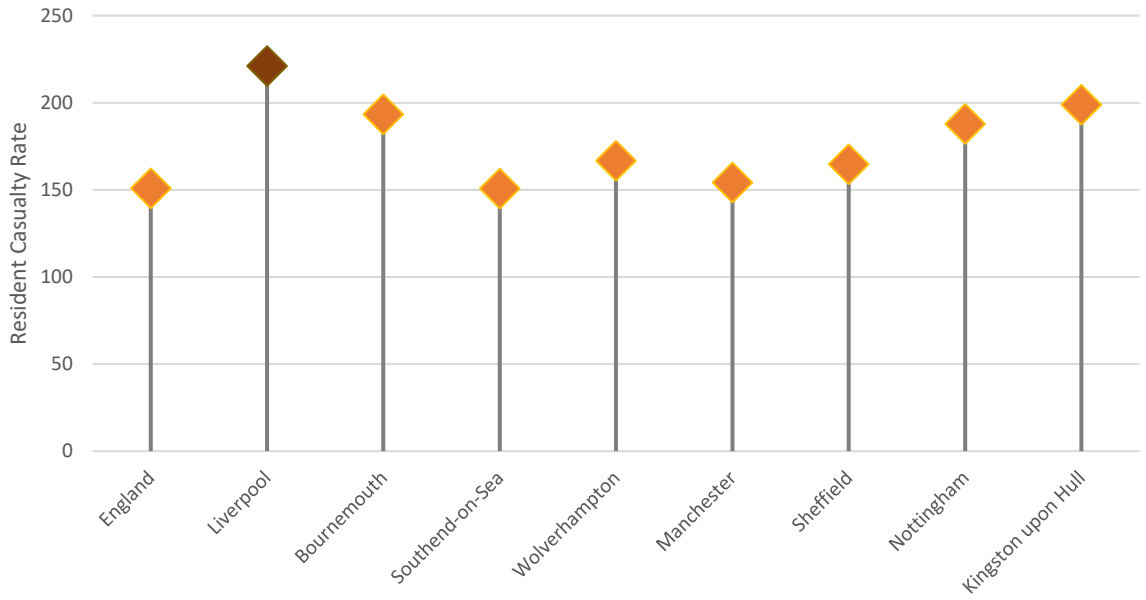
The top three authorities are based on network related variables and will be referred to throughout the report as 'network comparators'. These authorities, whilst not immediately similar to Liverpool, all share characteristics with the city which affect the way in which the roads are used.

The lower four authorities are based on population related variables and will be referred to throughout the report as 'socio-demographic comparators'. Three of these authorities are in the same HANCS group and therefore have similar network density and percentage of urban roads.

As a starting point, Figure 2 shows the annual average number of resident adult pedestrian casualties per 100,000 adult population. The number of resident casualties, rather than casualties occurring on local roads, is used to ensure the relevance of the population data. The chart shows that several comparators have adult pedestrian rates per head of population which are similar to the rate for the whole of England: Southend on Sea, Wolverhampton, Manchester and Sheffield. Bournemouth, Nottingham and Kingston upon Hull all have higher rates than England, with Liverpool having the highest rate of all, with the equivalent of 221 resident adult pedestrian casualties per 100,000 people each year.

This shows that despite identifying similar authorities to Liverpool, adult pedestrian risk in the city is increased and warrants the further investigation undertaken in this report.

FIGURE 2 - ANNUAL AVERAGE ADULT PEDESTRIAN CASUALTIES PER 100,000 HEAD OF ADULT POPULATION



4.0 RISK PROFILE

This profile covers two distinct areas: information about the collision and about the person involved. Both are relevant to the analysis and are considered separately. All the analysis focuses on adult pedestrian casualties injured in Liverpool.

4.1 COLLISION PROFILES

4.1.1 WHAT?

Between 2012 and 2016, pedestrians accounted for 16.2% of all casualties injured on Liverpool's roads. This is 20% higher than the ratio for network comparators and 15% higher for socio-demographic comparators. For those casualties killed or seriously injured (KSI) in Liverpool, 37.7% were pedestrians. This severity ratio is higher than for the comparator authorities: 28% of those killed or seriously injured on network comparator roads were pedestrians as were 30% of the KSI casualties on socio-demographic comparator roads.

Figure 3 shows the percentage of all casualties in Liverpool, and the two groups of comparators who were pedestrians between 2012 and 2016. One-hundred based indices have also been calculated (shown in red) which show whether the proportions in Liverpool are similar to those in the comparators. Any positive values show that Liverpool has a higher proportion than the comparators, whereas negative values show an underrepresentation. Throughout the report, values of less than 30 or less than 1% of the total are too small to index.

FIGURE 3 - PERCENTAGE OF CASUALTIES (ALL SEVERITIES) WHICH ARE PEDESTRIANS (2012-2016)

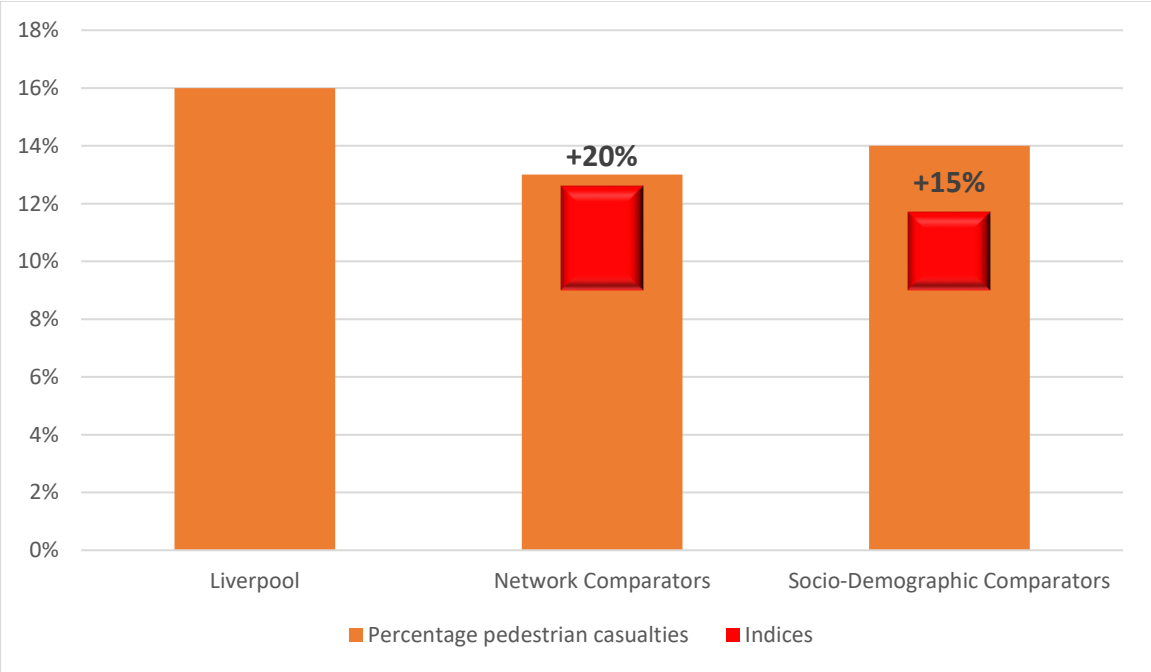


Table 7 shows the number of each type of casualty injured in Liverpool between 2012 and 2016. It shows that the highest number of casualties killed were pedestrians and that of all casualty types, pedestrians represent the highest percentage of those killed and seriously injured. The final two columns compare the percentages each casualty type represents in Liverpool compared to the percentage each group represents in the similar authorities. It shows that the other vulnerable road

user groups of motorcyclists and cyclists are under-represented in Liverpool, compared with both comparator groups. Whilst bus occupants only represent 5% of all casualties in Liverpool, this is a higher percentage than the comparator authorities (78% higher than the network comparators).

TABLE 7 – 2012-2016 CASUALTIES BY TYPE ON LIVERPOOL'S ROADS

	Fatal	Serious	Slight	Total	% of All KSI	% of All	Difference with proportions in Network comparators	Difference with proportions in Socio-Demographic comparators
Car Occupants	4	244	4318	4566	24%	61%	+8%	+7%
Motorcyclists	11	168	270	449	17%	6%	-45%	-31%
Goods Vehicle Occupants	0	8	121	129	1%	2%	-15%	-17%
Bus Occupants	0	25	336	361	2%	5%	+78%	+16%
Cyclists	3	172	558	733	17%	10%	-29%	-27%
Other	1	3	35	39	0%	1%	+1%	-23%
Pedestrians	**21**	**365**	**826**	**1212**	**38%**	**16%**	**+20%**	**+15%**

FIGURE 4 – TRENDS BY CASUALTY TYPE IN LIVERPOOL, 100-BASED COMPARED TO 2007 (2012-2016)

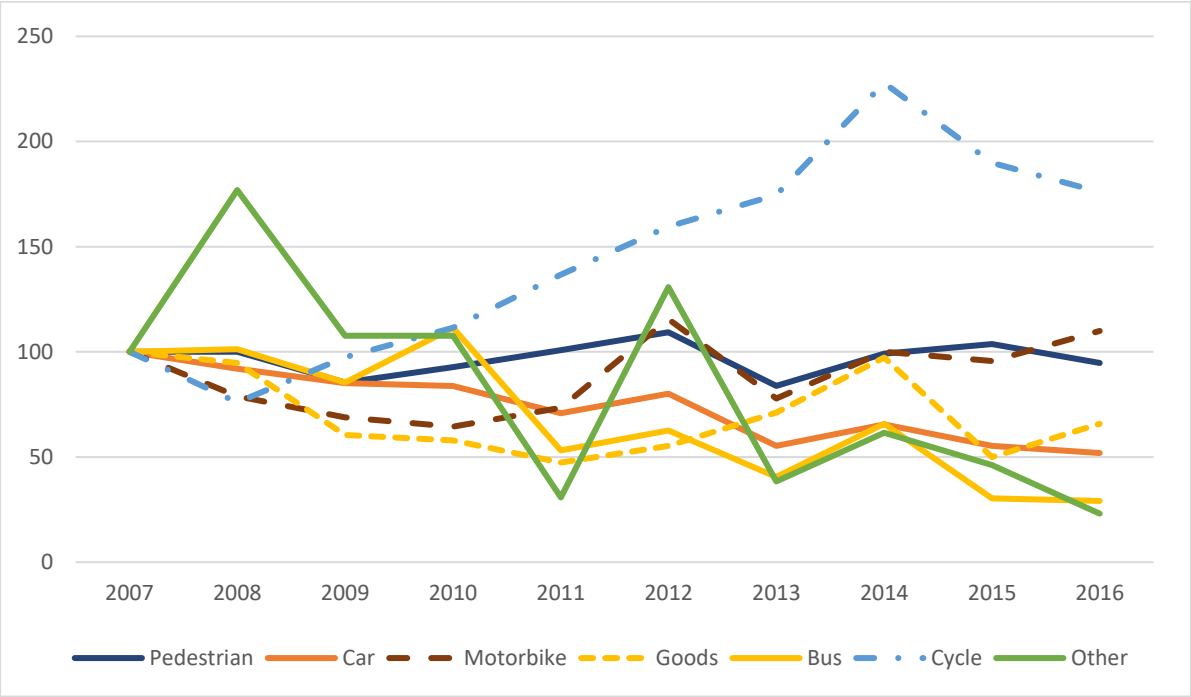


Figure 4 shows the 100-based trends by the different casualty types on Liverpool's roads, with 2007 as the base. It shows that most of the casualty types (other, bus, goods and car) have seen reductions in numbers since 2007, with pedestrians and motorcyclists seeing little change over the last 10 years. Cycle casualties increased from 2007 to 2014, after which reductions were seen (although not a return to 2007 levels).

FIGURE 5 – ADULT PEDESTRIAN CASUALTIES BY SEVERITY IN LIVERPOOL, WITH ROLLING 2007-2011 AVERAGE (2012-2016)

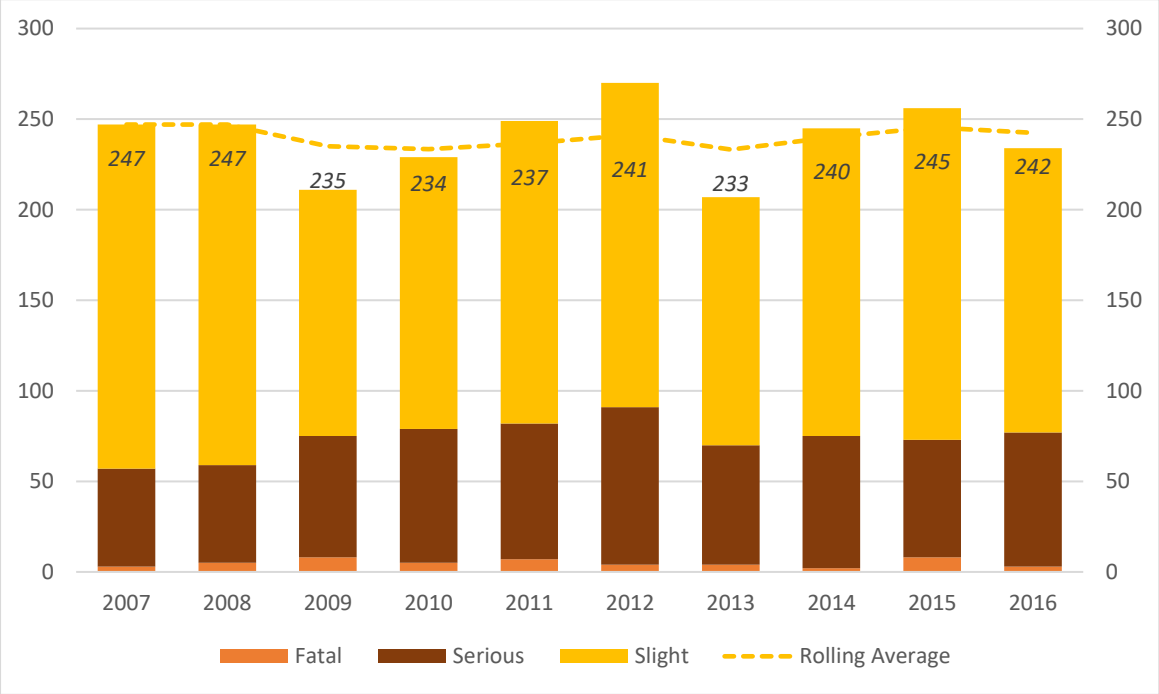


Figure 5 shows the number of adult pedestrian casualties in Liverpool each year, by severity. There is also a rolling average trend line, which shows very little change in the past 10 years (supporting Figure 4).

Annually, between 230 and 250 adult pedestrians are injured in Liverpool each year. The lowest number of adult pedestrians killed or seriously injured was in 2007 (57) with the highest number in 2012 (91).

4.1.2 WHEN?

This section of the analysis looks at when Liverpool pedestrians were injured in collisions between 2012 and 2016.

Figure 6 shows the hour of day in which the adult pedestrian casualties were injured, both in Liverpool and in the comparator authorities. It shows a peak for all areas, particularly Liverpool, at 5pm and fewest casualties at 5am to 7am. The network comparators have higher percentages of casualties injured during the day. Overall, 40% of adult pedestrians injured in Liverpool were involved in collisions between 6pm and 6am. This is 21% higher than the proportion for the network comparators but only 3% higher than the socio-demographic comparators.

