DEPRIVATION AND CHILD PEDESTRIAN ROAD CASUALTIES IN NORTHERN IRELAND

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1. THE COMMISSION

Colin Buchanan was commissioned by the Department of the Environment's Road Safety Division to:

- carry out a systematic literature review of recent (last 10 years) published and unpublished key research relevant to the project (UK or Irish only)
- carry out a 10 year analysis of available PSNI casualty data for child pedestrian casualties aged 0-15 years
- determine whether or not there is evidence suggesting a link between child pedestrian casualties in NI and the deprivation of the area (as measured by the Northern Ireland Multiple Deprivation Measure (NIMDM) in which the collisions occurred, and:
  - if there is evidence suggesting a link then a statistical model should be developed to measure the effect of deprivation, taking account of environmental factors. The reliability of this model should be assessed
  - if there is no evidence of a link then outline the reasons why this might be the case (i.e. any data issues or NI-specific factors which mean that the deprivation effect is not as prevalent here as in the rest of the UK).

The study was based on demographic and infrastructure data for each of the 890 Census Super Output Areas (SOAs) and road collision data for the period 1999-2008 supplied by the Police Service of Northern Ireland (PSNI).

The road collision data comprised records for 64,651 collisions involving 109,385 casualties of which 8,829 were pedestrians. The number of child pedestrian casualties was 3,235.

In addition to the ten year dataset, a two year dataset was provided by the PSNI for the period April 2007 – March 2009 (inclusive). Postcode information relating to casualties has been recorded by the PSNI since April 2007. This allowed an analysis to take place of how the location of collision and location of residence of the casualty are distributed and whether or not – for the ten year data – the location of collision could be used as a proxy for location of residence of the casualty.

2. LITERATURE REVIEW

The literature review of research indicated a strong link between deprivation and child pedestrian rates. A few of the studies had been undertaken using the same collision data for England and drew very similar conclusions: these –

although self-supporting - could not be viewed as being wholly independent of each other. Other research projects where independent STATS19 data sources for Welsh and Scottish collisions were reviewed together with some hospital admission data for Scotland, Wales and Northern Ireland. These projects reported strong links between deprivation and casualty rates. Other points emanating from the review of relevance the study included

- the risk of serious injury or death in a road collision increases with increasing deprivation
- the individual factors which make up an index of multiple deprivation are also linked to child pedestrian casualty rates but with different statistical relationships
- other variables, such as population, road infrastructure, employment density, weather (rainfall and sunshine hours) are also found to be linked to child pedestrian casualty rates
- some research indicated that it is acceptable to use location of accident as a proxy for place of residence for child pedestrian casualties.

3. DATA SOURCES

Road collision casualty data were provided by the PSNI. The data covered the period January 1999 to March 2009 (inclusive).

The population data used were those relating the 2001 Northern Ireland Census. The data were downloaded from the Northern Ireland Statistics and Research Agency (NISRA) website.

Deprivation data relating to the Multiple Deprivation Measure (MDM) for 2005 were downloaded from the Northern Ireland Statistics and Research Agency (NISRA) website.

An urban rural classification (URDG) at the SOA level was obtained through a web link from a NISRA file which contained a two level factor (U = urban and R = rural).

Road infrastructure data were provided by the Department for Regional Development's (DRD) Roads Services from their digitised road network database. Infrastructure data were obtained at the SOA level which comprised:

- road length by road type (Motorway, A Class, B Class, C Class and Unclassified)
- number of junctions (i.e. nodes on the digitised network with three or more attached road links).

In addition, the following Census 2001 data were also sourced from NISRA:

- People in employment (the number of SOA residents in employment)
- Workplace population (the number of people with jobs within the SOA)
- Car ownership
- Household tenure.

School pupil and free school meal data for 2008/2009 were provided in Excel format by the Statistics and Research Branch of the Department of Education.

Weather data were provided by the Met Office following a specific request for the information. The data are:

- annual rainfall measurements (mm) for thirty weather stations in Northern Ireland (1999 -2008)
- annual sunshine hours (hrs) for eleven weather stations in Northern Ireland (1999 -2008).

A number of composite variables were created as functions of the data compiled for the study. These composite variables match in a number of instances variables used in research outlined in the literature review. These composite variables included:

- Traffic proxy: this variable is designed to provide a proxy for travel activity levels in each SOA and is a function of the two variables:
  - people in employment
  - workplace population

  taking the form:

  traffic proxy = $\sqrt{}$(people in employment * workplace population)
- Road length per hectare
- Junctions per road km
- Junctions per hectare
- Resident population per road junction
- Employed residents per road junction
- Workplace population per road junction.

