

Analysis of the Impact of Deprivation on Road Safety in North East England, 2011 to 2015

Peter Slater
Data Analyst
NE Regional Road Safety Resource
0191 433 3165
peterslater@gateshead.gov.uk

Caroline Shield
Team Leader
Transport Strategy
Gateshead Council

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Report Summary

- There is a clear link between deprivation and total casualty numbers in the North East, with a general rule being that people from more deprived areas are more likely to be injured in a road traffic collision than people from less deprived areas.
- However, despite this link, there are some major variations when looking at individual road user and age groups.
- Car drivers injured in collisions are more likely to come from areas with a medium level of deprivation, and while injuries are highest for the 25-34 age group, casualty numbers are spread fairly evenly across all age groups from 16 to 54
- Car passengers injured in collisions are much more likely to come from areas with high deprivation, and tend to be most likely to be aged between 16 and 24
- Pedestrian casualty numbers have a clear link to deprivation levels in the region, with more deprived areas tending to see far higher levels of pedestrian casualties than areas with lower deprivation levels
- Child pedestrians in particular are seemingly most at risk from more deprived areas, seeing an injury rate that is three times that from the least deprived areas
- There are two distinct groups of pedal cyclists injured in the North East: children and young people from the most deprived areas, and people aged 45-54 from the least deprived areas
- Cyclists from the most deprived parts of the region tend to be more likely to be injured close to their home address while cyclists from the least deprived areas are more likely to be much further away from home
- Both pedestrians and cyclists are more likely to be injured in a collisions with a car driver who was from an area with a similar deprivation level to theirs
- Riders of motorcycles with an engine size under 500cc tend to be aged between 16 and 24, and be from the more deprived areas of the region, while riders of larger motorcycles are more likely to be between 25 and 54, and from areas with medium to low deprivation
- People riding smaller motorcycles tend to be much closer to home when they are injured than riders of larger motorcycles
- Older people from more deprived areas are the most likely to be injured on buses, and across all age groups, people from more deprived areas are much more likely to be injured as a bus passenger than people from the least deprived areas
- Goods vehicle occupants injured in collisions tend to be from areas of medium to high deprivation and aged between 25 and 54
- Most people in the region prefer to be contacted by e-mail, own a smartphone, use the internet daily and have an active Facebook account

Introduction

Most reports that have been completed by the North East Regional Road Safety Resource include an element of population profiling, and this tends to identify that deprivation is a key factor in determining who is more likely to be involved and injured in road traffic collisions in the region. However, a key question that remains unanswered by this analysis is how much of this impact resulted from the generally higher numbers of people living in deprived areas in the North East. This report addresses this, investigates who is more likely to be involved or injured in road traffic collisions, which leads to the provision of suggestions of how to better target road safety interventions towards these road user groups in the future.

About the Data

The road user casualty statistics used in this report come from the Resource's database of Stats 19 information from the North East region of England, which is collected by Northumbria, Durham and Cleveland police officers and is provided to the Resource by the data teams for each police force. As this is a live dataset, the statistics quoted in this report were correct at the time of publication, but may slightly differ in the future if any of the collision data is updated at a later date.

The key dataset used when examining deprivation is the "English Indices of Deprivation" produced by the Department for Communities and Local Government.¹ The latest data, published in 2015, provide a combined score for deprivation for each of the 32,844 "Lower Super Output Areas" (LSOAs) in England.² This combined score is referred to as the "Index of Multiple Deprivation" (IMD), as it is based on such elements as the income, employment, education, health, crime and living environment in each LSOA. For this report, we use the combined IMD score for our analysis as this provides the best overall assessment of deprivation.

To assist in the analysis of deprivation, LSOAs are divided into ten groups (deciles) of equal size. For this analysis, as the North East region has a much higher number of LSOAs that are more deprived than the country as a whole, this would mean that when using the national deciles, we would have far higher numbers of the population (and casualties) in the lower deciles. As this would unfairly skew the analysis, we have calculated deciles specifically for the region, meaning that there are equal numbers of the population in each of the ten North East deciles. This then gives us a more statistically sound impression of the impact of deprivation on injury numbers across the region, and removes the bias that would have existed otherwise.

About the Resource

The North East Regional Road Safety Resource, based at Gateshead Council, is funded by the three North East Road Safety Partnerships, and exists to provide data and analysis on road traffic collisions, and the resulting casualties, to road safety professionals and organisations in the region.

¹ The latest English Indices of Deprivation are available to download from the following website:
<https://www.gov.uk/government/statistics/english-indices-of-deprivation-2015>*

² A Lower Super Output Area (LSOA) is a small geographic area that typically contains a population of between 1,000 and 3,000 people, or between 400 and 1,200 households. They have been designed to improve the reporting of small area statistics, mainly in relation to the Census.

* Please note that all links were correct at the time of publication but could be subject to subsequent change.

Interaction between Deprivation, Population Density and Injuries

Key information in this section

- Areas with a higher population density are slightly more likely to see higher levels of deprivation, but this is only a weak correlation
- Areas with higher levels of deprivation are moderately more likely to see higher numbers of their population injured in a road traffic collision
- There is no evidence of a link between population density and the number of people injured in each LSOA
- Pedestrian and child casualties in particular are very closely related to deprivation levels, but there is a more complex relationship for most road user groups