FIGURE 6 - TIME OF DAY ADULT PEDESTRIANS WERE INJURED IN LIVERPOOL AND COMPARATORS (2012-2016)

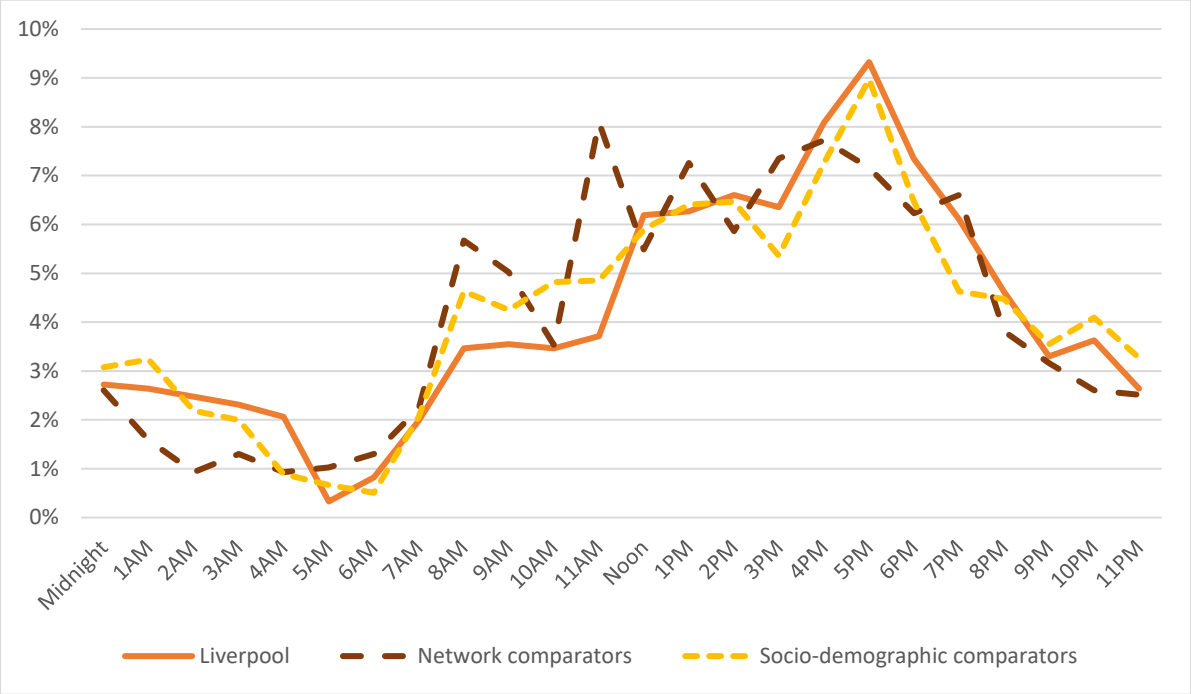


FIGURE 7 - LIGHTING CONDITIONS WHEN ADULT PEDESTRIAN CASUALTIES WERE INJURED IN LIVERPOOL & COMPARATORS (2012-2016)

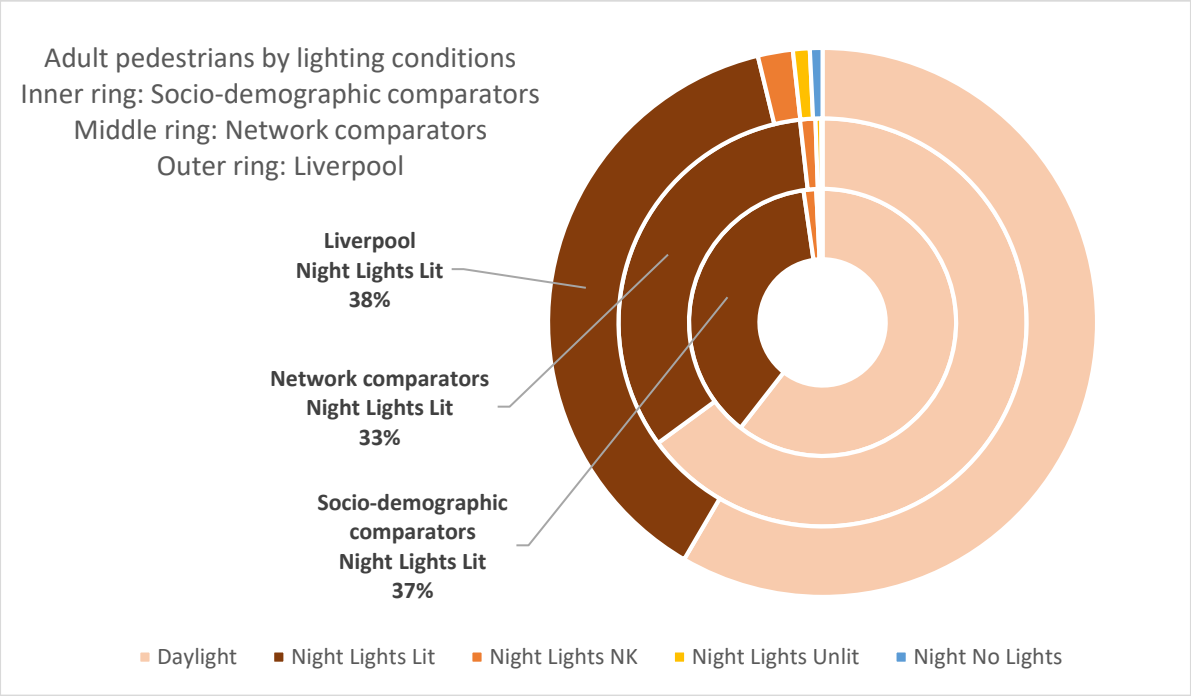


Figure 7 shows the lighting conditions at the time the adult pedestrian casualties were injured in both Liverpool and the comparator authorities. It shows that 58% of the casualties were injured in daylight and this is similar to the socio-demographic comparators (61%) but lower than the network comparators (65%). Conversely, 38% of adult pedestrian casualties injured in Liverpool were at night with lights lit, which is again similar to the socio-demographic comparators (37%) but higher than the network comparators (33%).

The days of the week when pedestrians are involved in collisions are shown in Figure 8. The red bars compare Liverpool pedestrians with the two comparator groups. For all three groups of adult pedestrian casualty, there is a peak on Fridays. The greatest difference observed between Liverpool and the comparator authorities is on Sundays, when 14% of the pedestrians are injured in the city (compared to 10% for the network and 11% for the socio-demographic authorities).

FIGURE 8 – DAY OF WEEK WHEN ADULT PEDESTRIAN CASUALTIES WERE INJURED IN LIVERPOOL AND COMPARATORS, WITH INDICES FOR COMPARATORS (2012-2016)

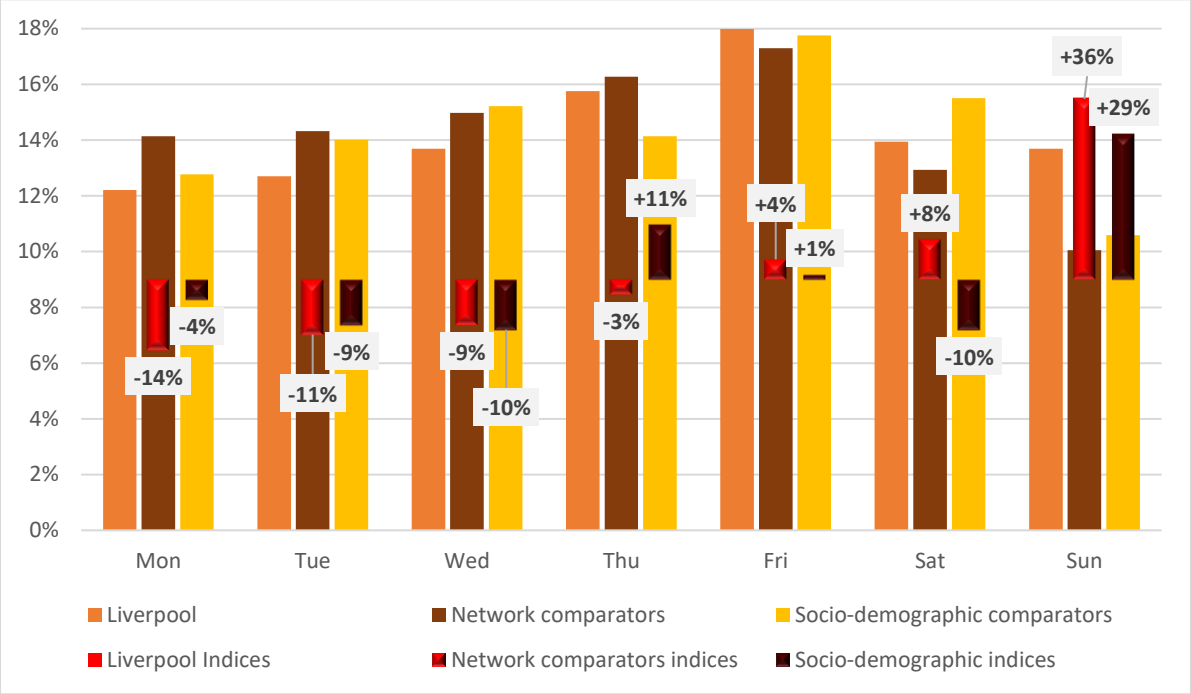


FIGURE 9 - DAY OF WEEK BY TIME OF DAY FOR ADULT PEDESTRIAN CASUALTIES IN LIVERPOOL (2012-2016)

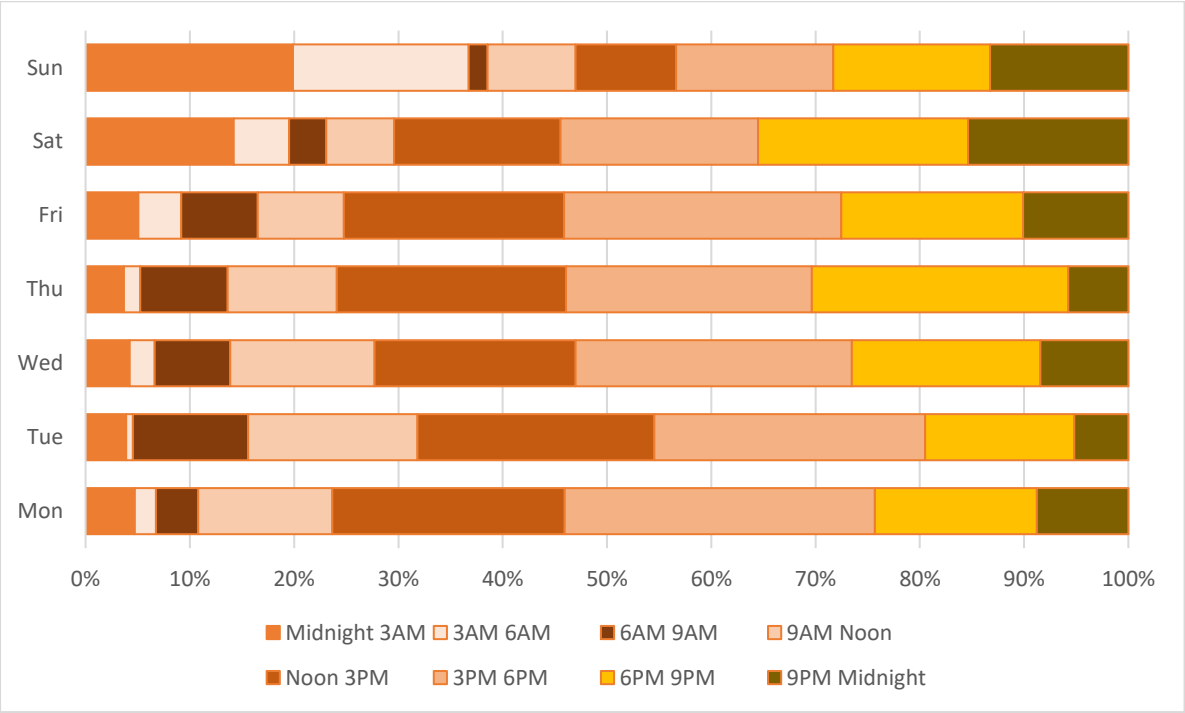
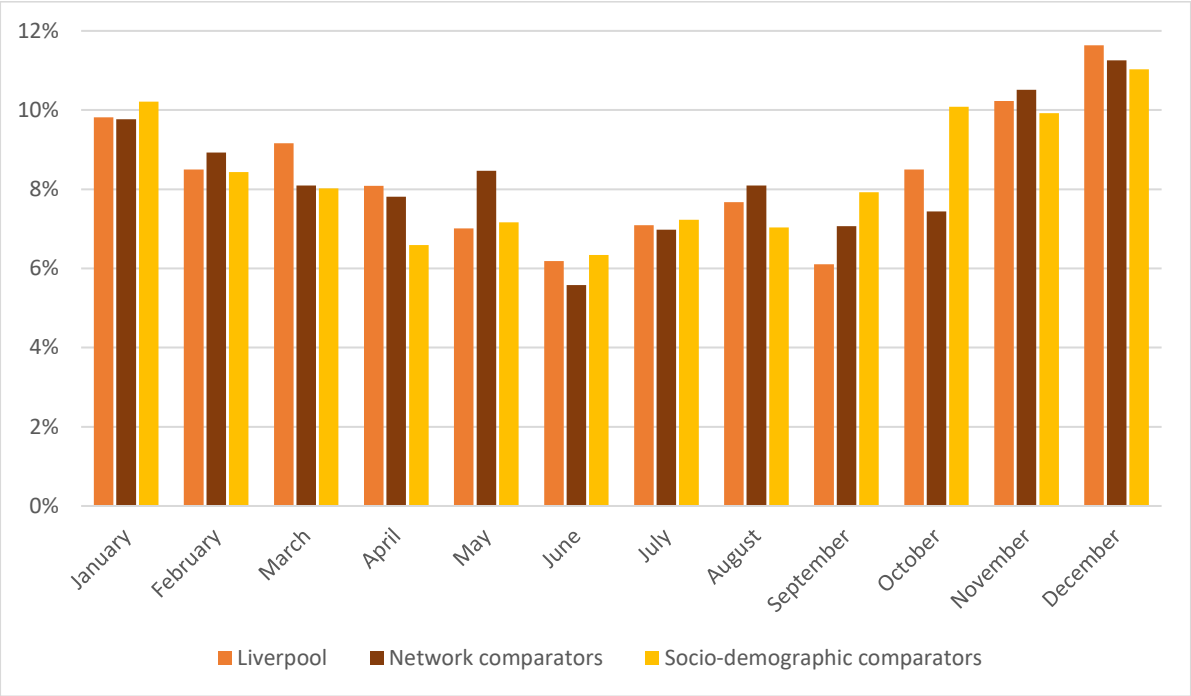


Figure 9 explores the relationships between day of week and time of day further, to see when the casualties injured on Sundays were involved in collisions. It shows that 37% of the adult pedestrians injured in Liverpool were involved in collisions between midnight and 6am (i.e. from Saturday night onwards) and a further 28% were injured between 6pm and midnight on Sunday itself. It also shows that 54% of the adult pedestrians injured on Saturdays were involved in collisions between 6pm and 3am.

FIGURE 10 – MONTH OF YEAR WHEN ADULT PEDESTRIAN CASUALTIES WERE INJURED IN LIVERPOOL AND COMPARATORS (2012-2016)



The month of the year in which the adult pedestrians were injured was analysed and compared to the similar authorities. Figure 10 shows that there are peaks for all of the authorities in November, January and especially December.

The weather conditions at the time the adult pedestrians were involved in the collisions were examined (Table 8). Most pedestrians are injured in collisions in fine and still weather (79%); this pattern is common to the comparator authorities (77% for network and 78% for socio-demographic).

However, adult pedestrians in Liverpool were more likely to be involved in collisions in wet and still weather than those on network comparator roads and in wet and windy conditions compared to socio-demographic comparator roads.

TABLE 8 - WEATHER CONDITIONS WHEN MOTORCYCLISTS WERE INVOLVED IN COLLISIONS (IN LIVERPOOL AND LIVERPOOL RESIDENTS)

Weather	Liverpool	Network Comparators	Network Comparators Indices	Socio-Demographic Comparators	Socio-Demographic Comparators Indices
Fine and still	957	832	+2%	2475	+1%
Fine and windy	21	18		41	
Wet and still	165	120	+22%	414	+4%
Wet and windy	25	24		57	+14%

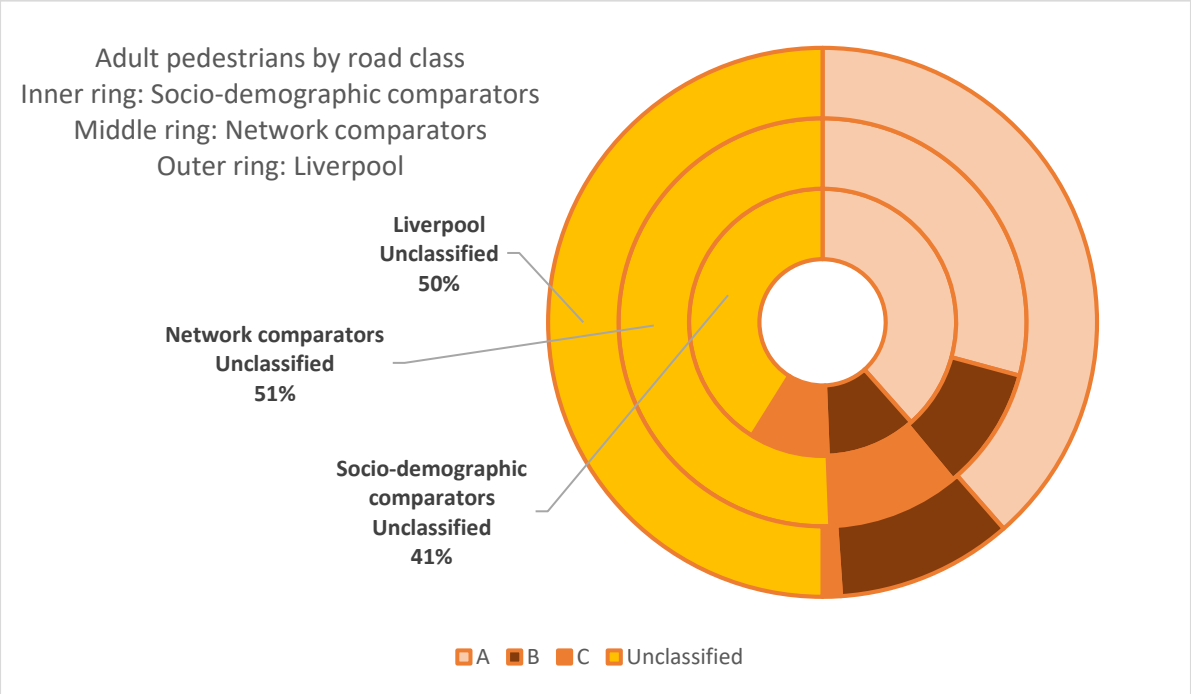
Fog or mist	0	4		8	
Other	13	34	-66%	50	-32%
Not known	31	43	-36%	109	-26%

Associated with weather is the road surface condition. Most pedestrians (71%) injured in Liverpool were on dry roads at the time of their collision, which is similar to casualties in both sets of comparator authorities.