4. TEN YEAR ANALYSIS

The key purpose of the ten year analysis (calendar years 1999 – 2008) was to establish if a link existed between deprivation and child pedestrian casualty rates.

4.1 Use of SOA of Collision as a Proxy for SOA of Residence

In Northern Ireland postcode information relating to the addresses of the driver and casualty have been recorded since 1 April 2007. Before that time it was not possible to identify the place of residence of a casualty. To establish if it was reasonable to assume that the deprivation measure (MDM) assigned to a casualty was the MDM relating to the location of the collision, an analysis of the most recently available 2 years of data (1 April 2007 – 31 March 2009) was conducted. This analysis compared the MDM for SOA of the collision with the SOA of the casualty postcode for child pedestrian casualties.

The results of the analysis indicated that:

- for 81% of all child pedestrian casualties the use of location of collision provides the same or similar (within 2 deciles) deprivation score that would be assigned from location of residence
- the differences between casualty rates based on location of collision and location of residence are:
  - generally low
  - not biased in relation to deprivation decile

The conclusion was that the use of location of collision as a proxy for location of residence is very unlikely to skew results to an extent that would substantially impact on the robustness of the findings of the study. Accordingly the analysis of the ten year data continued with the use of the SOA of collision as a proxy for the SOA of residence of the injured child pedestrian.

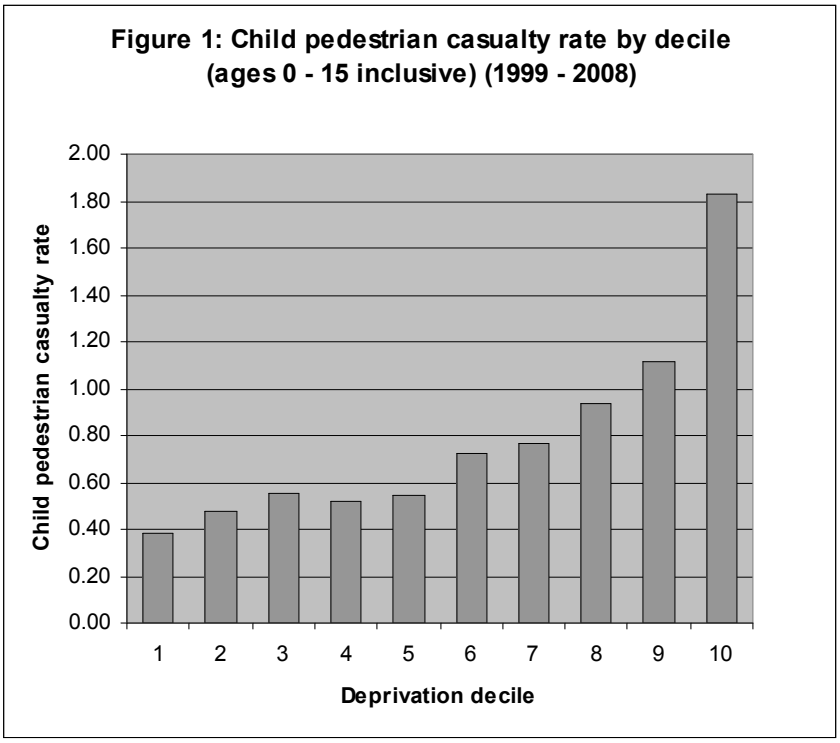
4.2 Relationship between Deprivation and Child Pedestrian Casualty Rates

A top level analysis identified a clear and highly statistically significant link between deprivation and child pedestrian casualty rates. The MDM values were stratified into ten deciles (numbered 1 – 10 with 1 = the most affluent and 10 = most deprived).

Casualty rates are expressed as the average annual casualty numbers divided by the population (in thousands) to provide an average annual number of casualties per 1,000 population for the ten year period, viz:

$$\frac{\text{(10 year casualty total)/10}}{\text{population/1,000}}$$

Figure 1 shows the casualty rates for all children (ages 0 –15) by deprivation decile. A clear relationship between the variables is evident. Children in the most deprived areas being 4.8 times more likely to be injured as a child pedestrian than a child resident in the most affluent areas.