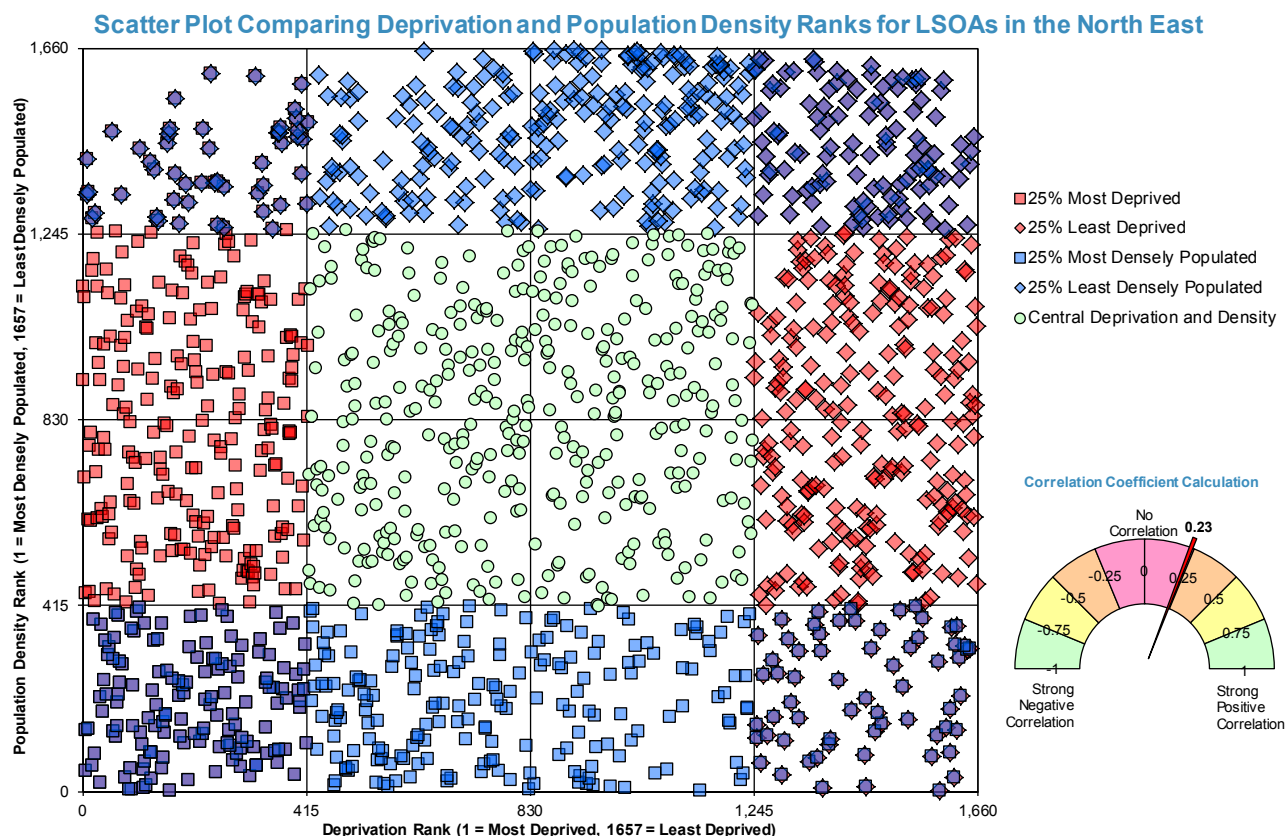
Over the course of researching this report it was clear that there were more injuries sustained by people living in areas of higher deprivation than those from less deprived areas (even when using the North East deciles rather than the national deciles). To establish whether there is any link between population size and deprivation levels, which might influence casualty levels, the independence of the population density and deprivation data was considered. This allows us to progress on to investigate the impact of deprivation and population numbers of injury levels.

First, the hypothesis whether the density of the population in each Lower Super Output Area (LSOA) in the North East is related to the deprivation in the area was addressed. Each LSOA was given a rank from 1 to 1,657 for both deprivation and population density, and these ranks were then used to populate the scatter graph in Figure 1. The results displayed in Figure 1 suggest little relationship, and when calculating the correlation coefficient of the two datasets, this shows that there is only a very weak correlation³ of 0.23.⁴

This means that there is a very weak relationship between higher deprivation and higher population density (and lower deprivation with lower population density), but overall there is a good spread of different deprivation and density levels across the region.

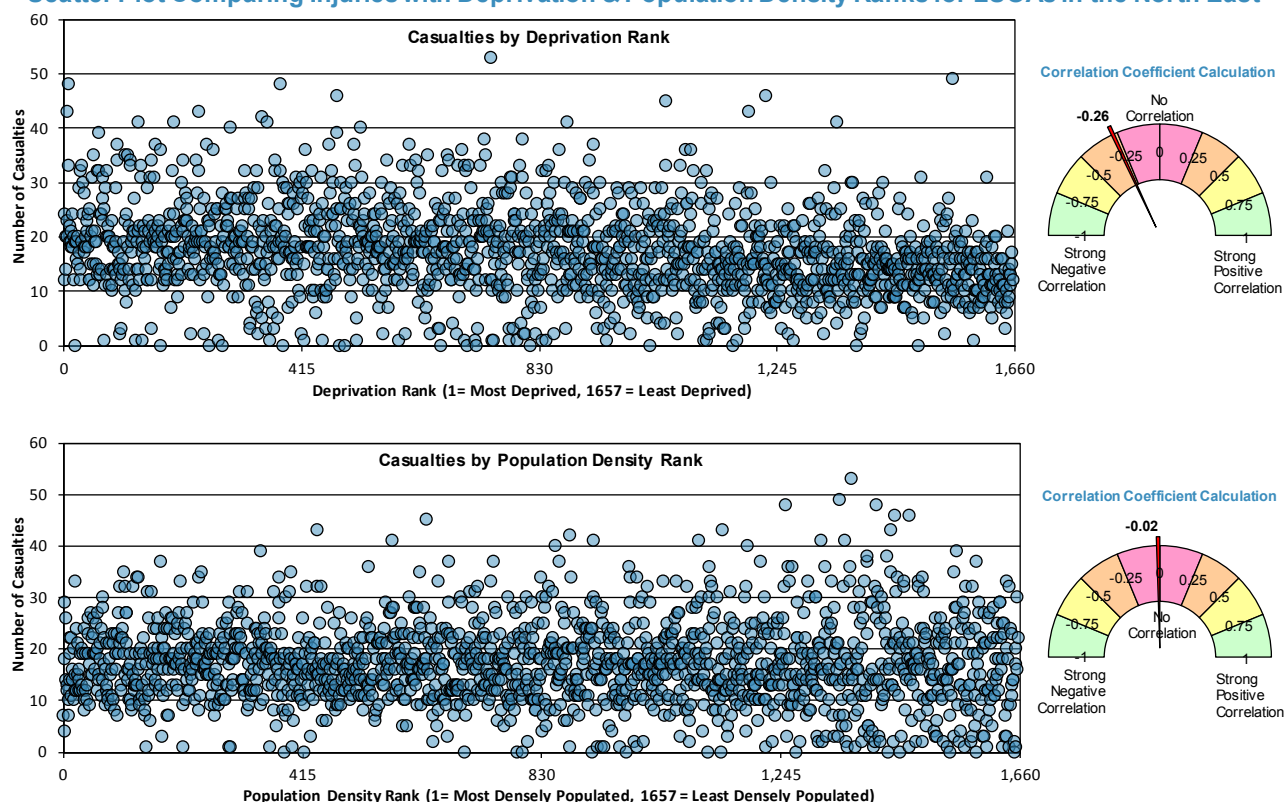
³ Correlation is calculated across a range of -1 to +1, where 0 indicates no linear correlation and +/-1 shows there to be strong correlation.

⁴ This method is based on one used by David Ian White in his 2002 PhD thesis for Napier University entitled 'An Investigation of Factors Associated with Traffic Accident and Casualty Risk in Scotland'. This is available to download from the following website: <http://researchrepository.napier.ac.uk/2782/1/WHIPhD248496.pdf>

Figure 1: Correlation between Deprivation and Population Density Ranks

We examined next the link between deprivation and population density with casualty numbers; this led to some interesting results. Figure 2 shows that there is a weak negative correlation between casualty numbers and deprivation, but more deprived LSOAs have slightly higher numbers of injuries and less deprived LSOAs tending to see fewer injuries. However, the most interesting result is when looking at population density, where there is virtually no correlation between the density of the population in each LSOA and the number of people who were injured from there.