4.1.3 WHERE?

The next section looks at the road characteristics of locations where pedestrians were injured in Liverpool.

FIGURE 11 – ROAD CLASS WHERE ADULT PEDESTRIAN CASUALTIES WERE INJURED IN LIVERPOOL & COMPARATORS (2012-2016)

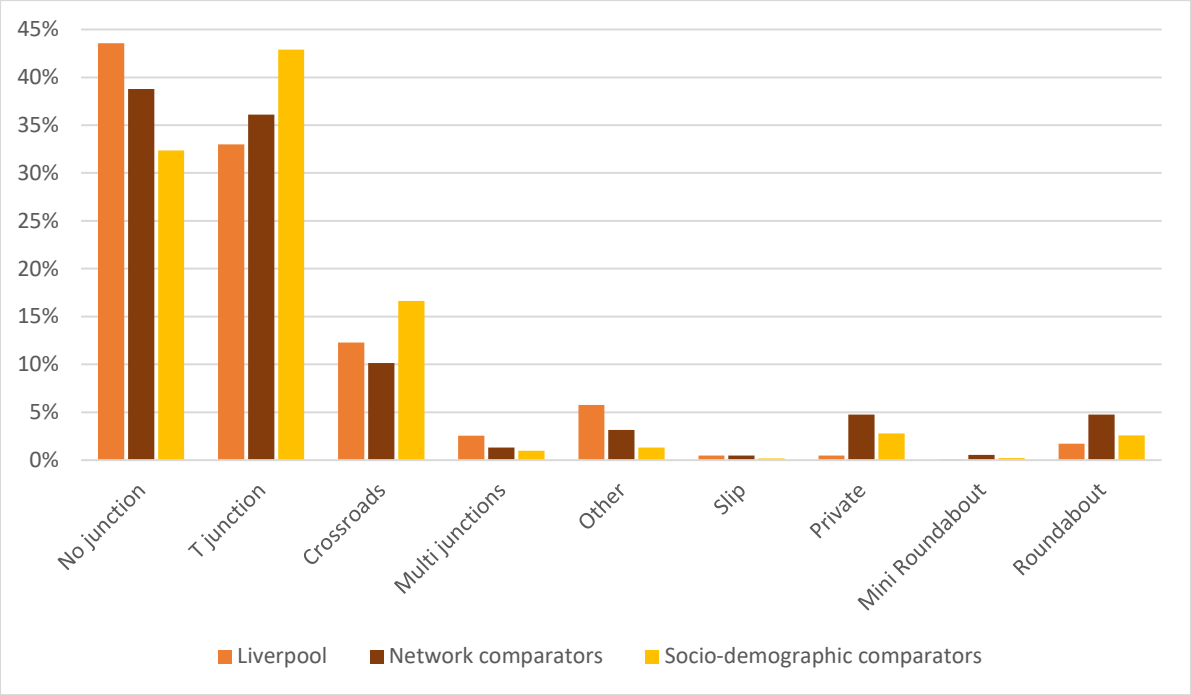


In terms of road class, 39% of pedestrians injured on Liverpool's roads were on 'A' roads at the time of their collision, with 50% on unclassified roads. In contrast, only 29% of those adult pedestrians injured on network comparator roads were on 'A' roads, which is a third lower than Liverpool. However, the proportion of those injured on unclassified roads was the same for those injured on similar network roads (51%). The trend for the socio-demographic comparators is the reverse: 38% were injured on 'A' roads but only 41% were on unclassified roads (which is 22% lower than for Liverpool pedestrians). The road class of the adult pedestrian casualties are shown in Figure 11.

A large majority (88%) of adult pedestrians injured in Liverpool were on 30mph roads. This is similar to the percentages for both network and socio-demographic comparators. Seven percent of Liverpool adult pedestrian casualties were injured on 20mph roads – this is higher than the network comparators (4%), although it could mean that despite having similar network density, these roads don't have similar speed limit distribution. Interestingly, 7% of casualties injured on socio-demographic comparator roads were also in 20mph limits.

Pedestrians injured on network comparator roads and on socio-demographic roads (both 80%) tended to be on single carriageway roads at the time of their collision. This represents a higher frequency than for those injured in Liverpool, where 69% of adult pedestrians were injured on these roads. The difference is with dual carriageways – 20% of those injured in Liverpool were on these roads, which is twice the rate for network and socio-demographic comparator casualties (both 10%). Looking at the total road length of Liverpool and comparators, Liverpool has a higher percentage (4.3%) of major road dual carriageway than the network (2.9%) and socio-demographic comparators (3.3%). Of the individual comparators, only Manchester has a similar percentage of major road dual carriageway (4.2%).

FIGURE 12 – JUNCTION TYPE WHERE ADULT PEDESTRIAN CASUALTIES WERE INJURED IN LIVERPOOL AND COMPARATORS (2012-2016)



Junction details were also analysed, and the most relevant results are displayed in Figure 12. The highest percentage (44%) of adult pedestrians injured in Liverpool were not at a junction. Whilst representing a slightly lower percentage (39%), this was also the case for those injured on network comparator roads. A lower percentage of those injured on socio-demographic comparator roads were away from junctions (32%) and instead, a greater percentage were at T-junctions (43%). T-junctions were the location for 33% of Liverpool casualties and 36% of those on similar network roads.

When pedestrians were at a junction at the time of their collision, 66% of those injured in Liverpool were at a 'Give Way' or uncontrolled junction and 33% were at an automatic traffic signal. For those injured on network comparator roads, the ratio was 77% at 'Give Way' or uncontrolled junctions and 22% at automatic traffic signals. , whilst those on socio-demographic comparator roads were more similar to Liverpool with 70% at 'Give Way' or uncontrolled junctions and 29% at automatic traffic signals.

FIGURE 13 – CROSSING TYPE WHERE ADULT PEDESTRIAN CASUALTIES WERE INJURED IN LIVERPOOL AND COMPARATORS (2012-2016)

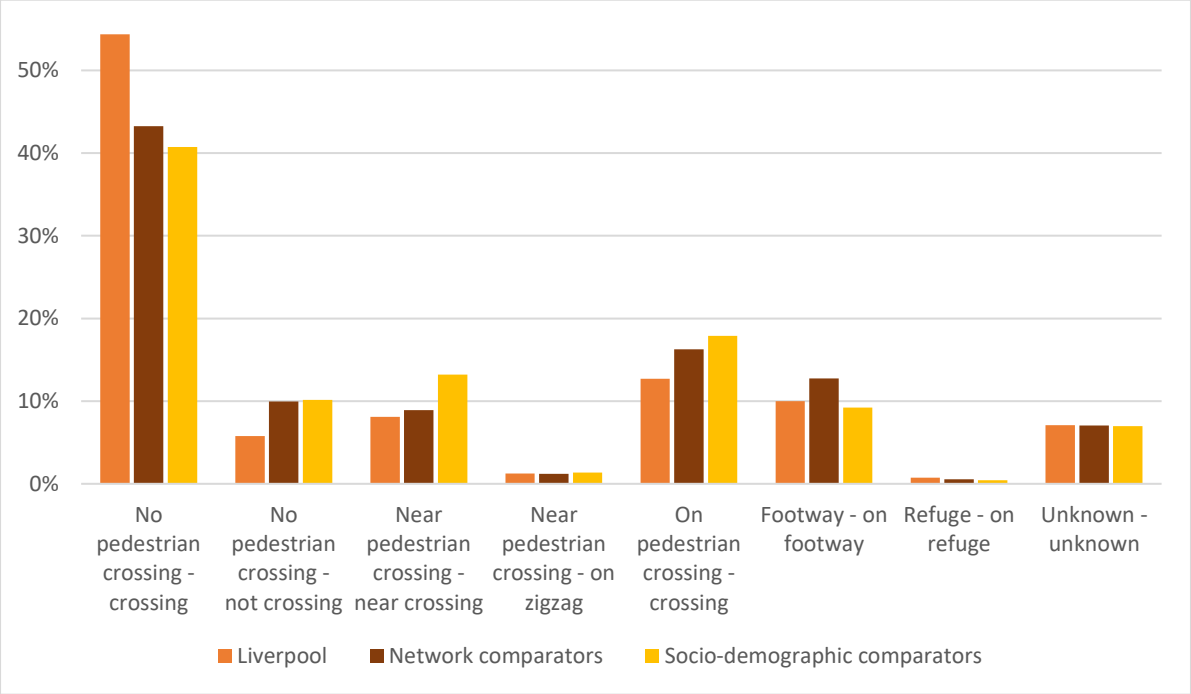


FIGURE 13 SHOWS THE CROSSING TYPE AT THE LOCATIONS WHERE THE ADULT PEDESTRIANS WERE INJURED. REFLECTING THE ANALYSIS ABOVE, 54% OF THOSE INJURED IN LIVERPOOL WERE CROSSING BUT WERE NOT AT A CROSSING, WHILST 13% WERE CROSSING ON A PEDESTRIAN CROSSING. THE PERCENTAGE IN LIVERPOOL CROSSING AWAY FROM A CROSSING WAS HIGHER THAN CASUALTIES ON BOTH TYPES OF COMPARATOR ROADS WHILST THE PERCENTAGE INJURED WHILST CROSSING ON A PEDESTRIAN CROSSING WAS LOWER. TABLE 9 – PEDESTRIAN CROSSING FACILITIES WHERE ADULT PEDESTRIAN CASUALTIES WERE INJURED (2012-2016)

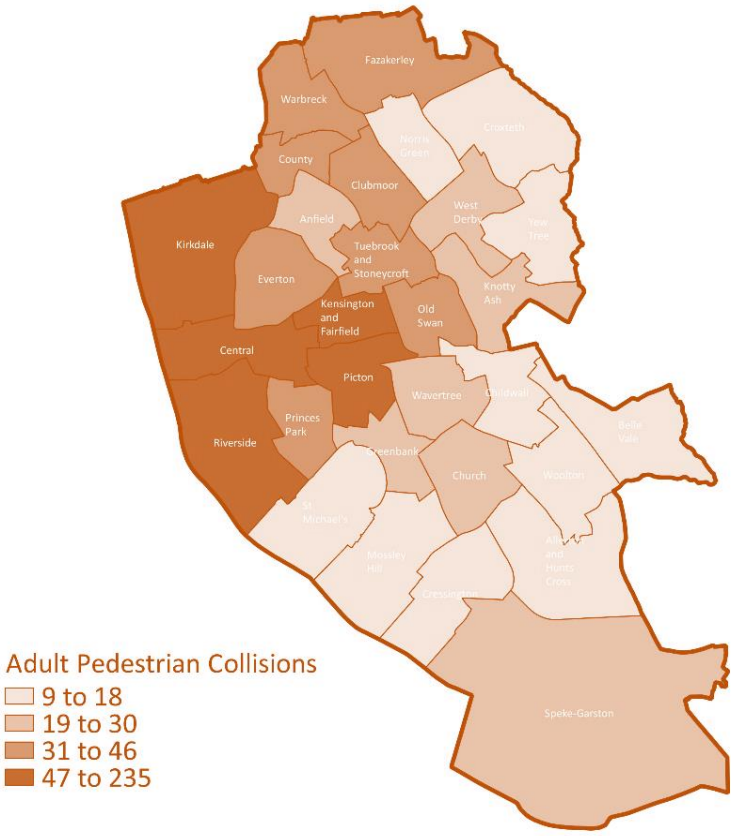
Crossing facility	Liverpool	Network Comparators		Socio-Demographic Comparators	
	%	%	Index	%	Index
Central refuge – no other controls	1.7%	4.7%		3.7%	
Footbridge or subway	0.3%	0.5%		0.2%	
No physical crossing facility within 50 metres	66.0%	63.4%	+4%	55.8%	+18%
Pedestrian phase at traffic signal junction	12.9%	10.6%	+21%	17.5%	-27%
Pelican, puffin, toucan or similar non-junction pedestrian light crossing	16.3%	16.0%	+2%	17.9%	-9%
Zebra crossing	2.8%	4.8%	-42%	4.9%	-43%

Table 9 shows the physical crossing facility of adult pedestrian casualties. As before, most casualties were not near a crossing facility and this was over-represented in Liverpool against the network comparators and particularly the socio-demographic comparators. In Liverpool 16% were on a pelican, puffin, toucan or similar non-junction pedestrian crossing. This was similar to the network comparators but lower than the socio-demographic comparators. In Liverpool 12.9% of casualties

were at the pedestrian phase at a traffic signal junction, which was higher than the network comparators but lower than the socio-demographic comparators.

Analysis of the wards where adult pedestrians were involved in collisions in Liverpool is shown in Figure 14. There were concentrations in the Kirkdale, Central, Riverside, Kensington and Fairfield, and Picton wards.

FIGURE 14 - WARDS WHERE ADULT PEDESTRIAN CASUALTIES WERE INJURED IN LIVERPOOL (2012-2016)



In addition to mapping the wards where adult pedestrians are involved in collisions in Liverpool, it is possible to analyse the routes where they crashed. The highest percentages of both KSI casualties and all casualties were on unclassified routes, with the A57 and A59 featuring highly for both severity levels.

Table 10 shows the number of adult pedestrians who were involved in collisions on specific routes in Liverpool. The highest percentages of both KSI casualties and all casualties were on unclassified routes, with the A57 and A59 featuring highly for both severity levels.

TABLE 10 – NUMBER OF ADULT PEDESTRIAN CASUALTIES INJURED IN LIVERPOOL BY ROUTE (2012-2016)

Route	KSI		All	
	Number	Percentage	Number	Percentage
Unclassified	179	46%	619	51%
A57	22	6%	79	7%
A59	20	5%	69	6%
A5038	14	4%	46	4%
A580	17	4%	42	3%
A5058	17	4%	36	3%
B5339	9	2%	34	3%
A562	17	4%	32	3%

The heat maps in Figure 15 and Figure 16 show where the highest densities of collisions occur in Liverpool, shown in red. The colour range goes through orange and yellow to the lowest density areas shown in blue. The overview map shows a concentration of collisions in the city centre, with collisions also occurring on the main routes of:

- A59 (particularly the junction with the A506)
- A5089 Oakfield Road with Breck Road
- A5049 West Derby Road (near the railway line)
- A57 Prescot Road junction with Derby Lane and Broad Green Road
- A57 Prescot Road junction with B5189
- A57 Prescot Road/Kensington near B5188 Sheil Road
- A57 Prescot Road near Royal Liverpool University Hospital

Figure 16 shows the concentration of adult pedestrian casualties in the city centre. The collisions stretch from east of Liverpool Lime Street Station in Lime Street, down Hanover Street to the junction with Argyle Street and in the side streets near the station (particularly Bold Street, Wood Street, Fleet Street and Renshaw Street).

Given the percentage of adult pedestrians who were injured at night-time, further maps were created to show the locations at these times of day. These are included in Appendix B – Night-time collision maps – Liverpool on page 42. Aside from the city centre, the other major night-time cluster of casualties is around the junctions of West Derby Village/Town Row with Meadow Lane and Mill Lane.