These high level results hide differences between the sexes and age groups. For example, Figure 2 shows the same data as used in Figure 1 but stratified by sex. It is clear that female rates are lower than those for males for all ages but that the disparities between the rates for deciles 1 and 10 are 4.5 and 5.3 for males and females respectively.

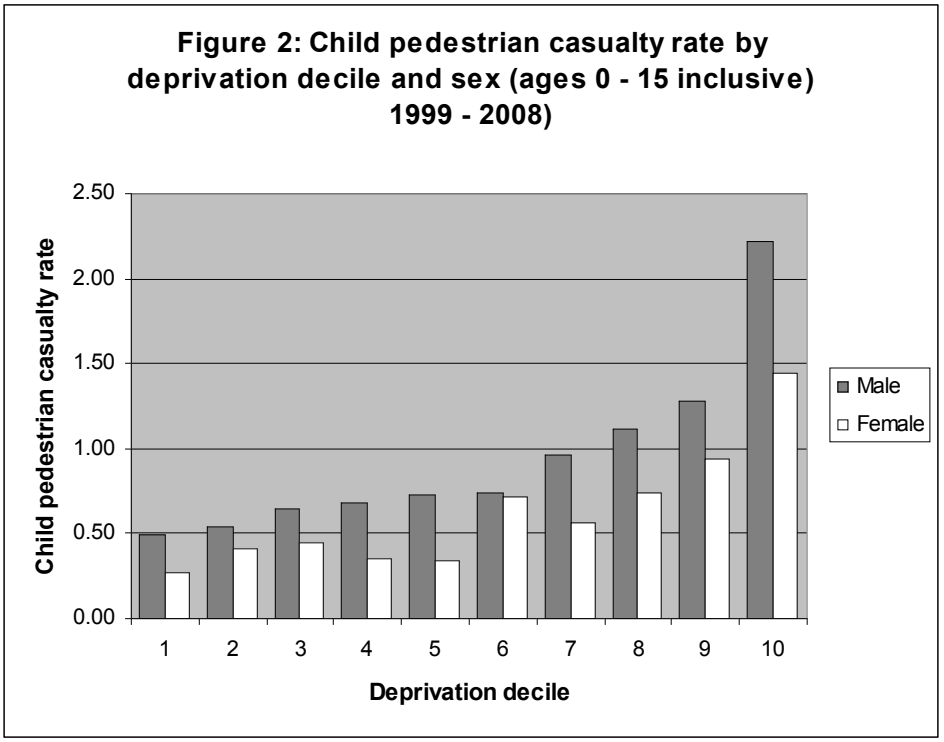
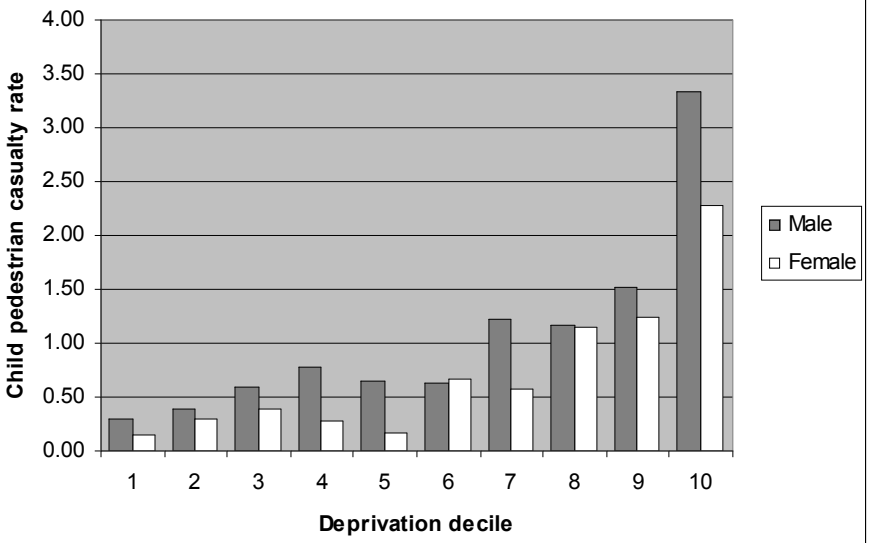


Figure 3 shows a similar tabulation for children in the 5 – 7 age group. The rates are higher for this age group. In addition, the disparities between deciles 1 and 10 are also higher with male and female children resident in the most deprived areas being 11 and 15 times respectively more likely to be injured as a child resident in the most affluent areas.