Therefore, these results confirm that it is appropriate for this report to focus on the link between deprivation and casualty numbers, and that population density can be discounted as a factor in its own right.

Figure 2: Correlation between Casualties and Deprivation/Population Density Ranks**Scatter Plot Comparing Injuries with Deprivation & Population Density Ranks for LSOAs in the North East**

Finally, the data in Table 1 shows that for some road user groups like children and pedestrians, there is an increased link between deprivation and casualty numbers, while for others like car drivers there appears to be no link. However, the correlation coefficient relates to linear relationships so is not applicable to distributions that are clustered such as in a bell curve or form another distribution. Therefore, the analysis in the following sections considers this in more detail and displays it more appropriately.

Table 1: Correlation Coefficients for Individual Road User Groups

Road User Group	Correlation Coefficient for IMD and Casualties
Child casualties	-0.39
Pedestrian casualties	-0.39
Child pedestrian casualties	-0.35
Car passenger casualties	-0.27
Total casualties	-0.26
Child cyclist casualties	-0.26
Motorcyclist (<500cc) casualties	-0.25
Bus passenger Casualties	-0.22
Goods vehicle occupant casualties	-0.11
Pedal cyclist casualties	-0.06
Motorcyclist (>500cc) casualties	0.03
Car driver casualties	0.05

Impact of Deprivation on All Road Users

Key information in this section

- There are more children living in areas with higher deprivation than other age groups
- As people get older they are more likely to live in areas with lower deprivation
- Many road user groups see higher injury numbers sustained by people from areas with the highest levels of deprivation
- People aged between 16 and 24 and from areas with the highest levels of deprivation are the most likely to be involved and injured in a collision
- Children from the most deprived areas are around 2.5 times more likely to be injured in a collision than children from the least deprived areas

The information in Table 2 shows that the actual population in the North East is not evenly split when looking at individual age groups. This tells us that there are more children living in deprived areas than average, while as a person gets older, they are more likely to live in a less deprived area.

Table 2: Total Population by Age Group and Deprivation Decile

Deprivation Decile (NE)		Population Age Group							Total	Key:
		0-15	16-24	25-34	35-44	45-54	55-69	70+		
Most Deprived Areas ← Least Deprived Areas	1	57,940	35,728	37,923	30,706	34,176	38,563	25,656	260,559	Highest Numbers
	2	52,978	34,111	37,743	31,344	35,166	40,482	28,878	260,560	
	3	50,211	32,154	36,796	32,278	36,327	43,332	30,763	261,232	
	4	49,278	32,147	36,986	31,814	36,045	43,862	31,009	260,560	
	5	45,841	31,627	36,384	32,695	37,095	45,360	31,959	260,278	
	6	42,520	32,920	32,453	31,567	37,922	49,314	34,944	260,813	
	7	41,592	28,821	29,595	31,686	40,101	53,454	36,157	261,135	
	8	39,007	31,472	27,860	31,225	39,509	53,902	37,647	260,534	
	9	40,002	30,818	26,108	32,041	41,628	54,346	35,717	260,662	
	10	43,761	29,590	23,084	32,847	40,587	53,918	36,900	260,654	Lowest Numbers
Total		463,130	319,387	324,932	318,202	378,557	476,533	329,630	2,606,986	

Table 3 gives the overall number of injuries sustained by each road user group in the 10 IMD deciles. This shows that many road user groups tend to see higher injury numbers sustained by people from areas with higher deprivation. However, there are some variations from this, with car driver, motorcyclist (over 500cc) and goods vehicle occupant injuries being more centred around the middle deciles. These variations are explored in much more detail in the rest of this report.

Table 3: Total Casualty Numbers by Road User Group and Deprivation Decile

Deprivation Decile (NE)		Casualty Road User Group									
		Car Drivers	Car Passengers	Pedestrians	Pedal Cyclists	Motorcyclists (<500cc)	Motorcyclists (>500cc)	Bus Passengers	Goods Vehicle Occupants	All Other Road Users	Total
Most Deprived Areas ←	1	997	635	616	352	174	56	207	92	171	3,300
	2	1,222	503	521	299	174	77	222	98	124	3,240
	3	1,306	579	423	216	163	91	227	120	108	3,233
	4	1,268	535	422	237	150	71	196	112	76	3,067
	5	1,276	498	346	237	120	89	178	101	79	2,924
	6	1,310	490	307	214	114	85	144	108	71	2,843
	7	1,320	396	263	216	76	108	124	94	70	2,667
	8	1,243	386	241	217	88	75	115	76	61	2,502
	9	1,286	342	205	258	70	78	94	65	51	2,449
	10	1,170	244	225	297	62	70	77	54	25	2,224
Total		12,398	4,608	3,569	2,543	1,191	800	1,584	920	836	28,449

Key:

Highest Numbers

(Color gradient bar from red to green)
 Lowest Numbers

Looking specifically at child casualties by road user group in Table 4, there are clearly more injuries sustained by children from more deprived areas for all road users groups. However, as shown in Table 2, there are more children living in areas with higher deprivation, so we would expect casualty numbers to be higher for these deciles. Again, analysis in subsequent sections of this report will take this into account for each road user and age group and attempt to provide a more rounded picture of how much of an impact deprivation actually has on injury numbers.

Table 4: Child (0-15) Casualty Numbers by Road User Group and Deprivation Decile

Deprivation Decile (NE)		Child Casualty Road User Group					Total
		Pedestrians	Car Passengers	Pedal Cyclists	Bus Passengers	All Other Road Users	
Most Deprived Areas ←	1	246	129	106	36	18	535
	2	204	85	85	26	19	419
	3	149	98	55	50	14	366
	4	175	93	57	31	6	362
	5	117	98	49	36	4	304
	6	81	92	31	17	7	228
	7	72	76	29	11	4	192
	8	64	64	19	11	3	161
	9	49	61	27	5	1	143
	10	61	42	24	5	1	133
Total		1,218	838	482	228	77	2,843

Key:

Highest Numbers

(Color gradient bar from red to green)
 Lowest Numbers

Tables 5 and 6 provide the format for most of the tables in the following sections, with Table 5 showing the actual number of injuries in each decile broken down by age group, and Table 6 using the data on population sizes to provide an annual rate of injuries per 10,000 people for the top and bottom 20% of areas.