FIGURE 15 - COLLISION LOCATION OF ADULT PEDESTRIAN CASUALTIES IN LIVERPOOL (2012-2016)

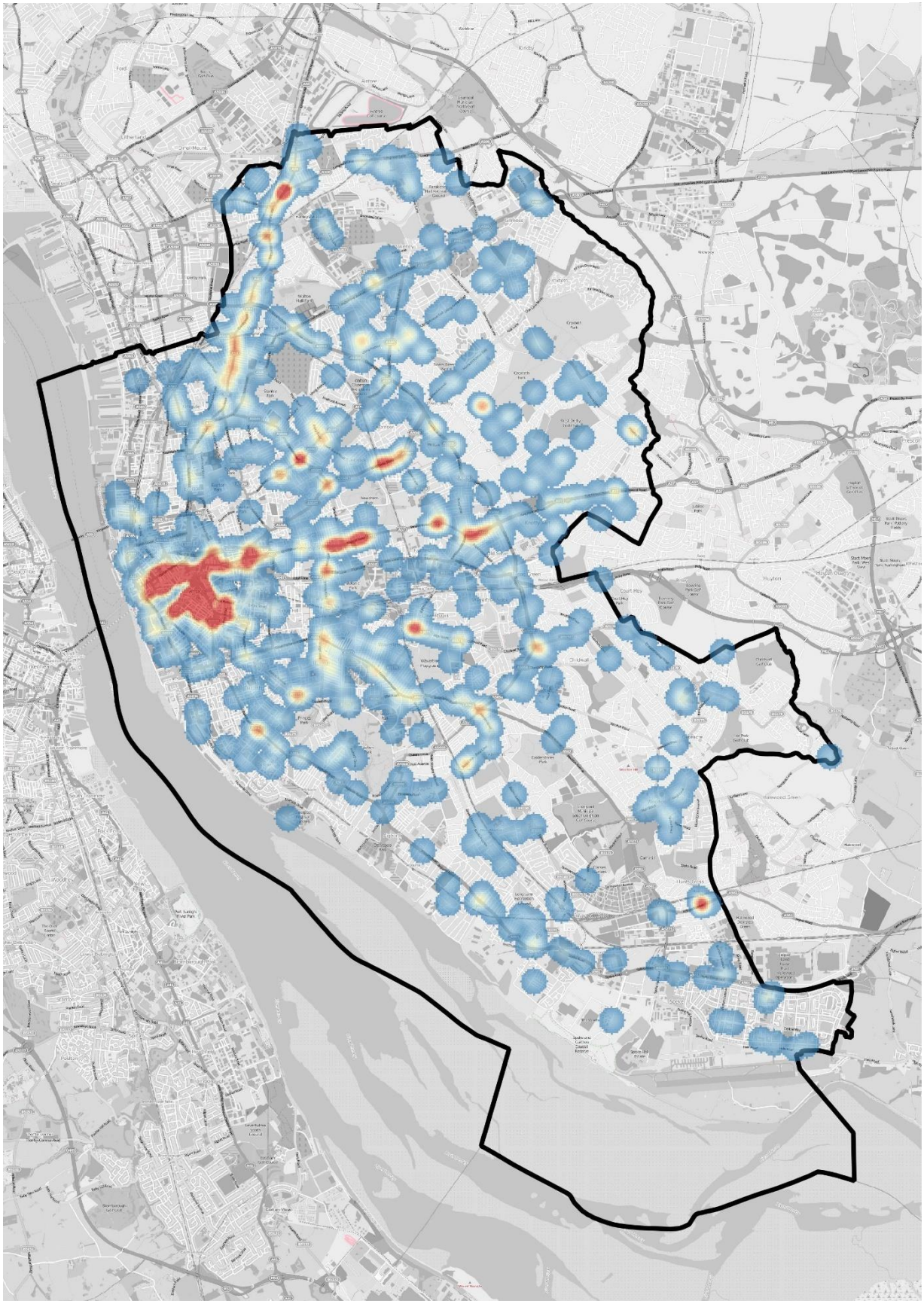
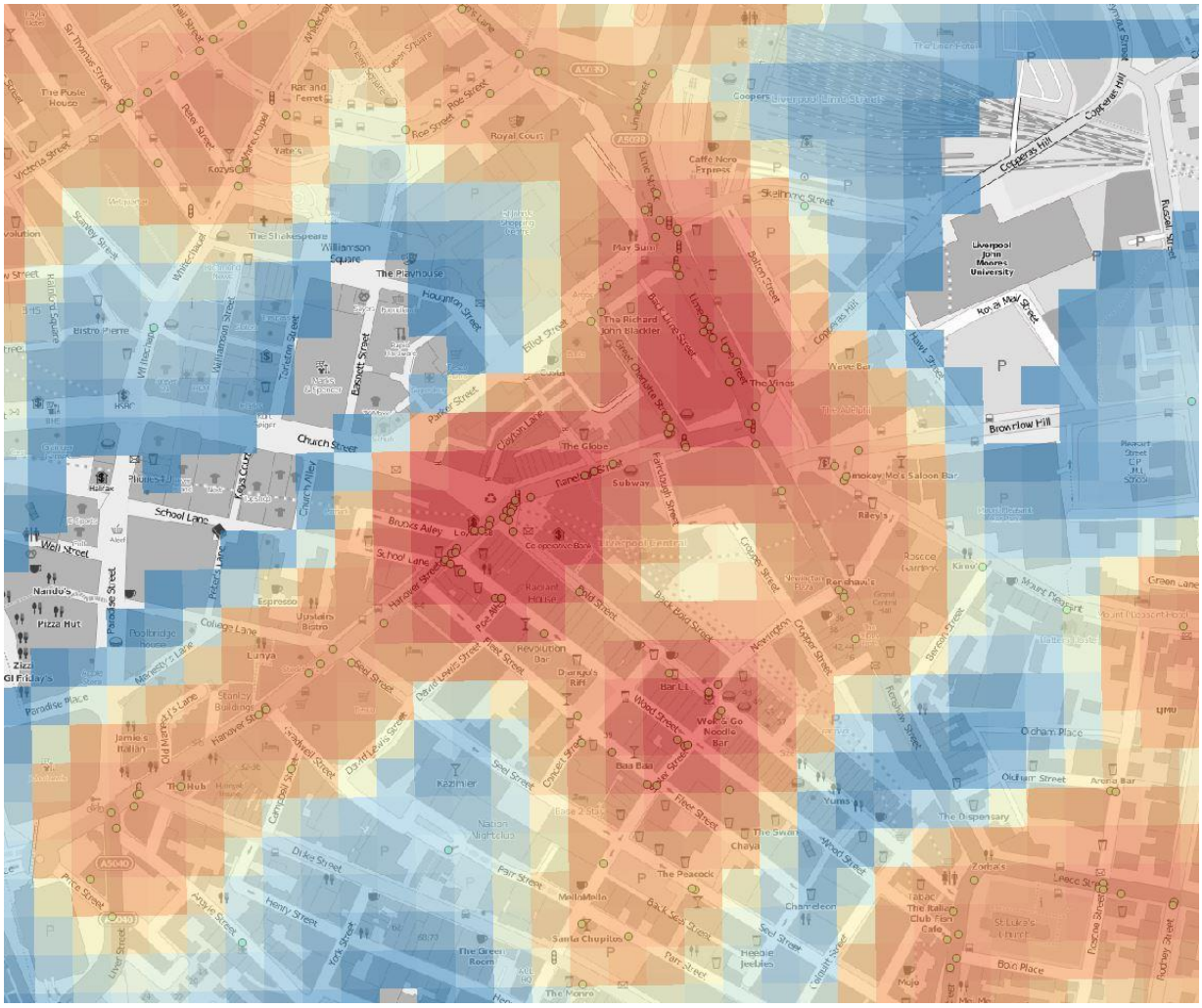


FIGURE 16 – FOCUS ON CENTRE LOCATIONS OF ADULT PEDESTRIAN CASUALTIES IN LIVERPOOL (2012-2016)



4.1.4 HOW?

After looking at when and where adult pedestrians were involved in collisions in Liverpool, the analysis now explores how these collisions occurred.

In order to understand the circumstances surrounding adult pedestrian collisions in Liverpool, it is important to look at the vehicles which hit them. Table 11 shows the percentages of adult pedestrian casualties who were hit by each vehicle type and indices comparing the similar authorities with Liverpool. It shows that 69% of the adult pedestrian casualties injured in Liverpool were hit by a car and that the majority of adult pedestrian casualties in the comparator authorities were also in conflict with car drivers. However, the percentages hit by cars were higher in the comparators (75.6% on network and 71.1% on socio-demographic comparator roads). The next largest percentage (13.8%) for Liverpool's adult pedestrian casualties were those hit by taxis – this is significantly higher than for casualties hit on similar network roads and higher than those in similar socio-demographic areas. The other major differences related to light goods vehicles, representing 5.6% of Liverpool's casualties (which was similar to the network comparators (5.5%) but higher than the socio-demographic comparators (4.7%)); and buses, representing 4.8% of Liverpool's casualties (which is higher than the network comparators (3.5%) but lower than the socio-demographic comparators (7.8%)).

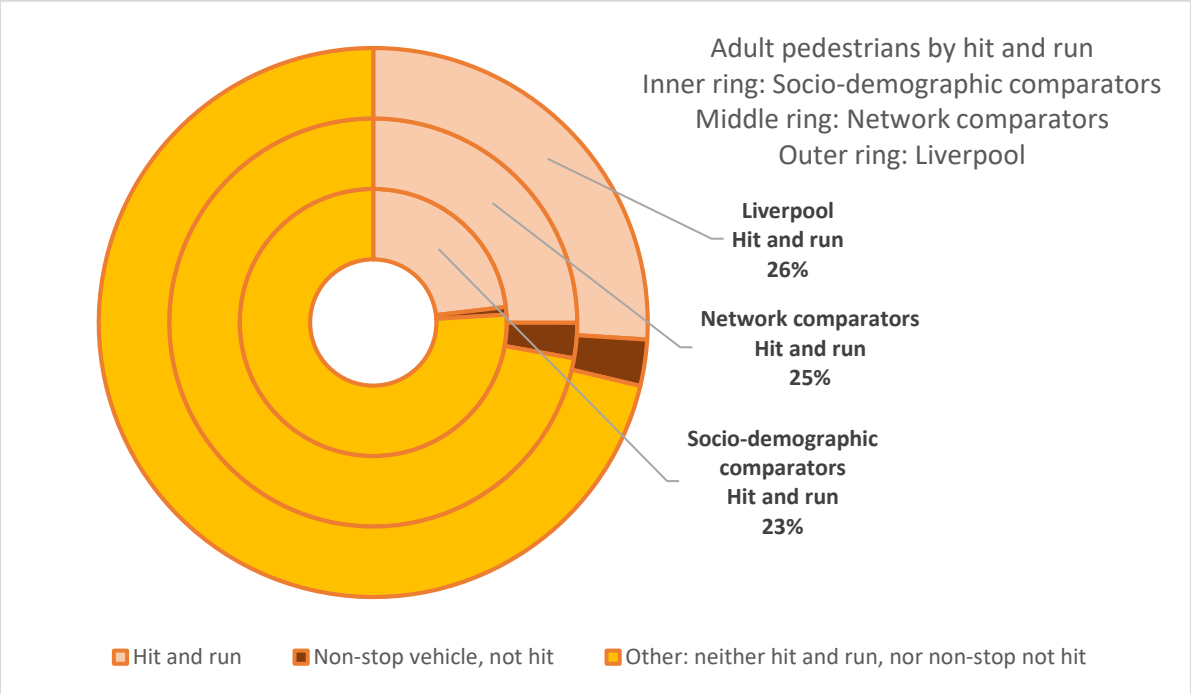
TABLE 11 - NUMBER OF ADULT PEDESTRIAN CASUALTIES BY THE RELATED VEHICLE (2012-2016)

Related Vehicle	Liverpool	Network Comparators		Socio-Demographic Comparators	
	%	%	Index	%	Index
Cars	69.2%	75.6%	-8%	71.1%	-3%
Taxi	13.8%	6.3%	+118%	9.0%	+53%
Minibus	0.4%	0.5%		0.3%	
Motorbike up to 125cc	1.6%	1.6%		1.4%	
Motorbike over 125cc	1.5%	1.0%		1.3%	
Light Goods	5.6%	5.5%	+2%	4.7%	+20%
Heavy Goods	1.8%	2.0%		1.7%	
Bus	4.8%	3.5%	+35%	7.8%	-38%
Cycle	1.0%	2.0%		0.9%	
Tractor	0.0%	0.1%		0.0%	
Other	0.2%	1.8%		1.6%	

Over 90% of the casualties were injured in collisions with only one vehicle (94% in Liverpool, 91% in network comparators and 94% in socio-demographic comparators).

Figure 17 shows the number of casualties by the hit and run status of the driver which hit them. It shows that 26% of the adult pedestrian casualties were hit by a driver who was described as 'hit and run', which is similar to the network comparators but higher than the socio-demographic comparators. In all cases, over 70% of casualties were injured by a driver who stopped.

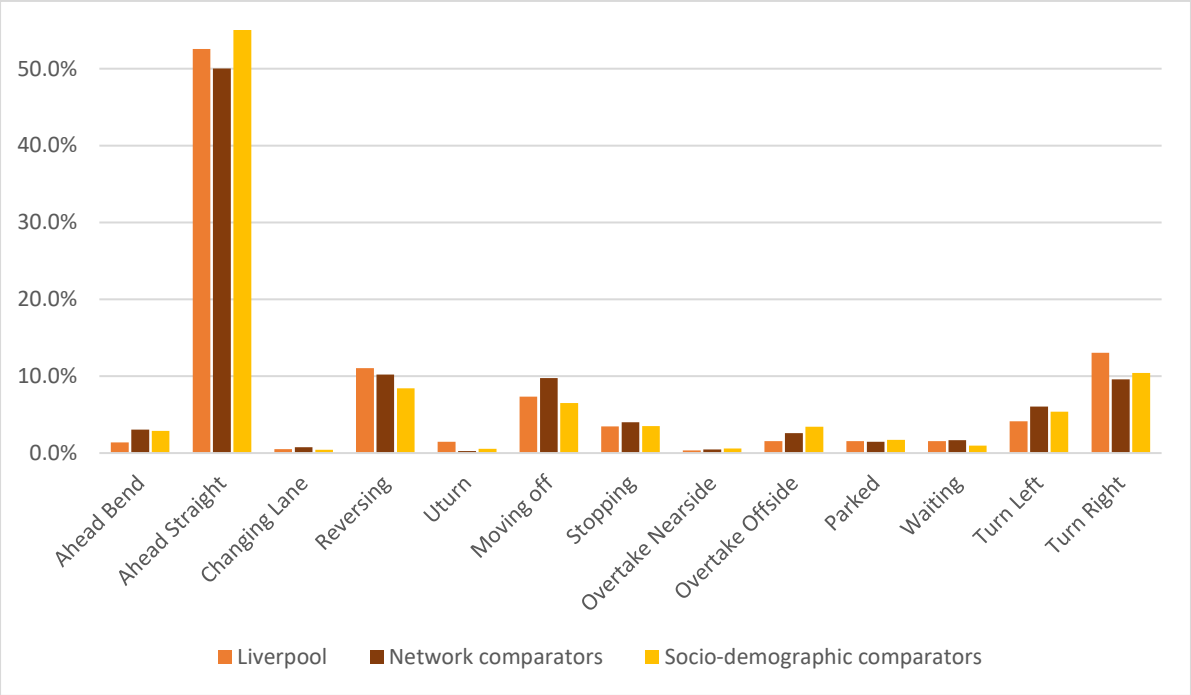
FIGURE 17 – NUMBER OF ADULT PEDESTRIAN CASUALTIES BY HIT AND RUN STATUS OF RELATED VEHICLE (2012-2016)



Looking at taxi drivers in a little more detail, 42% of the adult pedestrian casualties hit by taxis were in collisions between 9pm and 3am. Interestingly, it is reported that 23% of the casualties in Liverpool were hit by taxis which were described as 'hit and run'.

In all cases, over 90% of the casualties were in collisions where drivers were on the main carriageway at the time – 98% for Liverpool casualties; 92% for network comparator casualties and 93% for socio-demographic comparator casualties.

FIGURE 18 – RELATED VEHICLE MANOEUVRES FOR ADULT PEDESTRIAN CASUALTIES INJURED IN LIVERPOOL AND COMPARATORS (2012-2016)



The manoeuvres of the related vehicles can be analysed. Figure 18 shows that 53% of the adult pedestrian casualties in Liverpool were in conflict with a vehicle which was travelling straight ahead. This was similar to both the network comparators (50%) and the socio-demographic comparators (55%). Turning right was the next highest manoeuvre, with 13% of the casualties in Liverpool in conflict with such manoeuvring vehicles. This was higher than both sets of comparators (9.6% for network and 10.4% for socio-demographic comparators). Casualties hit by reversing vehicles were also higher in Liverpool – 11% compared to 10% on similar network roads and 8% in similar socio-demographic comparator areas.

It is possible to analyse the contributory factors (CFs) recorded by a police officer when completing the collision records. The following analysis only looks at collisions investigated at the scene by an officer and even then, it needs to be remembered that these factors reflect the officer's opinion at the time of reporting and might not be the result of extensive investigation. Analysis has been undertaken on adult pedestrian casualties by the CFs assigned to them and also by the CFs assigned to the related driver (using data from MAST Professional). Pedestrian casualties in similar areas have also been analysed to provide a comparison.

Table 12 shows the proportions of pedestrian casualties and drivers of the related vehicle in Liverpool and comparator authorities who were assigned any contributory factor. It shows that almost three-quarters of adult pedestrian casualties in Liverpool and the socio-demographic comparator authorities were thought to have contributed to their collision in some way. The

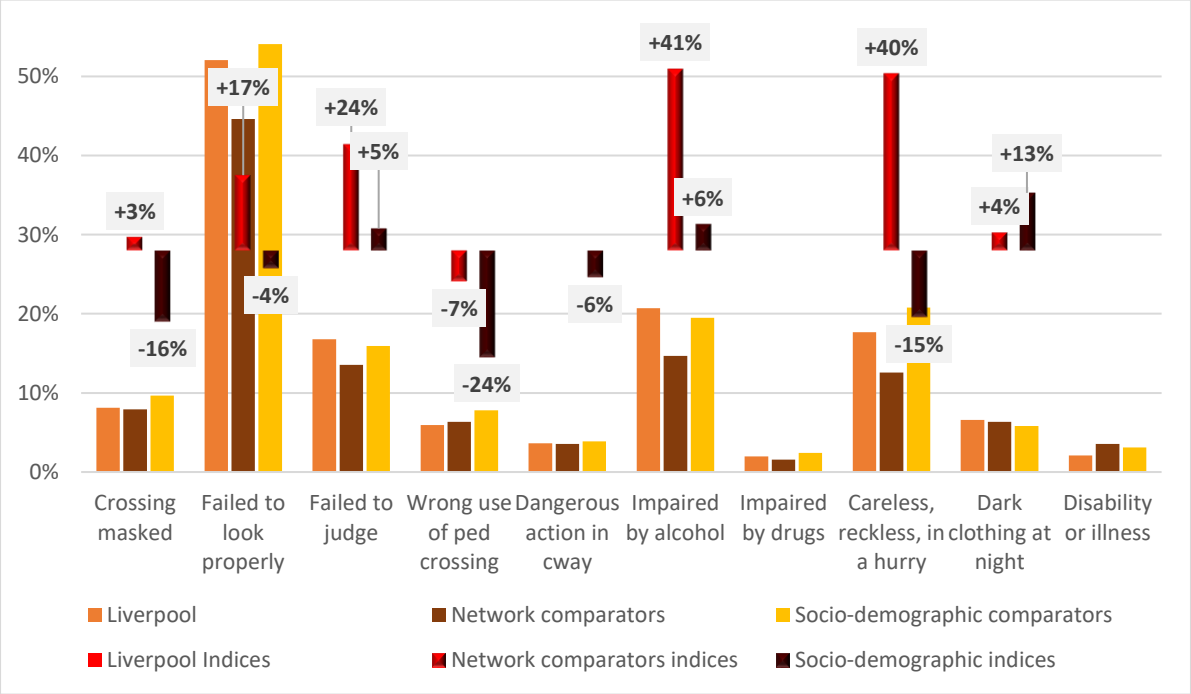
percentage of contributing casualties is slightly lower in network comparators. It shows that generally, about 49% of casualties were hit by drivers where the drivers were thought to have contributed to the collision in some way and were assigned at least one contributory factor. This percentage is lower than the percentages for both sets of comparators.