Figure 3: Child pedestrian casualty rate by deprivation decile and sex (ages 5 to 7 inclusive) (1999 - 2008)



Having established the link, the next phase of the research was to seek to understand the nature of the link and to determine if a statistical model could be constructed to explain the variations in casualty rates.

4.3 Domains of the Multiple Deprivation Measure

The multiple deprivation measure (MDM) adopted for the study (source: NISRA) is itself a weighted function of seven separate (domain) scores relating to:

- Income
- Employment
- Health
- Education
- Proximity to Services
- Crime
- Living environment.

An analysis of the correlations between the domain scores and the overall MDM value indicated that the Crime and Proximity to Services domains were not well explained by the MDM value and it was thought sensible to use these domain values individually as potential explanatory variables in the model.

4.4 Variables taken forward into the Modelling Process

The list of potential variables was examined for intercorrelations between variables which if allowed to be present in a model could cause significant analysis problems. In general terms it is widely accepted as good practice that there is a virtue in the parsimonious use of independent variables to keep models practical and simple.

Where there is strong intercorrelation between independent variables a statistical model does not need both of these variables in order to explain the dependent variable. It can happen that one of the independent variables will be eliminated from the regression and it can often be that it is the wrong variable. This is usually called "nonsense-elimination".

The examination and resulting removal of certain variables resulted in the assembly of a datset which stratified the population and casualty data by 7 age groups for females, males and both sexes combined to provide 21 stratifications. The age groups are:

- Preschool children (ages 0 – 4)
- Infant/early primary (ages 5 – 7)
- Primary (ages 8-11)
- Secondary/post primary (ages 12 – 15)
- All children (ages 0 – 15)
- Young adult (ages 16 – 24)
- Adults (ages 25 and over).

Each of the stratifications was linked to a set of variables as set out in Table 1.

Table 1: List of Variables

Variable	Variable type
Population (by age group and sex)	number
Pedestrian casualty total (by age group and sex)	number
Local Government District	factor
URDG classification	factor
Population density per	number
School places (by age groups: 5-7, 8–11 and 12-15)	number
MDM Score	number
MDM Crime domain score	number
MDM Proximity to Services domain score	number
Workplace employment	number
Employed residents	number
Traffic proxy	number
Road length (by M, A, B, C and unclassified roads)	number
Total road length (all road classes combined)	number
Road length density (km of road per hectare)	number
Number of road junctions	number
Junctions per km (junctions per km of road)	number
Junctions per hectare	number
Traffic proxy per road km	number
Traffic proxy per road junction	number
Average annual rainfall (mm)	number
Average annual sunshine hours	number
Free school meals – primary	number
Free school meals – post primary	number
Free school meals – primary and post-primary	number
Resident population per road junction	number
Employed residents per road junction	number
Workplace population per road junction	number

4.5 Fitting the Models

The models were fitted in a systematic way by adding and removing variables in an incremental manner. An example of this is shown below in Figure 4.

Figure 4A shows the relationship between MDM decile and pedestrian casualty rates; although the relationship is highly statistically significant the overall fit is poor. This would not be a good model to use for predictive purposes.