Table 5: Total Casualties by Age Group and Deprivation Decile

Deprivation Decile (NE)		Casualty Age Group							Total	Key: Highest Numbers Lowest Numbers
		0-15	16-24	25-34	35-44	45-54	55-69	70+		
Most Deprived Areas	1	535	731	690	499	382	299	159	3,295	
	2	419	695	719	492	430	300	183	3,238	
	3	366	716	690	479	459	343	179	3,232	
	4	362	681	588	502	438	317	176	3,064	
	5	304	626	587	481	447	293	183	2,921	
Least Deprived Areas	6	228	669	550	441	422	321	209	2,840	
	7	192	583	464	382	442	366	236	2,665	
	8	161	520	418	395	456	332	217	2,499	
	9	143	494	422	407	446	333	204	2,449	
	10	133	381	322	395	452	312	228	2,223	
Total		2,843	6,096	5,450	4,473	4,374	3,216	1,974	28,426	

Table 6: Comparison of Annual Total Casualty Rate per 10,000 Population between Most and Least Deprived Areas by Age Group

	0-15	16-24	25-34	35-44	45-54	55-69	70+	Total
Most Deprived 20%	17.1	40.8	37.2	31.9	23.4	15.2	12.5	25.1
Least Deprived 20%	6.61	28.9	30.1	24.7	21.9	11.9	11.9	17.9
% Difference	159%	41%	24%	29%	7%	27%	5%	40%

This information shows that both the highest numbers and rates of injuries are sustained by people aged 16-24 from the most deprived areas of the North East. The data in Table 6 also shows that the greatest disparity between the rates of injuries between the lowest and highest 20% deprivation deciles is for children aged 0-15, with children from the most deprived areas of the region being around two and a half times more likely to be injured than those from the least deprived areas.

Overall this information tells us that deprivation is an important factor in determining who is more likely to be involved and injured in a collision, so it is worth looking in greater detail at individual road user groups, and then using this information to plan more focused road safety interventions.

Impact of Deprivation on Car Occupants

Key information in this section

- Car occupants make up the largest group of casualties on the North East's roads
- Car drivers injured in collisions are more likely to come from areas with a medium level of deprivation, and while injuries are highest for the 25-34 age group, casualty numbers are spread fairly evenly across all age groups from 16 to 54
- Car passengers injured in collisions are much more likely to come from areas with high deprivation, and tend to be most likely to be aged between 16 and 24
- Car drivers from areas with higher deprivation tend to be involved in collisions close to their home address, while the reverse is true for drivers from areas with low deprivation

The largest road user group both involved and injured in collisions in the region are car occupants, and of these, there are more injuries sustained by car drivers than any other road user group.

Looking initially at car driver casualties in Table 7, we can see that the lowest numbers of injuries actually come from the most deprived decile, while the highest numbers of injuries are in the middle deprivation deciles. When we look in more detail at these figures broken down by the age group of the car driver casualty, we see that the most likely group to be injured are people from more deprived (but not the most deprived) areas who are aged between 25 and 34. Overall however, we see a fairly even spread of injuries sustained by most age groups and deciles.

Table 7: Car Driver Casualties by Age Group and Deprivation Decile

Deprivation Decile (NE)		Casualty Age Group							Total	Key:
		0-15	16-24	25-34	35-44	45-54	55-69	70+		
Most Deprived Areas ↓ Least Deprived Areas	1	1	210	302	229	156	115	28	1,041	Highest Numbers
	2	0	256	373	246	212	116	43	1,246	
	3	0	285	352	253	230	150	55	1,325	
	4	1	263	311	284	228	139	56	1,282	
	5	0	257	328	263	233	145	71	1,297	
	6	0	288	325	252	219	156	80	1,320	
	7	0	301	245	220	265	189	113	1,333	
	8	0	255	235	241	259	174	89	1,253	
	9	0	269	274	239	246	182	84	1,294	
	10	0	180	196	234	273	175	114	1,172	Lowest Numbers
Total		2	2,564	2,941	2,461	2,321	1,541	733	12,563	

In Table 8, we can see that there are higher rates of injuries per year in the least deprived areas of the region than the most, however, given that the most deprived areas of the region tend to see the lowest car ownership levels then this is not a surprise.

Table 8: Comparison of Annual Car Driver Casualty Rate per 10,000 Population between Most and Least Deprived Areas by Age Group

	0-15	16-24	25-34	35-44	45-54	55-69	70+	Total
Most Deprived 20%	0	13.4	17.8	15.3	10.6	5.85	2.58	8.78
Least Deprived 20%	0	14.8	19.0	14.6	12.6	6.59	5.44	9.46
% Difference	0%	-10%	-6%	5%	-16%	-11%	-53%	-7%

Looking at car passengers Table 9 shows that the make-up of these injuries is very different to those for car drivers, with higher casualty levels in the more deprived areas for all ages except the over 70s, and the highest casualty numbers being sustained by young people from the most deprived areas.

Table 9: Car Passenger Casualties by Age Group and Deprivation Decile

Deprivation Decile (NE)		Casualty Age Group							Total	
		0-15	16-24	25-34	35-44	45-54	55-69	70+		
Most Deprived Areas ↓	1	135	208	129	77	60	54	29	692	Key: Highest Numbers Lowest Numbers
	2	91	158	110	63	53	39	27	541	
	3	103	187	118	56	53	67	29	613	
	4	94	189	85	57	49	50	32	556	
	5	98	165	78	48	55	31	34	509	
	6	93	172	72	47	53	45	29	511	
	7	78	124	64	29	41	39	41	416	
Least Deprived Areas	8	65	105	71	44	48	30	43	406	
	9	61	102	49	40	37	33	35	357	
	10	42	70	29	29	26	21	32	249	
Total		860	1,480	805	490	475	409	331	4,850	

Table 10 reinforces this observation that the rate of car passenger injuries per year is also highest for young people from the most deprived areas. The difference between the rates of injury for the most and least deprived areas is greater for older age groups, culminating with a person aged between 55 and 69 being almost two and a half times more likely to be injured as a car passenger if they are from the most deprived areas than from the least.

Table 10: Comparison of Annual Car Passenger Casualty Rate per 10,000 Population between Most and Least Deprived Areas by Age Group

	0-15	16-24	25-34	35-44	45-54	55-69	70+	Total
Most Deprived 20%	4.05	10.5	6.32	4.52	3.26	2.36	2.07	4.73
Least Deprived 20%	2.48	5.68	3.13	2.13	1.53	1.00	1.85	2.32
% Difference	63%	84%	102%	112%	113%	137%	12%	104%

Finally, Table 11 looks at the distance from home that car drivers were when they were involved in a collision (including collisions where they themselves were not injured). To assist in the viewing of this information, and to aid comparisons, the distance between the drivers' home postcode and the location of the collision have been grouped in to five similarly sized groups, each accounting for 20% of the total number of drivers.

This table gives us some interesting results, showing that people from the most deprived areas are likely to be very close to their home address when they are involved in a collision, while drivers from the least deprived areas are likely to be much further away. To attempt to determine why this should be, a brief analysis was undertaken on the purpose of the journey that the driver was on as recorded on Stats 19, however this did not give any conclusive results, so we cannot say whether drivers from less deprived areas were more likely to be involved in collisions further from home due to working further away, or driving greater distances for leisure or other reasons.