TABLE 12 – PROPORTION OF ADULT PEDESTRIAN CASUALTIES AND RELATED DRIVERS ASSIGNED ANY CF (2012-2016)

	Pedestrian Casualties	Related Drivers
Liverpool – Assigned Any CF	71%	49%
Network Comparators– Assigned Any CF	68%	56%
Socio-Demographic Comparators– Assigned Any CF	74%	54%

Within the set of contributory factors available to police officers, there are 10 which specifically relate to the actions of pedestrians. Participants can be assigned more than one CF, which is why the percentages do not add up to 100. Figure 19 shows these contributory factors assigned to adult pedestrian casualties. In Liverpool, 52% of the adult pedestrian casualties were thought to have 'failed to look properly', which is higher than casualties in the network comparator authorities but slightly lower than in the socio-demographic comparator areas. It is thought that 21% of the adult pedestrian casualties in Liverpool were 'impaired by alcohol' and this is significantly higher than the network comparators and slightly higher than the socio-demographic comparators. 'Careless, reckless or in a hurry' was assigned to 18% of the Liverpool adult pedestrian casualties, which again is higher than the network comparators but lower than the socio-demographic comparators. Lastly, 17% of the Liverpool adult pedestrian casualties were believed to have 'failed to judge the vehicle's path or speed', which was higher than both the network and socio-demographic comparator authorities.

FIGURE 19 – CONTRIBUTORY FACTORS ASSIGNED TO ADULT PEDESTRIAN CASUALTIES WERE INJURED IN LIVERPOOL AND COMPARATORS, WITH INDICES FOR COMPARATORS (2012-2016)



From the contributory factor analysis, it suggests that the behaviour of the Liverpool adult pedestrian casualties is more similar to those in socio-demographic comparators than the network comparators. Whilst unsurprising, it is useful to note the differences in behaviour.

FIGURE 20 – PERCENTAGES OF ADULT PEDESTRIAN CASUALTIES BY THE CONTRIBUTORY FACTORS ASSIGNED TO RELATED DRIVERS IN LIVERPOOL AND COMPARATORS (2012-2016)

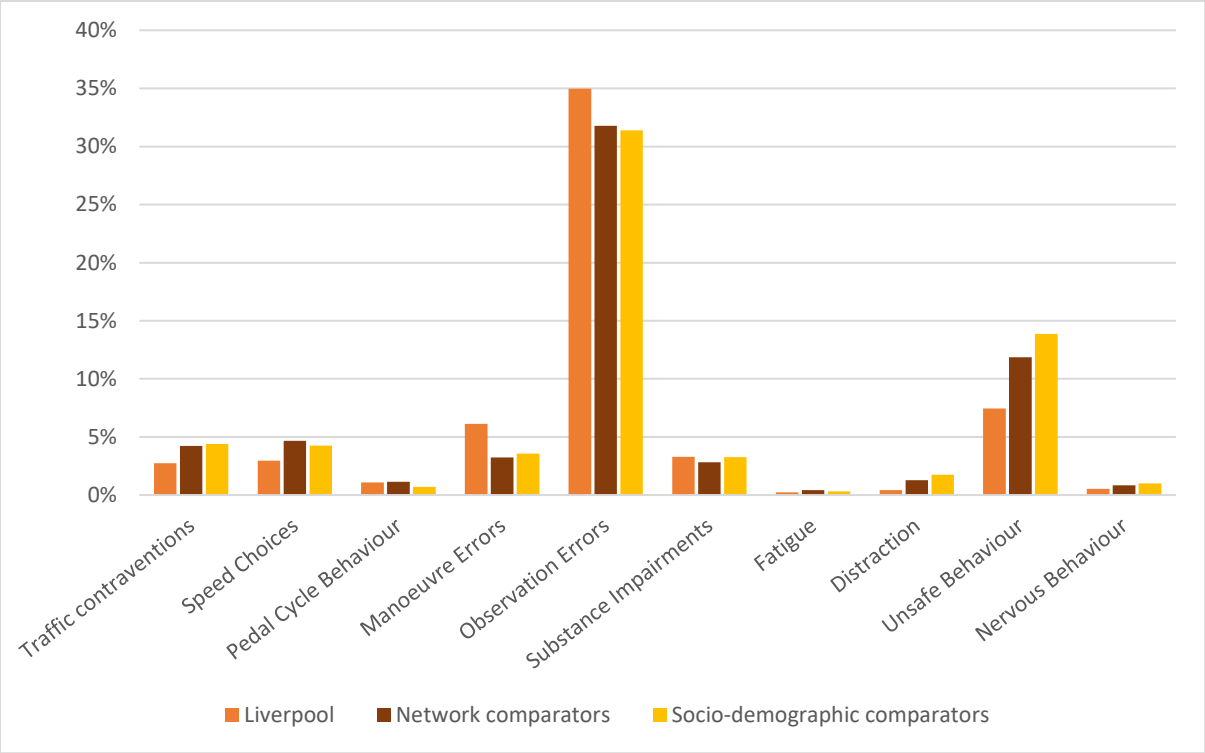


Figure 20 shows the percentages of casualties by the contributory factor of the related driver (i.e. the driver which hit them). The focus is on the percentages of casualties to ensure that the contributory factors of only the vehicle which struck them are included, otherwise other vehicles involved in the collision would also have to be examined.

It shows that for adult pedestrian casualties in Liverpool and in both sets of comparators, between 30 and 35% were hit by a driver who was thought to have committed 'observation errors' ('failed to look properly' or 'failed to judge other person's path or speed) and this is higher in Liverpool than both the network authorities and the socio-demographic comparators. Other contributory factor groups to note are: 'unsafe behaviours' ('aggressive driving' or 'careless, reckless, in a hurry) where 7% of casualties were hit by drivers thought to have contributed in these ways and this was lower in Liverpool than the comparators; and 'manoeuvre errors' ('poor turn or manoeuvre') where 6% of casualties were hit by drivers who were thought to have done this and this was higher in Liverpool than the comparators. Three percent of the adult pedestrians in Liverpool were hit by drivers who were thought to have been impaired at the time through drink or drugs and this was similar to the socio-demographic comparators but higher than the network comparators. 'Speed choice' and 'traffic contraventions' were lower in Liverpool than the comparators.

The number of adult pedestrians injured by taxi drivers is overall low (despite representing 14% of all adult pedestrian casualties) so the contributory factor analysis is limited. One third of the adult pedestrian casualties hit by taxi drivers were in collisions where the taxi driver had 'observation

errors' assigned. Six percent of the casualties were hit by taxi drivers who were engaged in 'unsafe behaviour' (aggressive or careless); 6% where there were 'traffic contraventions'; and 4% where there were 'manoeuvre errors'.

It should be remembered that the contributory factors are assigned at the time of the collision and are not the result of extensive investigation.

4.2 PEDESTRIAN AND RELATED DRIVER PROFILES

Moving away from the 'when, where and how' questions, we can now explore the 'who' question. It is essential to understand more about the people involved in the collisions, including information about their everyday lives, as well as demographics.

The ages of adult pedestrian casualties injured in collisions in Liverpool are shown in Figure 21. There was a peak in casualties aged 16 to 24 years old (26%) and this was slightly higher than amongst casualties in network comparators but lower than those in socio-demographic comparators. Overall, 55% were aged between 16 and 44 years old in Liverpool.

FIGURE 21 – AGE OF ADULT PEDESTRIAN CASUALTIES INJURED IN LIVERPOOL AND COMPARATORS (2012-2016)

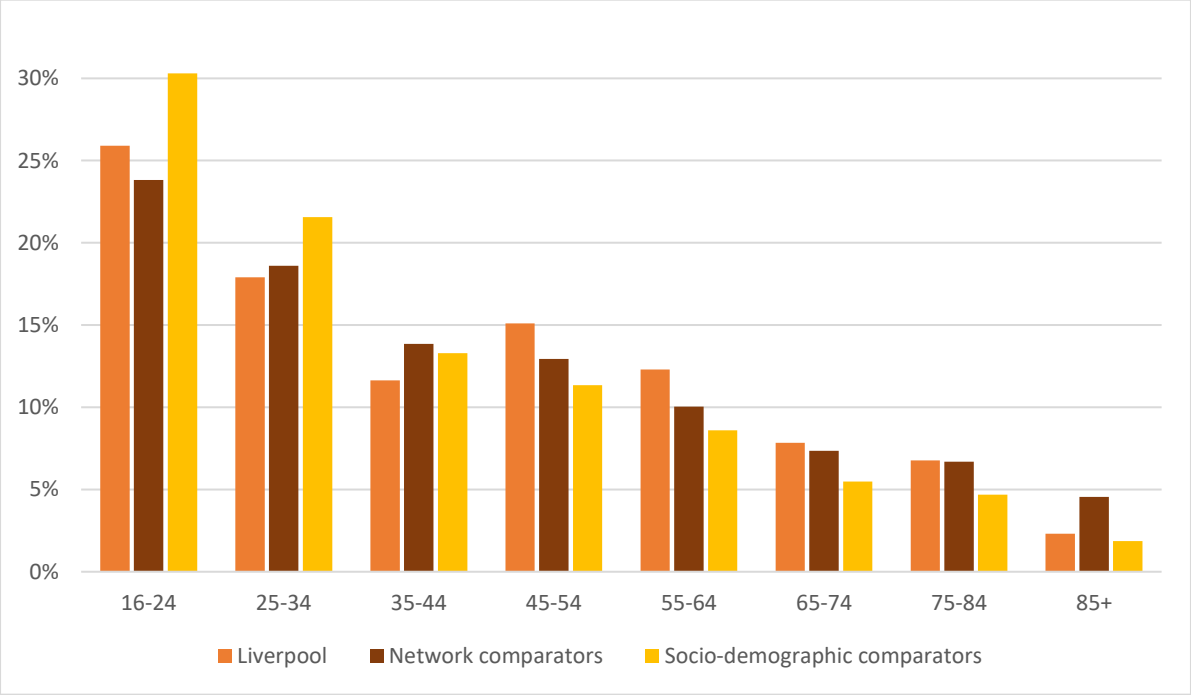
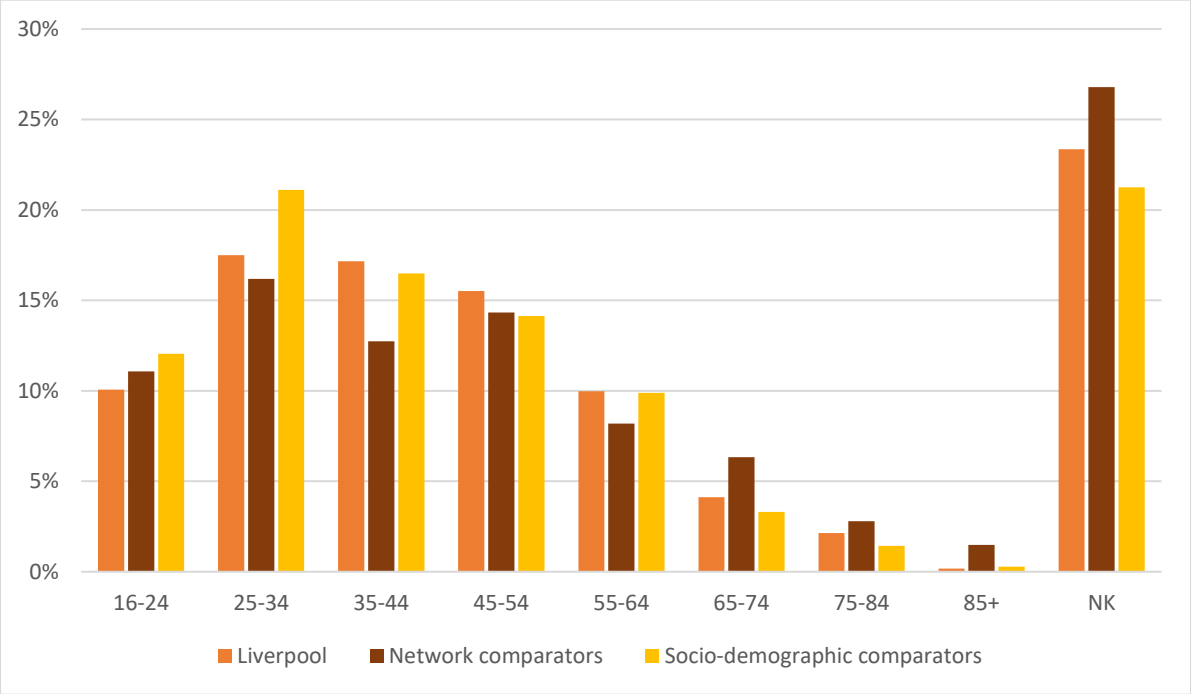


Figure 22 shows the number of adult pedestrian casualties by the age of the related driver. It shows that for all areas, about a quarter of the ages are unknown (reflecting the 'hit and run' analysis on page 26). For network comparators, there appears to be more casualties injured by older drivers (65 years and over) whereas the socio-demographic comparators have more casualties injured by drivers aged less than 35 years. For Liverpool's adult pedestrian casualties, 50% of them were in conflict with drivers aged between 25 and 54 years.

FIGURE 22 – NUMBER OF ADULT PEDESTRIAN CASUALTIES BY THE RELATED DRIVER AGE (2012-2016)

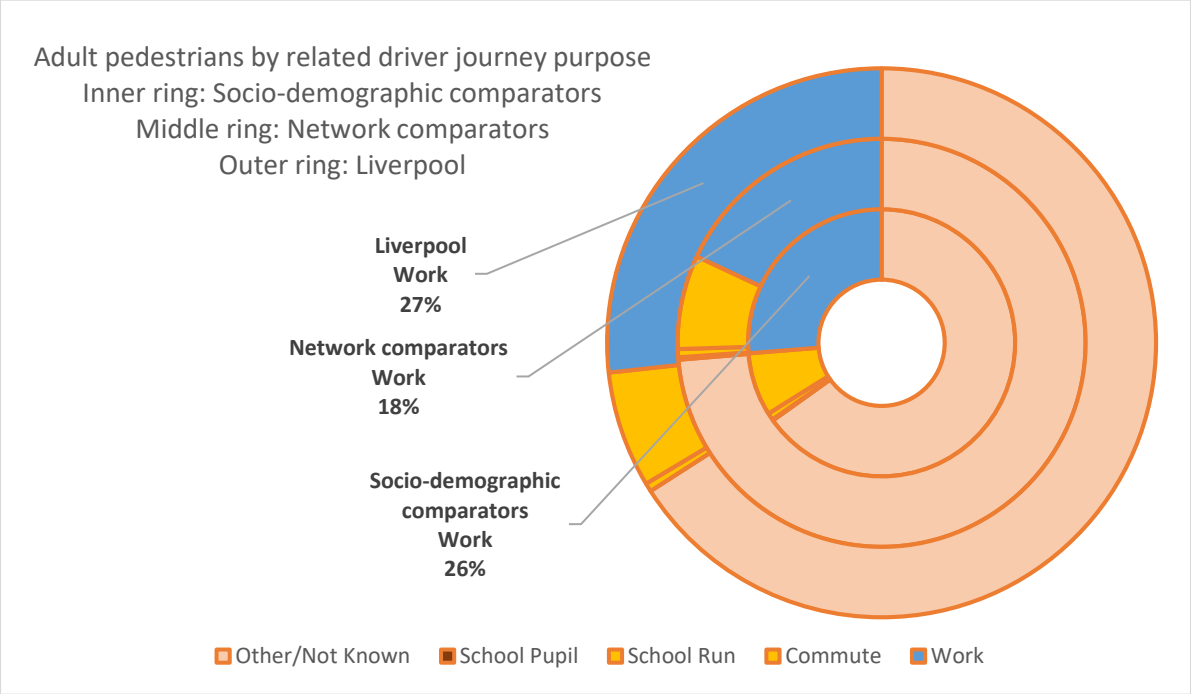


Over half (59%) of the adult pedestrian casualties injured in Liverpool were male. This is higher than casualties in the network comparators, where there is a more even split (53% male) but similar to the pedestrians injured in similar socio-demographic areas (58%).

With the related drivers, 65% of the casualties were in conflict with male drivers (19% female and 16% gender unknown). This is similar to both sets of comparator authorities, with 63% male, 21% female and 16% gender unknown in similar network authorities, and 63% male, 20% female and 18% gender unknown in similar socio-demographic areas.

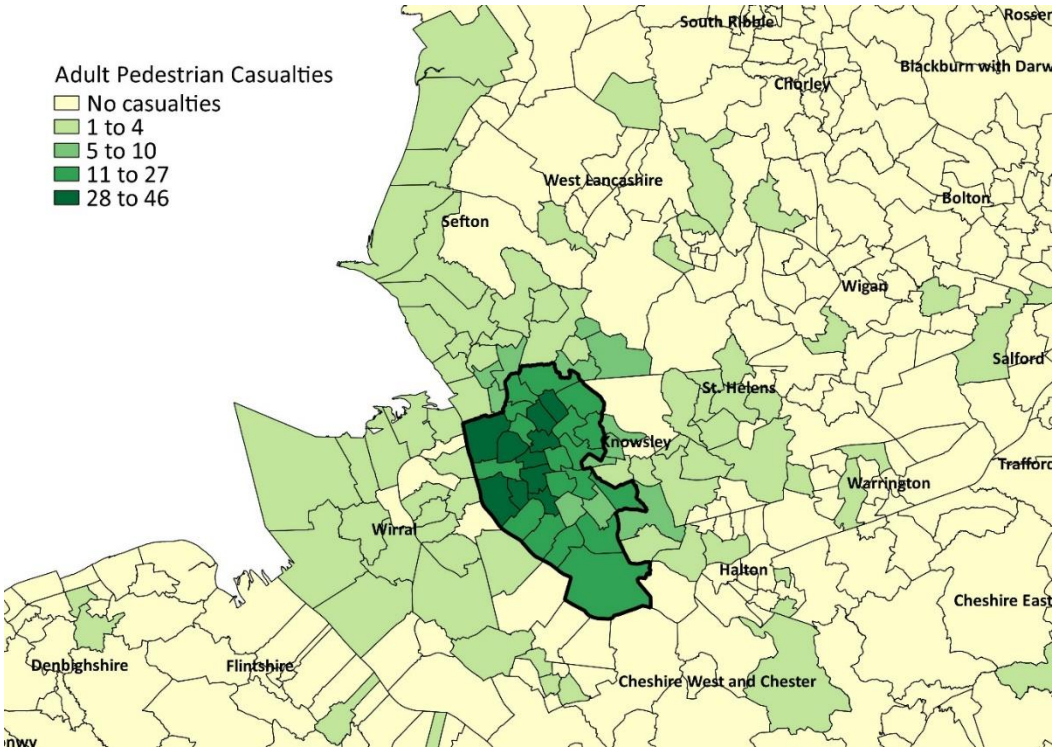
Journey purpose can be used to gain an idea of what the related drivers were doing at the time of their collision with adult pedestrians. There are three types of journey purpose recorded in STATS19: 'school related', where a 'school pupil' is riding to school or college and 'school run' where a pupil is being taken to school; 'work related', separated into 'commute' and 'work' where the latter is a journey undertaken for work purposes; and 'other' includes all other activities (shopping, leisure purposes, driving/riding for fun) but also includes where journey purpose is not known. It is not possible to tell the proportions of 'not knowns' included in 'other', compared to known journey purposes which were not school or work-related. This should be borne in mind when using the journey purpose field.

FIGURE 23 – NUMBER OF ADULT PEDESTRIAN CASUALTIES BY JOURNEY PURPOSE OF RELATED VEHICLE (2012-2016)



Analysis of the journey purposes of the related drivers of adult pedestrian casualties is shown in Figure 23. Just over a quarter of the casualties were in conflict with a related driver who was driving for work (not commuting) and this supports the vehicle type analysis, where 26% were driving vehicles often used for work purposes (taxis, goods vehicles and buses). The percentage of casualties injured by a driver driving for work is higher in Liverpool than casualties in the similar network comparators but similar to the socio-demographic comparators.

FIGURE 24 - HOME LOCATION OF ADULT PEDESTRIAN CASUALTIES WHO WERE INJURED IN LIVERPOOL (WARDS) (2012-2016)



The home locations of adult pedestrian casualties injured in Liverpool have been analysed. These are shown in Figure 24.

For adult pedestrian casualties injured in Liverpool, there are concentrations of residents from the wards of Kirkdale, Everton, Clubmoor, Norris Green, Tuebrook and Stoneycroft, Kensington and Fairfield, Riverside, Princes Park, Picton and Greenbank. There are small numbers of casualties from wards in neighbouring authorities.

Of the adult pedestrian casualties injured in Liverpool and where home postcode was recorded, 77% were from Liverpool. This is a lower percentage than for those in the network comparator authorities, where 81% were local to the authority in which the collision occurred but it is similar to the socio-demographic comparators, where 78% were local.

Looking at the residency of the related drivers, 65% of the adult pedestrian casualties in Liverpool were in conflict with a driver from Liverpool. For the comparators, 68% of the casualties on similar network roads were injured by a local driver, as were 67% of those in similar socio-demographic areas.

4.3 MOSAIC ANALYSIS

As well as demographic and spatial analysis of adult pedestrians, we can also undertake socio-demographic analysis using Mosaic. Mosaic is intended to provide an accurate and comprehensive view of citizens and their needs by describing them in terms of demographics, lifestyle, culture and behaviour. By matching postcodes, we can segment pedestrians into one of **15** *groups* and analyse their relative representation in the statistics based on population figures.

Figure 25 shows Liverpool *resident* adult pedestrian casualties *injured* in Liverpool, grouped by Mosaic Group of the community in which they live. This sub-set of adult pedestrians therefore focuses on the three-quarters of *local* casualties injured on *local* roads. The reason for this focus is two-fold: firstly, in order to understand who the local adult pedestrian casualties are, as these will be a key target audience; and secondly, MAST Online uses the Mosaic composition of the local population as a base, so if there is a large number of people in Liverpool who live in one particular Mosaic Group, this will be accounted for when determining the over-representation as adult pedestrian casualties.

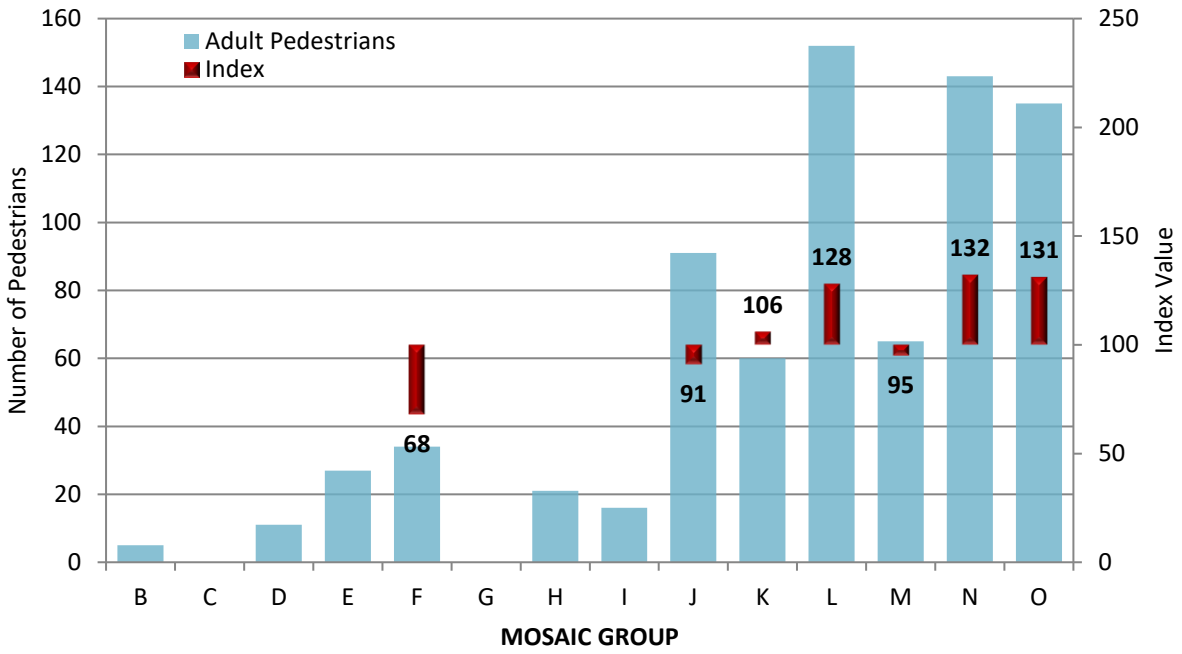
Mosaic classification is based on the individual postcodes provided in STATS 19 records for each casualty and uses the Experian Mosaic socio-demographic classification system[6]. Typically, 85% of postcodes can be matched to a Mosaic Type, so this analysis is based on about five out of six of all Liverpool resident pedestrian casualties.

The blue bars indicate the number of adult pedestrians in each Mosaic Group, with figures corresponding to the left hand vertical axis. The red bars show the “Index” for each Mosaic Group. An Index value of 100 indicates that the number of pedestrians is in proportion to the population of Liverpool’s communities where that Group predominates. A value of 200 would mean that this Group is involved in collisions at twice the expected rate; a value of 50 would imply half the expected rate. Displaying the data overlaid on a single chart allows quick and easy analysis of total

[6] for details see http://www.experian.co.uk/public-sector

pedestrians and relative risk. The Index value becomes less significant as the number of pedestrians decreases and random change lowers confidence levels.

FIGURE 25 – ADULT PEDESTRIANS FROM LIVERPOOL INJURED IN LIVERPOOL, GROUPED BY MOSAIC GROUP (2012-2016)



When carrying out Mosaic analysis the approach is to look for both levels of high representation and high index scores in individual Groups. Index values are not calculated for Groups which contain 30 or fewer pedestrians as the number is too low to be meaningfully interpreted. The highest numbers of pedestrians are from *Single people privately renting low cost homes for the short term* (Group L) and this Group is over-represented based on their population within Liverpool. *Elderly people reliant on support to meet financial or practical needs* (Group N) and *Urban renters of social housing facing an array of challenges* (Group O) both represent high numbers of casualties and are also over-represented compared to the local population of Liverpool.

Figure 26 shows the number of adult pedestrians injured in Liverpool by the Mosaic Group of the related driver. As the related drivers can live anywhere, it is not possible to create population-based indices. The highest numbers of casualties are injured by drivers from *Single people privately renting low cost homes for the short term* (Group L) and *Urban renters of social housing facing an array of challenges* (Group O). It suggests that the related drivers are from similar backgrounds to the pedestrian casualties.

FIGURE 26 – ADULT PEDESTRIANS INJURED IN LIVERPOOL BY THE MOSAIC GROUP OF THE RELATED DRIVER (2012-2016)

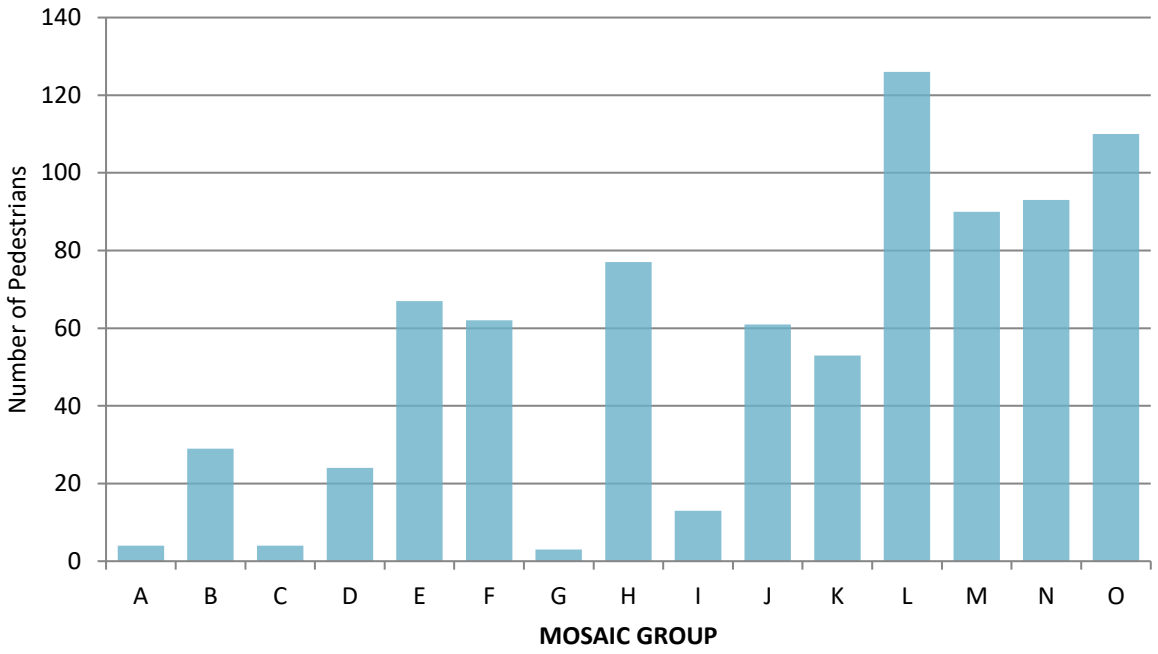


Table 13 summarises some of the main characteristics of Mosaic Groups which are over-represented amongst adult pedestrian casualties from Liverpool who are injured in Liverpool. The table shows which characteristics the Groups have, indicated by a tick where the characteristic is over-represented. It shows that there are some variations and similarities between the three Groups. Groups L and O represent the younger age groups, whereas Group N has older residents (17% of adult pedestrian casualties in Liverpool are over 65 years old). All Groups tend to comprise of single households with no children, but Groups L and O tend to be house sharers whereas Group N residents tend to live alone. All three Groups tend to be deprived and are benefit claimants. Group L residents are a combination of employed, unemployed and students whilst Group N are retired, and Group O are unemployed or students. They tend to shop at the same supermarkets of Iceland and Netto. None of these Groups tend to own their own transport (hence being pedestrians) and all report feeling very unsafe walking at night alone. They have low confidence in the local police and believe that anti-social behaviour is a problem in their area. Only Group L residents believe that speeding traffic is a problem. Residents from all three Groups tend to have low levels of education and have poor health – they tend to be smokers and Group N residents drink alcohol daily.

In terms of communication preferences, there are differences between the three Groups. They all use Facebook regularly with Group L and O residents preferring mobile phone communications with Group N preferring landline or post.

TABLE 13 - CHARACTERISTICS OF MOSAIC GROUPS OVER-REPRESENTED AMONGST ADULT PEDESTRIANS

	Group L – 'Transient Renters'	Group N – 'Vintage Value'	Group O – 'Municipal Challenge'
Aged 16-24	✓	×	×
Aged 25-34	✓	×	✓
Single households	✓	✓	✓
No children	✓	✓	✓
Home-sharers	✓	×	✓
Deprived	✓	✓	✓
Employed	✓	×	×
Student/Unemployed	✓	×	✓
Benefit claimants	✓	✓	✓
No transport owned	✓	✓	✓
Shop at Iceland or Netto	✓	✓	✓
Feel very unsafe walking at night	✓	✓	✓
Low confidence in local police	✓	✓	✓
Believe speeding traffic is problem	✓	×	×
Believe anti-social behaviour is problem	✓	✓	✓
No qualifications	✓	✓	✓
Bad or very bad health	✓	✓	✓
Smokers	✓	✓	✓
Drink alcohol once a month	✓	×	×
Drink alcohol once a day or more	×	-	-
Communication Preferences (of adults within the home)			
Mobile call	✓	-	✓
SMS	✓	×	×
Email	-	×	
Post	×	✓	✓
Landline	×	✓	✓
Prefer not to be contacted	-	✓	×
Like new technology	✓	×	✓
Use Facebook weekly	✓	✓	✓
Use Twitter weekly	✓	×	✓

The Mosaic profiling suggests that there are some differences between adult pedestrian casualties from Liverpool who are injured in Liverpool but there are also several similarities which can help create a cohesive intervention plan. The STATS19 and Mosaic analysis were used to create 'personas' in the synthesis part of this project.

The following maps in Figure 27 show the Lower Layer Super Output Areas (LSOAs)[7] where Groups L, N and O are the dominant Group. With Group L, there are concentrations of residents living in centre-north of Liverpool whilst Group N communities tend to reside in the north and on the borders. Group O communities dominate in the East and in the north and south of Liverpool.