Table 11: Car Driver Distance from Home by Deprivation Decile

Deprivation Decile (NE)		Distance Car Driver was from Home when Involved in Collision					Total	Key:
		0-929m	930-2,399m	2,400-4,749m	4,750-10,099m	10,100m+		
Most Deprived Areas	1	671	569	485	318	307	2,350	Highest Numbers
	2	639	617	572	468	356	2,652	
	3	590	625	545	551	513	2,824	
	4	574	573	517	540	494	2,698	
	5	543	515	562	544	519	2,683	
Least Deprived Areas	6	503	466	547	550	666	2,732	
	7	507	503	533	561	680	2,784	
	8	438	503	545	589	617	2,692	
	9	465	503	572	630	620	2,790	
	10	416	473	496	604	637	2,626	Lowest Numbers
Total		5,346	5,347	5,374	5,355	5,409	26,831	

Overall, this analysis shows that car drivers involved or injured in a collision in the North East are most likely to be from areas with a medium level of deprivation, while passengers are much more likely to be from more deprived areas. In terms of age group, passengers are most likely to be younger, generally between the ages of 16 and 24, while drivers cover a much greater spread of the population although the highest casualty numbers are seen by people aged 25 to 34.

Impact of Deprivation on Pedestrians

Key information in this section

- Pedestrian casualty numbers have a clear link to deprivation levels in the region
- More deprived areas tend to see far higher levels of pedestrian casualties than areas with lower deprivation levels
- Children are significantly more at risk when coming from deprived areas, seeing an injury rate that is three times that from the least deprived areas
- The greatest numbers of pedestrians were injured by drivers who live in areas that have similar deprivation levels to those of the pedestrian casualty
- Most pedestrians were injured very close to home, however for less deprived areas there is a slight tendency to be further away from home when they were injured

From the information displayed in Table 1 above, one of the strongest correlations between deprivation and casualty numbers is seen by pedestrians. Looking at the information in Table 12, this is clearly the case, with pure injury numbers being 174% higher in the most deprived decile than the least. In addition, there are clearly more child pedestrians injured from the most deprived areas of the region than from any other age group showing that this is the key demographic to work with for this road user group.

Table 12: Pedestrian Casualties by Age Group and Deprivation Decile


Deprivation Decile (NE)		Casualty Age Group							Total	Key: 
		0-15	16-24	25-34	35-44	45-54	55-69	70+		
Most Deprived Areas	1	246	116	69	53	49	44	39	616	
	2	204	87	73	36	39	40	42	521	
	3	149	74	65	32	33	33	37	423	
	4	175	70	55	38	25	30	28	421	
	5	117	61	48	27	34	31	28	346	
Least Deprived Areas	6	81	65	38	30	21	36	36	307	
	7	72	52	38	24	27	24	26	263	
	8	64	55	19	23	17	31	32	241	
	9	49	31	17	22	24	28	34	205	
	10	61	43	24	21	20	27	29	225	
Total		1,218	654	446	306	289	324	331	3,568	

Table 13 backs up this analysis, showing that even when accounting for the higher numbers of children in these areas, child pedestrians from the most deprived 20% of the region are three times more likely to be injured than child pedestrians from the least deprived 20% of areas. A large difference in the rate is also reflected in other age groups.

Table 13: Comparison of Annual Pedestrian Casualty Rate per 10,000 Population between Most and Least Deprived Areas by Age Group

	0-15	16-24	25-34	35-44	45-54	55-69	70+	Total
Most Deprived 20%	8.10	5.80	3.75	2.87	2.54	2.13	2.97	4.36
Least Deprived 20%	2.62	2.46	1.69	1.33	1.07	1.02	1.74	1.65
% Difference	209%	136%	122%	117%	138%	110%	71%	165%

A common question that is raised when discussing the effect of deprivation on particularly pedestrian injuries is whether pedestrians from more deprived areas are injured by drivers from less deprived areas who were just travelling through the area. Taking the data on both the driver and pedestrian recorded on the Stats 19 record, Table 14 shows that this is not really the case, with the highest numbers of pedestrians being injured by drivers from the same deprivation decile as themselves. Further to this, drivers from the least deprived areas actually seem to be among the least likely to injure pedestrians at all, with the highest injury numbers coming from the second and third most deprived deciles.

Table 14: Total Pedestrians Injured by Cars by Pedestrian and Car Driver Deprivation Deciles

Pedestrian Deprivation Decile (NE)		Car Driver Deprivation Decile (NE)										Total	Key:
		1	2	3	4	5	6	7	8	9	10		
Most Deprived Areas ← Least Deprived Areas	1	84	47	41	31	28	34	21	25	22	25	358	Highest Numbers
	2	25	72	34	30	22	26	24	22	23	13	291	
	3	27	30	53	18	26	24	17	21	16	15	247	
	4	22	21	25	50	20	24	18	19	22	24	245	
	5	12	18	29	10	44	13	20	23	9	13	191	
	6	4	12	17	15	17	38	24	12	14	21	174	
	7	8	14	10	8	15	10	47	15	13	13	153	
	8	4	6	12	8	10	10	14	29	18	19	130	
	9	4	10	8	9	7	6	9	10	36	15	114	
	10	3	5	6	12	8	12	12	16	12	38	124	Lowest Numbers
Total		193	235	235	191	197	197	206	192	185	196	2,027	

Finally, Table 15 shows the distance that pedestrians were from their home address when they were injured. This tells us that the majority of pedestrians from all deprivation deciles were injured within a mile of their home address, with a fifth injured within 160m (effectively on their own street). When looking at the different deprivation deciles, there is a little bit of variation in the distance from home, with some of the less deprived deciles seeing higher numbers of injuries further from home.

Table 15: Pedestrian Distance from Home by Deprivation Decile

Deprivation Decile (NE)		Distance Pedestrian was from Home when Injured in Collision					Total	Key:
		0-159m	160-499m	500-1,299m	1,300-3,999m	4,000m+		
Most Deprived Areas ← Least Deprived Areas	1	158	125	136	135	62	616	Highest Numbers
	2	115	117	93	102	94	521	
	3	83	90	88	86	76	423	
	4	94	85	87	84	72	422	
	5	77	60	64	62	83	346	
	6	51	56	62	61	77	307	
	7	41	54	43	59	66	263	
	8	31	57	52	42	59	241	
	9	36	32	39	41	57	205	
	10	24	57	40	53	51	225	Lowest Numbers
Total		710	733	704	725	697	3,569	

Overall, these tables confirm that deprivation is a very important factor to consider when identifying the most likely groups of people to be injured whilst walking in the region.