[7] For further information about super output areas, refer to http://neighbourhood.statistics.gov.uk/dissemination/

FIGURE 27 – AREAS OF RESIDENCE FOR OVER-REPRESENTED MOSAIC GROUPS

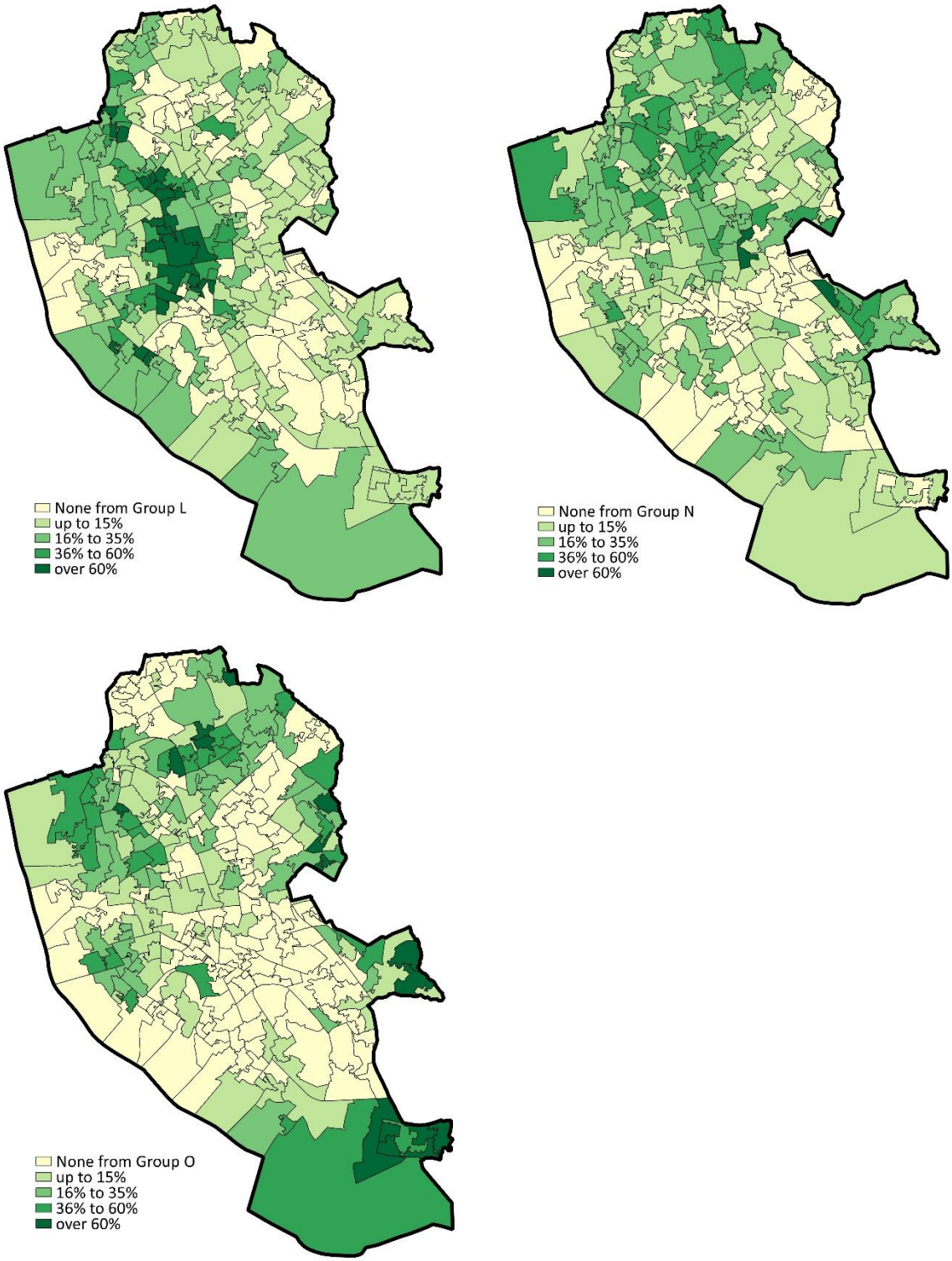


Table 14 provides a summary of some main characteristics of the over-represented Groups and these can be used to create a picture of the target audience in terms of economic and educational position; and family life. This information is invaluable for understanding target audiences and knowing how to communicate with them.

TABLE 14 - SUMMARY OF CHARACTERISTICS OF OVER-REPRESENTED MOSAIC GROUPS[8]

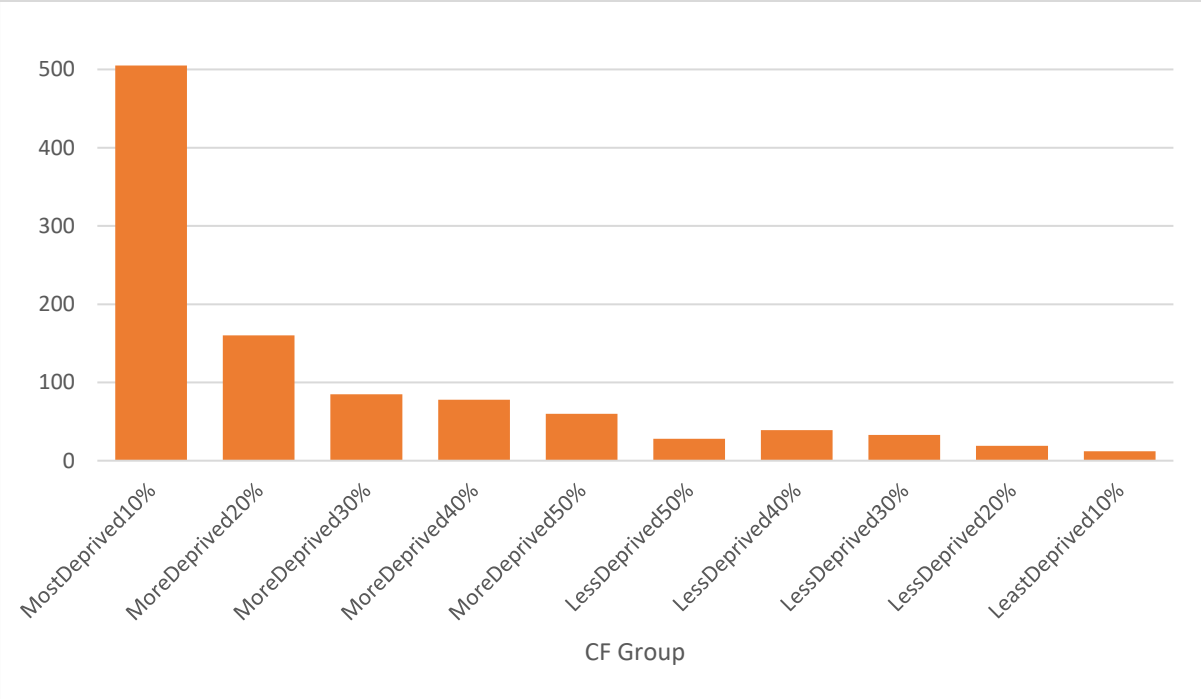
Group L Transient Renters	Group N Vintage Value	Group O Municipal Challenge
Households in this group are typically aged in their 20s and 30s and are either living alone or home-sharing. Very few people are married and there are few children. Properties are often older terraced properties, primarily rented from private landlords with a few social landlords. They include some of the lowest value house of all, and with tenants moving on quickly and paying low rents, private landlords are often not inclined to invest in improvements. Many work full-time, however their lower skilled jobs mean that incomes for Transient Renters are often limited. Others may be trying to improve their situation by studying for additional qualifications. This group are the most reliant on their mobile phones, saying they couldn't manage without them. They are the most prolific texters, and frequently check social networks and download music. They have the lowest use of landlines. Levels of poor health are higher than average, and this group contains the highest proportion of people who smoke. They enjoy a drink, although they are by no means the most regular drinkers.	Vintage Value consists of pensioners with an average age of 74, and most are now living alone. Women outnumber men because of their longer life expectancy. Some still live in homes they have rented from the council for many years, while others have moved, more recently, into specialised accommodation or small housing developments as their independence has decreased. Typically, people in Vintage Value live in small houses and flats, frequently with one or two bedrooms. While the majority are long-term social renters, a third are owner occupiers – a mix of people who have purchased flats and others who exercised their right to buy their home from the council. Before they retired Vintage Value often worked in skilled manual occupations or routine jobs. The majority are now dependent on state pensions, only a few have additional income from an occupational pension. As a result, incomes are generally very low, but they spend money carefully to keep within their budgets. Take up of technology from mobile phones to internet services, is very low and they prefer traditional methods of communications such as post and landline calls. They often watch many hours of television in a week and enjoy listening to local radio.	People in Municipal Challenge are typically of working age. There are some families with children, but most are singles. Many have been renting their flats for a number of years. These are often multi-storey or high-rise blocks built from the 1960s onwards. Those in houses on estates have been settled there for a long time. These neighbourhoods suffer from high levels of unemployment, and incomes can be particularly low. Those in work tend to be in manual or low-level service jobs. People are the most likely to be finding it difficult to cope on their incomes and they often receive benefits. Municipal Challenge contains the highest proportion of people without a current account. They have a low take up of financial products but may use short term finance occasionally. Given their income and urban location, car ownership is very low. Generally, ownership of technology is not high, but mobile phones are important and are the preferred means of contact. On average they spend more time watching television than they do on the internet and they prefer making purchases in local shops than buying online.

[8] www.segmentationportal.com

4.4 INDEX OF MULTIPLE DEPRIVATION (IMD)

As well as looking at the Mosaic socio-demographic classifications, it also possible to look at relative wealth using the UK IMD values for each postcode. The Index of Multiple Deprivation[9] uses a range of economic, social and housing data to create a single deprivation score for each small area of the country. The analysis (Figure 28) uses deciles, which creates ten groups of equal frequency across Britain, ranging from the 10% most deprived areas to the 10% least deprived areas.

FIGURE 28 – IMD OF ADULT PEDESTRIAN CASUALTIES INJURED IN LIVERPOOL (2012-2016)



Half of the adult pedestrian casualties injured in Liverpool live in the 10% most deprived communities in the country. There are fewer numbers of pedestrians from the less deprived communities. It should be remembered that the indices of multiple deprivation include income, employment, health, education, crime, access to services, and living environment: they are not merely about relative wealth.

4.4.1 OTHER LIVERPOOL DEMOGRAPHICS

Mosaic and IMD analysis provide a picture of the types of people from and in Liverpool who are involved in collisions as pedestrians. It is also useful to put these findings in context with some more general information about Liverpool. A demographic bulletin from January 2017 brings together resident data to provide an insight into the local population.[10] Whilst it is not possible to definitively state that the residents from Liverpool who are involved in collisions as pedestrians share the backgrounds described in the study, it is useful information to understand the challenges which will be faced in creating adult pedestrian safety interventions in Liverpool.

- *Liverpool has a resident population of 478,600 (as at mid-year 2015)*

[9] For more information, see https://data.gov.uk/dataset/index-of-multiple-deprivation
[10] http://liverpool.gov.uk/council/key-statistics-and-data/

- *Liverpool has a younger population, with 40% of residents aged between 16 and 39 years old compared with 31% in the North West and 31% in England.*
- *Liverpool has a smaller older population (65 or older) at 15%, compared with 18% in the North West and 18% in England.*
- *The local population is predicted to increase by 4.8% by 2024 (compared to a 7.5% increase in England).*
- *Compared to other core English cities (two of which are included as socio-demographic comparators in the STATS19 analysis), Liverpool has the lowest projected population increase*
- *The 85+ age group is predicted to grow the fastest (27%) and the 15-24 group the slowest (-11%).*
- *Liverpool is not particularly ethnically diverse with 86% of residents belonging to White British and Irish groups (compared to 81.5% in England and Wales). Of the whole population, 2.6% are of Black ethnicity compared to 3.3% in England and Wales. Four per cent of the population are of Asian ethnicity.*
- *Liverpool is the 4th most deprived local authority in England (out of 326) on IMD 2015 but is no longer England's most deprived local authority (it was ranked 1st in IMD 2004, 2007 and 2010).*
- *43.4% of Liverpool residents live in the most 10% deprived LSOAs in England.*
- *In August 2016, 14.2% of working age residents in Liverpool were benefit claimants (Job Seekers Age, Incapacity Benefit, Lone Parent and other income relate benefit), compared to 1.3% in the North West and 8.6% in Great Britain.*
- *In 2015, 13.6% of working age residents in Liverpool had no qualifications, compared to 9.8% in the North West and 8.6% in Great Britain.*

There are a number of challenges that emerge from the socio-demographic analysis of Liverpool for designers of road safety interventions. The deprivation levels are high, with high numbers of benefit claimants and low qualifications. It is likely that residents face a number of daily challenges and worrying about their safety as pedestrians is unlikely to rank highly amongst them. The language used in any intervention should reflect their education levels. Calls to action which require them to invest their own limited funds are unlikely to be successful.

The age composition of Liverpool, with a high proportion of younger residents, is reflected in the pedestrian figures.

5.0 CONCLUSION

The analysis of STATS19, incorporating socio-demographic data and making comparisons with other authorities with which Liverpool shares either network or population-based characteristics, has provided insight into trends related to adult pedestrians. However, to gain a true understanding, the findings should be investigated further 'on the ground'. These further investigations ensure that the collision analysis is not undertaken in isolation and that there is an understanding of why the issues highlighted in the data are occurring.

The detailed collision analysis revealed there were three key themes which were worthy of further investigation. These are:

- Adult pedestrians are involved in collision on arterial routes in Liverpool, especially on dual carriageways
- Adult pedestrians are involved in collisions in Liverpool in locations associated with the night time economy and that taxis are a particular feature at night time
- Mobile phone use, both pedestrians and drivers, could be a factor in adult pedestrian collisions in Liverpool. The collision analysis did not reveal this theme specifically. This could be due to limitations in the data – there are no pedestrian contributory factors which directly refer to pedestrian distraction due to mobile phone use. Whilst there is a contributory factor 'Driver using mobile phone', this is not commonly assigned as investigations to prove mobile phone use by a driver are often not undertaken unless the collision resulted in fatal injuries. As contributory factors in STATS19 are selected at the time of reporting and are not the result of extensive investigation, mobile phone use may not always be reported where it was a factor.
  Despite this, it was decided to include mobile phone use of both drivers and pedestrians as a theme as it is increasingly viewed nationally as a new and significant threat to adult pedestrian safety.

With the identification of the three themes, further primary and secondary evidence was gathered and collated to understand these issues in Liverpool. The findings of these investigations are set out in further reports.

5.1 FURTHER READING

Following this report, a suite of documents was produced which draw out key findings for decisions makers.

Executive data report

The first in the series of documents, this provides key data findings from phase 1 research.

Executive Insight report

The second in the series of documents, this outlines the process that So-Mo undertook in order to begin answering the questions which arose from our data analysis and provides ten usable insights.

Executive Options report

This is the third in the series and sets out opportunities as well as a recommended direction of travel for the next phase of the work.