Impact of Deprivation on Pedal Cyclists

Key information in this section

- There are two distinct groups of cyclists injured in the North East:
 - Children and young people from the most deprived areas
 - Middle aged people from the least deprived areas
- Cyclists from the most deprived parts of the region tend to be more likely to be injured close to their home address while cyclists from the least deprived areas are more likely to be much further away from home

Pedal cyclists see one of the largest variations in the spectrum of who is most likely to be injured, with Table 16 showing that the highest injury numbers are seen by children from the most deprived parts of the region and adults aged 45-54 from the least deprived areas.

Table 16: Pedal Cyclist Casualties by Age Group and Deprivation Decile

Deprivation Decile (NE)		Casualty Age Group							Total	Key:
		0-15	16-24	25-34	35-44	45-54	55-69	70+		
Most Deprived Areas	1	106	69	73	57	26	17	4	352	Highest Numbers
	2	85	45	61	45	41	19	3	299	
	3	55	30	36	44	33	15	3	216	
	4	57	42	44	43	31	17	3	237	
	5	49	36	50	42	42	14	4	237	
Least Deprived Areas	6	31	41	39	42	35	17	8	213	
	7	29	33	46	43	36	23	6	216	
	8	19	31	42	38	55	21	9	215	
	9	27	26	30	58	73	36	8	258	
	10	24	37	36	67	86	38	9	297	Lowest Numbers
Total		482	390	457	479	458	217	57	2,540	

This information is supported by Table 17, which shows that the risk of injury by population varies greatly for different groups, with children from the most deprived areas being over two and a half times as likely to be injured when cycling as children from less deprived areas, while adults aged 45-54 were 50% more likely to be from the least deprived parts of the region.

Table 17: Comparison of Annual Pedal Cyclist Casualty Rate per 10,000 Population between Most and Least Deprived Areas by Age Group

	0-15	16-24	25-34	35-44	45-54	55-69	70+	Total
Most Deprived 20%	3.43	3.25	3.54	3.29	1.93	0.91	0.26	2.50
Least Deprived 20%	1.22	2.09	2.71	3.85	3.87	1.37	0.47	2.13
% Difference	181%	55%	31%	-14%	-50%	-33%	-44%	17%

As with pedestrians, a common question about pedal cyclist injuries is whether cyclists are more likely to be injured by people from different areas. However, again as with pedestrians, Table 18 shows that pedal cyclists are most commonly hit by car drivers from the same or similar deprivation deciles as themselves (although there is more of a mixture than with pedestrians).

Table 18: Total Pedal Cyclists Injured by Cars by Pedal Cyclist and Car Driver Deprivation Deciles

Pedal Cyclist Deprivation Decile (NE)		Car Driver Deprivation Decile (NE)										Total	Key:
		1	2	3	4	5	6	7	8	9	10		
Most Deprived Areas ← Least Deprived Areas	1	52	14	21	22	18	17	17	14	17	13	205	Highest Numbers
	2	14	47	18	14	13	16	14	13	10	9	168	
	3	10	13	16	23	8	13	11	18	11	12	135	
	4	11	10	18	23	11	13	11	18	12	8	135	
	5	13	14	12	18	20	13	19	16	16	16	157	
	6	15	9	10	11	8	26	10	12	17	12	130	
	7	8	11	15	11	17	10	30	12	10	14	138	
	8	9	11	8	7	19	13	9	23	16	25	140	
	9	12	8	18	14	5	16	17	21	28	22	161	
	10	18	11	14	14	22	10	20	18	28	37	192	Lowest Numbers
Total		162	148	150	157	141	147	158	165	165	168	1,561	

Finally, Table 19 shows that cyclists from the most deprived areas of the region are more likely to be injured close to home, while those from less deprived areas are much more likely to be further away from home. Unfortunately, as with car drivers, the information on the type of journey that the cyclist was undertaking was inconclusive, with most being classed as being on an "other" type of journey (which includes playing in the street, longer distance recreational cycling, and cycling to visit anywhere other than their place of business/education).

Table 19: Pedal Cyclist Distance from Home by Deprivation Decile

Deprivation Decile (NE)		Distance Pedal Cyclist was from Home when Injured in Collision					Total	Key:
		0-469m	470-1,159m	1,160-2,369m	2,370-4,999m	5,000m+		
Most Deprived Areas ← Least Deprived Areas	1	98	92	78	54	30	352	Highest Numbers
	2	79	67	68	53	32	299	
	3	65	37	40	40	34	216	
	4	46	63	54	40	34	237	
	5	56	44	43	48	46	237	
	6	40	48	38	43	45	214	
	7	36	35	39	51	55	216	
	8	24	37	51	55	50	217	
	9	28	43	42	62	83	258	
	10	33	41	55	64	104	297	Lowest Numbers
Total		505	507	508	510	513	2,543	

These results are very useful in directing cycling campaigns, as they clearly show that there are two distinct groups of cyclists who are most likely to be injured in the North East. Namely these are children and young people from the most deprived areas, and middle aged people from the least deprived areas.

Impact of Deprivation on Motorcyclists

Key information in this section

- Riders of motorcycles with an engine size under 500cc tend to be aged between 16 and 24, and be from the more deprived areas of the region
- Riders of motorcycles with an engine size over 500cc are more likely to be between 25 and 54, and from areas with medium to low deprivation
- People riding smaller motorcycles tend to be much closer to home when they are injured than riders of larger motorcycles

Initial analysis on motorcyclist injuries showed that there was a noticeable difference between the types of people injured on motorcycles with an engine size of less than 500cc and those that were over 500cc. Therefore, this section has split these two sizes of motorcycles apart to display the differences.

Tables 20 and 21 show that people riding smaller engine motorcycles were predominantly aged between 16 and 24, while the highest numbers and rates of casualties were most likely to be from the more deprived population deciles. A major factor in this will be the motorcycle licencing restrictions that limit the engine size that people can use by their age, however this does not detract from the point that overall, people from the most deprived areas of the region were around two and a half times as likely to be injured on a small motorcycle than people from the least deprived areas.