A copy of all 3 reports the can be accessed from our website www.so-mo.co.uk

APPENDIX A – CONTRIBUTORY FACTOR GROUPINGS

Injudicious Action	Driver Errors or Reactions	Driver Impairment or Distraction	Behaviour or Inexperience	Other
Traffic Contraventions	**Manoeuvre Errors**	**Substance Impairments**	**Nervous Behaviour**	**Vehicle Defects**
Disobeyed automatic traffic signal *Disobeyed double white lines* *Disobeyed 'Give way' or 'Stop' signs or markings* *Disobeyed pedestrian crossing facility* *Illegal turn or direction of travel*	*Poor turn or manoeuvre* *Failed to signal or misleading signal* *Passing too close to cyclist, horse rider or pedestrian*	*Impaired by alcohol* *Impaired by drugs (illicit or medicinal)*	*Nervous, uncertain or panic* *Learner or inexperienced driver/rider* *Inexperience of driving on the left* *Unfamiliar with model of vehicle*	*Tyres illegal, defective or under-inflated* *Defective lights or indicators* *Defective brakes* *Defective steering or suspension* *Defective or missing mirrors*
				Overloaded or poorly loaded vehicle or trailer
Speed Choices	**Control Errors**	**Distraction**	**Unsafe Behaviour**	**Road Surface**
Exceeding speed limit *Travelling too fast for conditions*	*Sudden braking* *Swerved* *Loss of control*	*Driver using mobile phone* *Distraction in vehicle* *Distraction outside vehicle*	*Aggressive driving* *Careless, reckless or in a hurry*	*Poor or defective road surface* *Deposit on road (e.g. oil, mud, chippings)* *Slippery road (due to weather)*
Close Following	**Observation Error**	**Health Impairments**	**Pedal Cycle Behaviour**	**Affected Vision**
Following too close	*Failed to look properly* *Failed to judge other person's path or speed*	*Uncorrected, defective eyesight* *Illness or disability, mental or physical*	*Vehicle travelling along pavement* *Cyclist entering road from pavement*	*Stationary or parked vehicle(s)* *Vegetation*
			Not displaying lights at night or in poor visibility	*Road layout (e.g. bend, winding road, hill crest)*
			Cyclist wearing dark clothing at night	*Buildings, road signs, street furniture*
	Junction Errors	**Fatigue Impairment**	**Pedestrian Behaviour**	*Dazzling headlights*
	Junction overshoot *Junction restart (moving off at junction)*	*Fatigue*	*Crossing road masked by stationary or parked vehicle* *Failed to look properly*	*Dazzling sun* *Rain, sleet, snow or fog*
			Failed to judge vehicle's path or speed	*Spray from other vehicles*
			Wrong use of pedestrian crossing facility	*Visor or windscreen dirty or scratched*
			Dangerous action in carriageway (e.g. playing) *Careless, reckless or in a hurry* *Impaired by alcohol* *Impaired by drugs (illicit or medicinal)* *Pedestrian wearing dark clothing at night* *Disability or illness, mental or physical*	*Vehicle blind spot*

APPENDIX B – NIGHT-TIME COLLISION MAPS – LIVERPOOL

FIGURE 29 - LOCATIONS OF ADULT PEDESTRIAN CASUALTIES AT NIGHT IN LIVERPOOL (2012-2016)

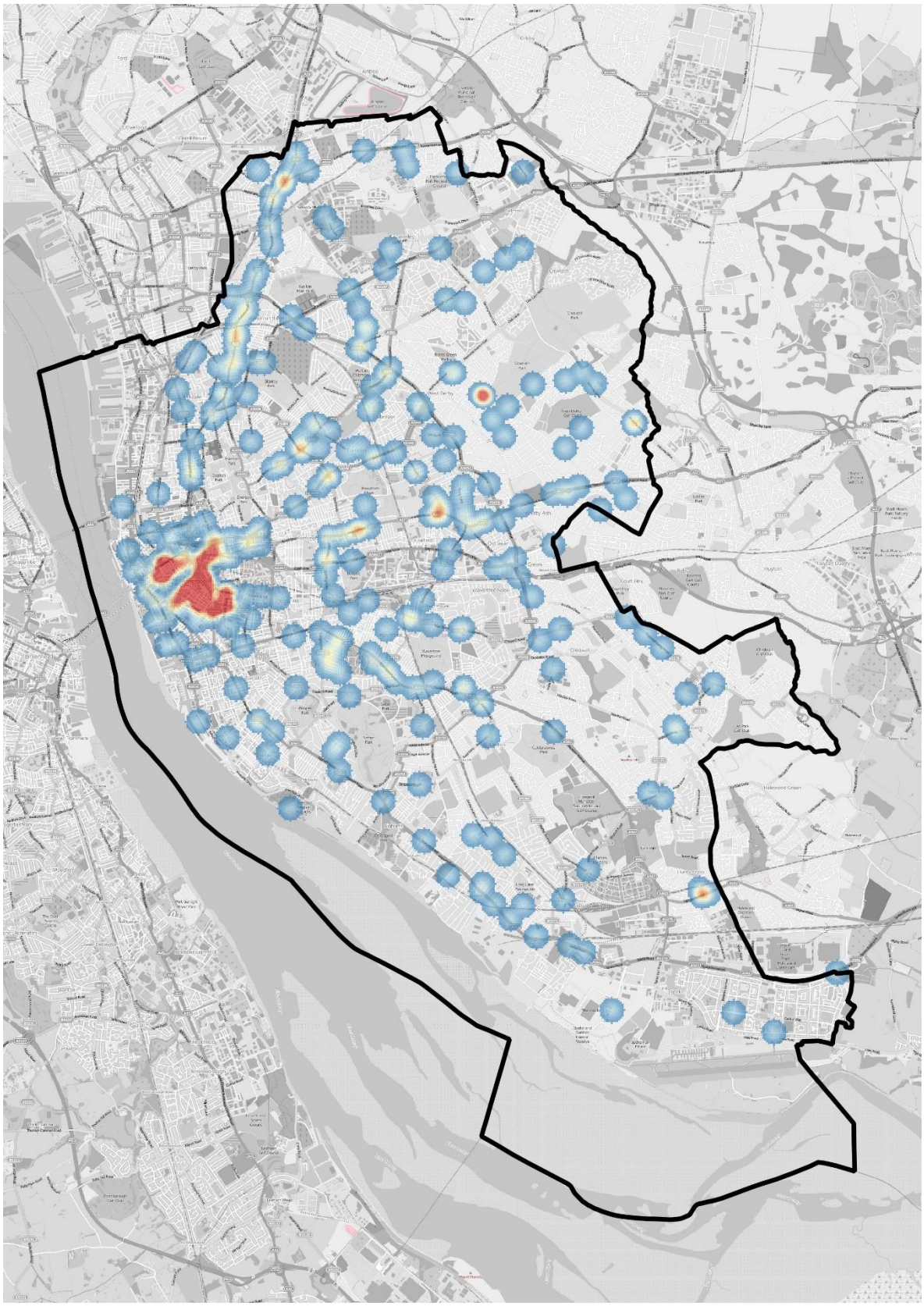
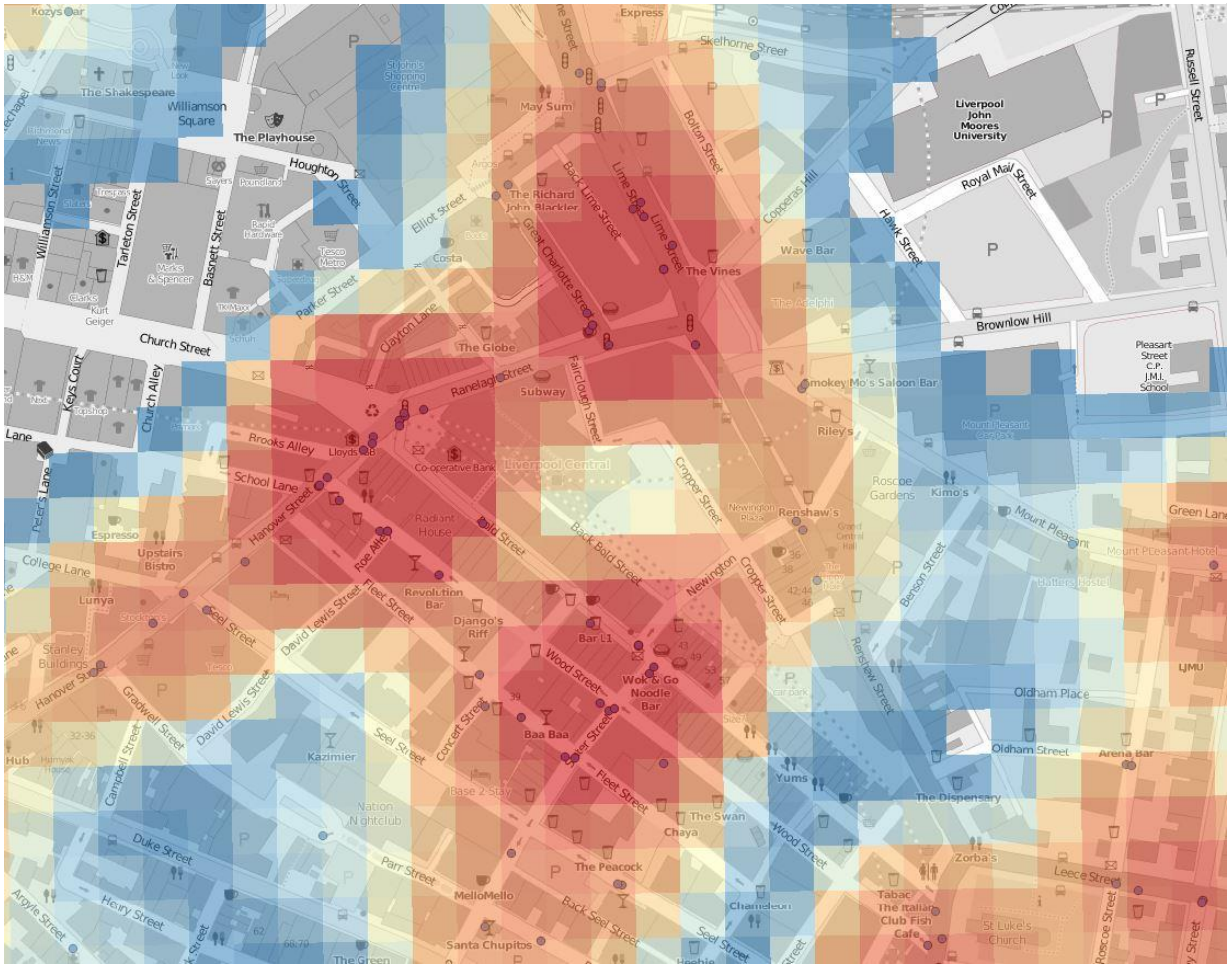


FIGURE 30 - CITY CENTRE LOCATIONS OF ADULT PEDESTRIAN CASUALTIES AT NIGHT IN LIVERPOOL (2012-2016)



APPENDIX C – LITERATURE REVIEW

1. Factors facilitating pedestrian collisions.

The following factors related to the infrastructure are considered to be risk facilitating:

- ✓ lack of pedestrian facilities,
- ✓ timing of signalisation phases,
- ✓ insufficient responsiveness of signalisation,
- ✓ button induced pedestrian phase at signalised crossings,
- ✓ long walking distances when crossing multi-stage junctions,
- ✓ excessively wide or multiple lane roads,
- ✓ insufficient width of crossings,
- ✓ high speed limits,
- ✓ location of parking or bus areas, which obstruct pedestrians' view,
- ✓ lack or insufficient width of pavements,
- ✓ insufficient lightning.

The following risk facilitating behaviours of pedestrians were identified:

- ✓ pedestrians' insufficient attention, or distraction,
- ✓ misjudgement of the traffic situation, distance of the oncoming vehicle and/or its position,
- ✓ intoxication,
- ✓ insufficient conspicuity, lack of high-visibility clothes or equipment,
- ✓ walking off the crossings,
- ✓ jaywalking,
- ✓ misjudgement of locations with high crash-risks along the walking routes,
- ✓ violating the traffic lights,
- ✓ misunderstanding of right-of-way rules,
- ✓ lack of communication or misunderstanding with the driver.

Some socio-demographic groups of adult pedestrians are found to have a higher likelihood of exhibiting more reckless behaviours. These are:

- ✓ men,
- ✓ younger pedestrians.

Whilst older pedestrians are not mentioned among the above at-risk groups, they are still considered to be a desirable subject of interventions (Dunbar, *et al.*, 2004, Teanby *et al.*, 1993, Martin, 2006, Polders *et al.*, 2015) and along with children, are the most frequently addressed pedestrian target group. In the case of older people, typical injuries resulting from an impact with an oncoming vehicle usually translates into more severe and life-threatening injuries in comparison to other age groups (Hagenzieker, 1996, Centers for Disease Control and Prevention, 2013). Their increased likelihood to experience collisions is related to the physical disadvantages such as:

- ✓ slower reactions,
- ✓ deteriorated motor abilities and responses,
- ✓ decrement in visual acuity,

- ✓ peripheral vision and useful field of view,
- ✓ impairment in the distance perceptions at low luminance level.

They also tend to overestimate the vehicles' velocity at lower speed and underestimate it at higher speeds (Scialfa *et al.*, 1991). It appears that some of their behaviour patterns may not be risk limiting ones. Their pedestrian strategies are not narrowed to maximise their safety but according to the theory of selection, optimisation and compensation (Baltes, 1997) they are rather focused on maximising their potential gains (the safety) and minimising potential losses (the physical effort). On one hand they do display more cautious behaviour and preparation when interacting with the vehicles' traffic (which may be related to the age-related physical limitations), but on the other hand they are found to stick to some own, tried and tested, rules and habits (Transport for London, 2013), that are not necessarily in compliance with the formal ones. Other undesired behaviours result from their over-caution (Dunbar *et al.*, 2004, Ewert, 2012). It was found that older people are likely to:

- ✓ walk onto the street away from pedestrian crossings,
- ✓ keep a relatively far but not necessarily optimal distance from the kerb when looking for a crossing opportunity,
- ✓ looking to the ground when crossing and directing less attention to the surrounding traffic.

There is limited specific evidence related to pedestrian groups aged older than children and teenagers but younger than the elderly.

2. Interventions.

A significant number of the interventions that were intended to increase pedestrian safety (apart from the ones addressed at the child or teenage pedestrians) were not targeting any specific, explicitly defined and selected socio-demographic groups. If any prevailing criterion could be indicated, this would be the geographical area where the individuals have their origin or destination points or the areas that link them or the undesired behaviour. (but this is a consequence of spatial analysis)

The most complex, multipronged interventions (i.e. implementing engineering, enforcement and educational measures) were conducted in the United States. One of the most large-scale one was delivered in Miami-Dade county (Zegeer *et al.*, 2008), covering several target groups and addressing a range of pedestrian hazards and a range of risk facilitating behaviours. It also included modules dedicated to ethnic minorities, but these actions did not appear to be successful (Zegeer *et al.*, 2007). The most beneficial areas were those receiving a wide spectrum of actions - selective police enforcement, a variety of educational measures, as well as a few engineering treatments (Zegeer *et al.*, 2007). Another example of effectiveness of the combined approach was the SMART Baltimore project, aimed primarily at reducing alcohol-involved pedestrian crashes (Blomberg *et al.*, 2000). Due to the anticipated inability or reluctance of the target group to accept potential direct countermeasure approaches, the education was channelled via intermediaries, mostly social and health services. A guide was prepared for use by jurisdictions that wanted to mount a programme targeting alcohol impaired pedestrians. It includes five steps: 'assessing the local problem'; 'establishing a community coalition'; 'designing the programme'; 'implementing the programme'; and 'evaluating programme results'.

As tailoring proper top-down messages within above the line (ATL) or below the line (BTL) campaigns appears to be challenging, it is worth recommending the implementation of methods which would directly involve the participants and enable permanent interaction with them. As a majority of them do not have professional obligations, recruiting them may be easier in comparison to other groups. Pedestrian Safety Training Workshops conducted in 2017 for local communities in California (Barajas *et al.*, Safe Transportation Research & Education Center University of California, California Walks) could be a model solution, since they also include modules in which the participants are expected to present their opinions on local pedestrian infrastructure and propose relevant solutions, which would not only result in avoiding patronisation but also in benefiting from this effect's reversal.

In the case of all potential adult target groups, it is in general suggested to use the fact that a considerable share of pedestrians are also drivers at other times (and at the same time all drivers are occasionally in the role of pedestrians). Thus, the attention may be drawn to the drivers' perspective to facilitate an understanding of the limitations and challenges the drivers face and resolve the potential conflict. A recently launched campaign - 'Bądźmy bezpieczni na drodze' ('Let's be safe on the road'; Ministerstwo Infrastruktury i Budownictwa, Krajowa Rada Bezpieczeństwa Ruchu Drogowego, 2017) may be an example of such approach.

Behavioural change techniques that have been implemented in the educational interventions or modules included:

- ✓ information on consequences,
- ✓ facilitating understanding on the perspective of other road users,
- ✓ prohibiting and penalizing undesired behaviours,
- ✓ raising and highlighting drivers' family pressure and the sense of responsibility for the relatives,
- ✓ fear appealing,
- ✓ shame appealing,
- ✓ involving potential beneficiaries in discussion and shaping the infrastructure.

Following educational measures have been implemented:

- ✓ classroom-based training or workshops,
- ✓ walking audits,
- ✓ walking parades,
- ✓ personal electronic devices for pedestrians,
- ✓ disguised campaigners on the streets,
- ✓ personal guides,
- ✓ digital boards,
- ✓ stencils for painting,
- ✓ paintings on the pavement,
- ✓ television, radio, print, web advertisements,
- ✓ social media measures,
- ✓ leaflets,
- ✓ posters and banners,
- ✓ cards with promises and commitments to sign,
- ✓ reflective items,
- ✓ flags at pedestrian crossings to use by them and signalize crossing intentions to drivers,

- ✓ items recalling campaign symbols or messages (coffee cup sleeves, magnets, tote bags, T-shirts, car air fresheners),
- ✓ cinema slides.

Following engineering measures related to the road infrastructure have been applied:

- ✓ separating pedestrians and vehicles by time:
  - ✓ installation of traffic signal,
  - ✓ exclusive pedestrian signal phase,
  - ✓ early release signal timing,
  - ✓ traffic signal change interval timing,
  - ✓ pedestrian prompting devices,
  - ✓ automatic pedestrian detection for display of walk signal,
- ✓ separating pedestrians and vehicles by space:
  - ✓ pedestrian overpasses,
  - ✓ advance stop lines,
  - ✓ pedestrian barriers and fences,
  - ✓ sidewalks,
  - ✓ median islands,
  - ✓ refuge islands.
- ✓ increasing visibility, conspicuity of pedestrian facilities:
  - ✓ increased intensity of roadway lighting,
  - ✓ installation of internally illuminated warning signs,
  - ✓ bus stop relocation,
  - ✓ diagonal parking,
  - ✓ crosswalk markings,
  - ✓ road studs with flashing lights or reflectors,
  - ✓ elevating crossings,
- ✓ clearing right of way for pedestrians on pedestrian crossings,
- ✓ mats on the surface of the road reducing speed of approaching vehicles,
- ✓ traffic calming,
- ✓ real-time speed advisory signs,
- ✓ traffic calming markings,
- ✓ erecting concrete bollards,
- ✓ rough surface at the edge of the pavement.

Following non-standard enforcement measures have been implemented:

- ✓ employing decoy officers,
- ✓ employing pedestrian officers,
- ✓ feedback flyers,
- ✓ written and verbal warnings.

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