Table 20: Motorcyclist (under 500cc) Casualties by Age Group and Deprivation Decile

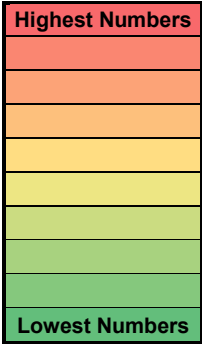
Deprivation Decile (NE)		Casualty Age Group							Total	Key: Highest Numbers Lowest Numbers
		0-15	16-24	25-34	35-44	45-54	55-69	70+		
Most Deprived Areas	1	6	77	47	18	21	4	1	174	
	2	6	93	31	17	17	10	0	174	
	3	4	93	32	16	10	8	0	163	
	4	2	77	27	18	18	8	0	150	
	5	0	60	22	16	15	5	2	120	
Least Deprived Areas	6	1	66	15	14	10	7	1	114	
	7	0	38	12	10	8	7	1	76	
	8	1	47	14	9	11	6	0	88	
	9	0	43	6	7	9	5	0	70	
	10	0	33	7	3	13	6	0	62	
Total		20	627	213	128	132	66	5	1,191	

Table 21: Comparison of Annual Motorcyclist (under 500cc) Casualty Rate per 10,000 Population between Most and Least Deprived Areas by Age Group

	0-15	16-24	25-34	35-44	45-54	55-69	70+	Total
Most Deprived 20%	0.22	4.88	2.06	1.13	1.10	0.35	0.04	1.34
Least Deprived 20%	0.00	2.51	0.53	0.31	0.54	0.20	0.00	0.51
% Difference	-	94%	287%	264%	105%	73%	-	164%

Table 22 shows the data for people injured while riding larger motorcycles with engine sizes of over 500cc. The main difference that is immediately apparent when compared to smaller motorcycles is the greater spread casualties across age group and deprivation deciles, with the greatest casualty levels being seen by people aged 45-54 from areas with a medium to low level of deprivation. Another important point is that casualties are focused in the mid ranked deciles.

Table 22: Motorcyclist (over 500cc) Casualties by Age Group and Deprivation Decile

Deprivation Decile (NE)		Casualty Age Group							Total	Key: 
		0-15	16-24	25-34	35-44	45-54	55-69	70+		
Most Deprived Areas	1	0	12	15	11	16	2	0	56	
	2	2	9	16	19	16	14	1	77	
	3	1	9	23	23	22	12	1	91	
	4	0	9	18	11	26	5	2	71	
	5	1	11	18	25	19	14	1	89	
Least Deprived Areas	6	0	10	19	20	20	14	1	84	
	7	0	6	23	26	32	19	2	108	
	8	0	9	12	8	27	17	2	75	
	9	1	4	18	19	23	13	0	78	
	10	0	5	13	20	11	17	4	70	
Total		5	84	175	182	212	127	14	799	

Looking at the annual injury rates per 10,000 population in Table 23, there are not the large disparities that are apparent for 16-24 year old users of smaller motorcycles shown in Table 21. While initially there appear to be a few large percentage differences in the rates for some age groups in Table 23, the actual numbers are very small, meaning that the actual differences between the age and deprivation groups are relatively minor.

Table 23: Comparison of Annual Motorcyclist (over 500cc) Casualty Rate per 10,000 Population between Most and Least Deprived Areas by Age Group

	0-15	16-24	25-34	35-44	45-54	55-69	70+	Total
Most Deprived 20%	0.04	0.60	0.82	0.96	0.92	0.40	0.03	0.51
Least Deprived 20%	0.02	0.30	1.25	1.20	0.82	0.55	0.11	0.57
% Difference	51%	101%	-35%	-20%	12%	-28%	-68%	-10%

Finally, Tables 24 and 25 show the distance from home that motorcyclists were when they were injured. Again there are differences apparent between the two motorcycle size categories, with riders of smaller engine machines tending to be fairly close to their home address, while riders of larger motorcycles saw much more of a spread of distances across all distances from home. This shows the influence of leisure riding on these figures.

Table 24: Motorcyclist (under 500cc) Distance from Home by Deprivation Decile

Deprivation Decile (NE)		Distance Motorcyclist (<500cc) was from Home when Injured in Collision						Total	Key:
		0-749m	750-1,699m	1,700-3,349m	3,350-7,599m	7,600m+			
Most Deprived Areas ← Least Deprived Areas	1	48	54	28	21	25	176	Highest Numbers	
	2	35	52	30	30	24	171		
	3	39	23	30	36	38	166		
	4	28	23	38	33	26	148		
	5	19	20	25	28	29	121		
	6	29	17	21	31	19	117		
	7	15	12	16	12	22	77		
	8	10	16	23	16	22	87		
	9	9	11	15	18	18	71		
	10	5	10	15	13	19	62	Lowest Numbers	
Total		237	238	241	238	242	1,196		

Table 25: Motorcyclist (over 500cc) Distance from Home by Deprivation Decile

Deprivation Decile (NE)		Distance Motorcyclist (>500cc) was from Home when Injured in Collision					Total	Key:
		0-1,699m	1,700-4,499m	4,500-9,699m	9,700-24,999m	25,000m+		
Most Deprived Areas ← Least Deprived Areas	1	19	17	9	6	3	54	Highest Numbers
	2	21	19	14	14	7	75	
	3	17	17	18	22	15	89	
	4	13	14	17	11	12	67	
	5	15	20	17	17	23	92	
	6	20	17	14	18	15	84	
	7	23	17	21	22	25	108	
	8	8	16	19	17	18	78	
	9	10	13	21	16	19	79	
	10	17	10	9	17	21	74	Lowest Numbers
Total		163	160	159	160	158	800	

Therefore, there is a clear split between the types of people injured using smaller engine motorcycles and those using larger engine machines, with riders of smaller bikes tending to be young adults from the more deprived areas of the region, while those riding larger motorcycles tending to be older from areas of medium to low deprivation.

Impact of Deprivation on Bus Passengers

Key information in this section

- Older people from more deprived areas are the most likely to be injured on buses
- Across all age groups, people from more deprived areas are much more likely to be injured as a bus passenger than people from the least deprived parts of the region

Table 26 shows that the main age group of bus passenger casualties are people over the age of 55 and in particular over 70, with older people from the mid to most deprived areas accounting for higher casualty numbers than those from the less deprived areas. There are also higher levels of children from the mid to most deprived areas injured

Table 26: Bus Passenger Casualties by Age Group and Deprivation Decile

Deprivation Decile (NE)		Casualty Age Group							Total	Key: Highest Numbers Lowest Numbers
		0-15	16-24	25-34	35-44	45-54	55-69	70+		
Most Deprived Areas	1	36	21	22	16	19	40	50	204	
	2	26	26	22	26	20	36	65	221	
	3	50	20	26	18	27	37	49	227	
	4	31	11	18	13	22	48	53	196	
	5	36	16	13	19	15	39	39	177	
Least Deprived Areas	6	17	10	10	8	18	29	51	143	
	7	11	8	7	9	5	40	42	122	
	8	11	8	10	5	10	33	38	115	
	9	5	9	6	3	11	21	39	94	
	10	5	4	1	6	7	17	37	77	
Total		228	133	135	123	154	340	463	1,576	

Table 27 backs up the information in Table 26, but also shows that older people actually see the lowest difference between the most and least deprived 20% of the population in terms of the rate of casualties per year, as unlike other user groups for this combination of mode and age range, the casualties are quite widely spread across the deprivation deciles. However the overall rates show that across all age groups, injury is over three times as likely for the most deprived areas of the region as the lowest, however as bus patronage is higher for people from more deprived areas then this is not a surprise.

Table 27: Comparison of Annual Bus Passenger Casualty Rate per 10,000 Population between Most and Least Deprived Areas by Age Group

	0-15	16-24	25-34	35-44	45-54	55-69	70+	Total
Most Deprived 20%	1.11	1.35	1.16	1.35	1.12	1.93	4.20	1.63
Least Deprived 20%	0.24	0.43	0.27	0.28	0.44	0.70	2.09	0.66
% Difference	365%	216%	326%	389%	158%	175%	101%	149%

Overall, bus passenger casualties are most likely to be older people from more deprived parts of the North East, although there are also much higher casualty rates of people from all age groups from the most deprived areas of the region compared to the least deprived.

Impact of Deprivation on Goods Vehicle Occupants

Key information in this section

- Goods vehicle occupants injured in collisions tend to be from areas of medium to high deprivation
- The majority of goods vehicle occupants were aged between 25 and 54, but the largest group were those aged between 45 and 54

As goods vehicles are used primarily for business travel, we see much higher numbers of drivers and passengers injured in goods vehicle who are of working age, and in particular people aged between 25 and 54. In terms of deprivation, goods vehicle occupants are most likely to come from areas with medium to high levels of deprivation, but the main focus is around the third to sixth highest deciles.

Table 28: Goods Vehicle Occupant Casualties by Age Group and Deprivation Decile

Deprivation Decile (NE)		Casualty Age Group							Total	Key: Highest Numbers Lowest Numbers
		0-15	16-24	25-34	35-44	45-54	55-69	70+		
Most Deprived Areas	1	2	9	22	25	20	14	0	92	
	2	1	13	20	30	19	13	1	97	
	3	2	10	28	24	38	15	2	119	
	4	1	15	23	27	32	13	0	111	
	5	0	12	26	29	21	11	2	101	
Least Deprived Areas	6	3	14	24	23	35	9	0	108	
	7	0	14	23	17	18	20	2	94	
	8	1	5	13	21	21	14	1	76	
	9	0	7	14	11	17	15	1	65	
	10	0	8	12	11	13	10	0	54	
Total		10	107	205	218	234	134	9	917	

Whilst the information on the rate of goods vehicle occupant casualties in Table 29 is useful, we can see from Table 28 above that the main cluster of injuries tends to be focused around people in the mid, but not most deprived deciles. Table 29 shows that people from the most deprived areas are more likely than those from the least deprived to be injured in a collision as a goods vehicle occupant, however, as exemplified in Table 28, the main deciles to focus on are those between these two extremes.

Table 29: Comparison of Annual Goods Vehicle Occupant Casualty Rate per 10,000 Population between Most and Least Deprived Areas by Age Group

	0-15	16-24	25-34	35-44	45-54	55-69	70+	Total
Most Deprived 20%	0.05	0.63	1.11	1.77	1.13	0.68	0.03	0.73
Least Deprived 20%	0.00	0.50	1.06	0.68	0.73	0.46	0.03	0.46
% Difference	-	27%	5%	161%	54%	48%	24%	59%

Overall, goods vehicle occupants injured in collisions tend to be aged between 25 and 54 and from areas of mid to high deprivation.

Communications Framework

Key information in this section

- Table 30 shows the best methods to target interventions at different population deciles
- Most people in the region prefer to be contacted by e-mail, own a smartphone, use the internet daily and have an active Facebook account

The final section of this report provides suggestions for how best to contact road users in each IMD decile when developing road safety interventions. By taking the postcodes associated with each LSOA by deprivation decile, we can use the Mosaic public sector profiling package to highlight the types of communication that people from different deciles are the most receptive to, as well as a several other communication opportunities. These results are displayed in Table 30 below.

When reading the information in this table there are two things to consider. The first is that the coloured numbers are based on an index, with 100 being the same as the regional average, while higher numbers mean that this measure is over-represented and lower numbers being under-represented. The second thing to bear in mind is the regional average percentages in the bottom row, which show the average percentages of each of the measures. Therefore, these two things together show, for example, that people from the most deprived areas are much more receptive to communication on the phone, but that this method is only preferred by a very small minority of people compared to communication by e-mail.

Table 30: Population Profile of the North East by Deprivation Decile

Deprivation Decile (NE)		Overall Channel Preference						Technology					Confidence in local police overall - Agree/Strongly Agree	Visits to GP	Alcohol consumption away from home
		E-mail	Post	Face to Face	Landline	SMS	Mobile call	Smartphone owned	Internet used several times a day	Facebook used every/most days	Twitter used every/most days	Online content/video viewed at least weekly			
Most Deprived Areas ← Least Deprived Areas	1	100	105	104	133	118	126	107	99	110	107	107	93	111	77
	2	99	103	105	125	108	126	103	99	106	102	103	95	111	81
	3	99	101	104	111	104	115	100	99	103	99	101	97	107	87
	4	98	102	105	107	102	109	98	99	101	98	100	98	105	91
	5	99	99	103	96	98	96	98	99	99	97	99	100	102	98
	6	100	99	101	86	81	77	92	101	95	91	96	102	98	103
	7	100	100	100	79	77	61	92	101	93	90	96	102	94	109
	8	100	100	97	81	84	70	93	101	91	91	96	104	93	115
	9	101	99	95	80	83	68	95	102	90	92	96	105	90	122
	10	101	99	88	78	89	74	95	103	87	92	96	107	88	128
Regional Average		58%	16%	5%	2%	2%	1%	71%	68%	59%	21%	61%	73%	56%	33%

This information can now be applied to the results in the rest of the report to show the most appropriate methods to target interventions at different population deciles. For example, if an intervention was planned to target motorcyclists on bikes with an engine size of over 500cc, then as Tables 22 and 25 show that it is people from the 7th IMD decile who are most likely to be injured, then Table 30 tells us the following:

- Any form of individual or personal communication with these road users should primarily be conducted by e-mail. This could be achieved by acquiring mailing lists from motorcycle clubs, motorcycling magazines, or health advocates.
- This decile are less likely than average to have a smartphone, and use Facebook and Twitter, meaning that more focus should be given to developing a dedicated webpage, multimedia e-mail or press release to advertise any intervention
- People from the 7th decile generally have a higher level of confidence in local police than average, meaning that having the police featured in a campaign will help the message rather than make them avoid it
- While people from this decile are less likely to visit a GP on a regular basis, they are much more likely to drink alcohol away from home, the actual numbers represented by these figures show that printed materials should be fairly evenly distributed between both GP's surgeries and in pubs and restaurants

The overall advice that this information gives is that the best method to use when developing road safety campaigns is electronic materials. People in the region as a whole prefer to be contacted by e-mail with information rather than any other method. Most people in the North East own a smartphone, use the internet daily and have an active Facebook account, so these facts should be considered when developing content for an intervention.