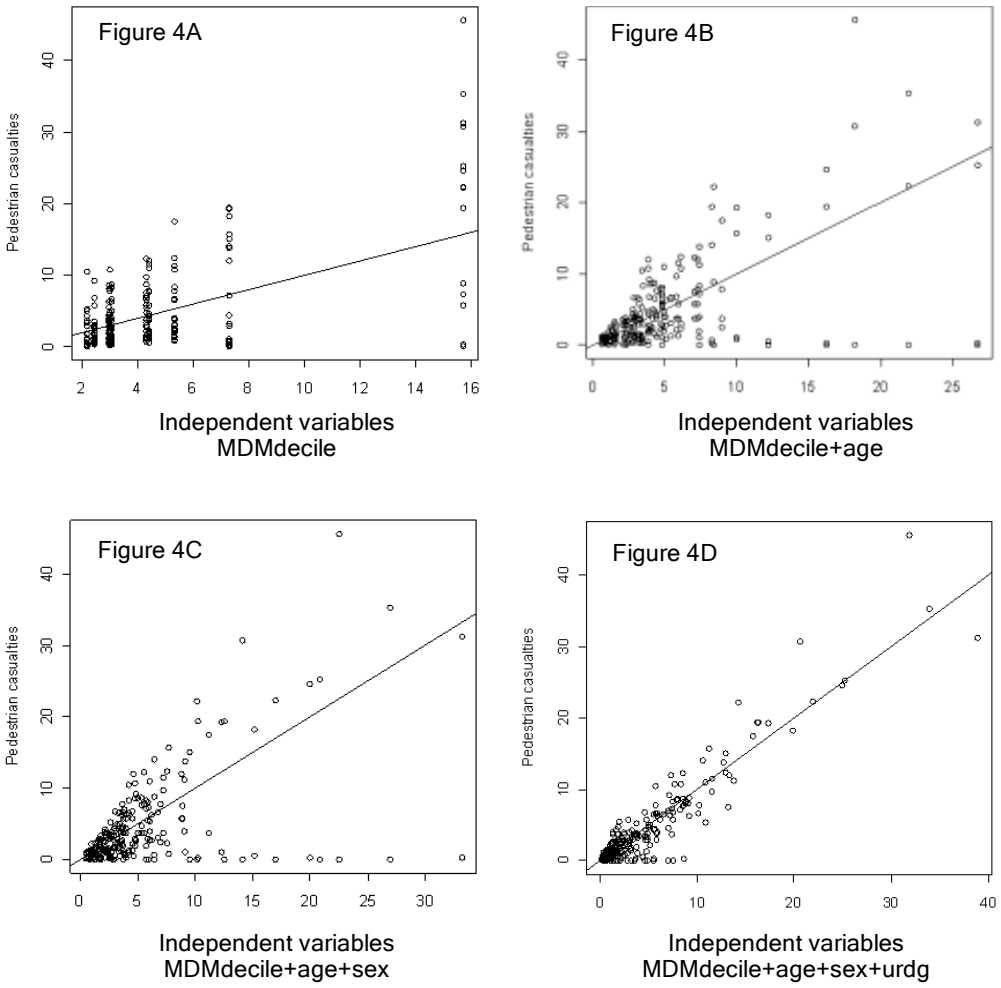
Figure 4B shows the same relationship (as in Figure 4A) with age added to the equation where it can be seen that the fit is better than it is for MDM decile alone, a number of outliers can be observed particularly where the observed number of casualties is low.

Figure 4C shows the same relationship (as in Figure 4B) with sex added where it can be seen that although sex is a significant factor, the fit is not

observably better than it is for MDM decile and age. There remain a number of outliers particularly where the observed number of casualties is low.

Figure 4D shows the same relationship (as in Figure 4C) with URDG (urban/rural classification) added where it can be seen that the inclusion of the URDG classification factor improves the fit measurably.

Figure 4: Modelled and Observed Child Pedestrian Casualty Totals



Following this process with the whole set of potential variables a final model was developed and used to predict the number of child pedestrian casualties in each SOA.

The model structure adopted for the study was a negative binomial model with log(population) defined as an offset variable. The R package[1] was used to undertake the work.

The final model fitted by this process included eight independent variables:

- MDM Score
- MDM Crime domain
- MDM Proximity to Services domain

- Traffic proxy
- School places
- Sunshine hours
- Annual Rainfall
- URDG classification.

Table 2 summarises the significance of the variables in explaining casualty numbers by sex and age group. It can be seen that:

- The MDM score is a consistent and highly significant positively correlated variable across all age groups and sexes – the more deprived the SOA, the greater the casualty rate
- The MDM Crime domain score is a consistent and highly significant positively correlated variable across all age groups and sexes – the more crime related to the SOA the greater the casualty rate
- The MDM Proximity to Services domain score is a consistent and highly significant inversely correlated variable across all age groups and sexes – the more deprived the SOA is in terms of proximity to services related to the SOA the greater the casualty rate
- The traffic proxy variable which provides a relative measure of travel activity in the SOA is a consistent and highly significant positively correlated variable across all age groups and sexes – the more activity there is in the SOA, the greater the casualty rate
- The number of school places is a consistent and highly significant positively correlated variable for about half of the models – the more school places, the greater the casualty rate
- Sunshine hours is seen to be a highly significant generally positively correlated variable in the models for most child age groups – the greater the number of sunshine hours, the higher the casualty rate
- Like sunshine hours, annual rainfall is seen to be a highly significant generally positively correlated variable in the models for most child age groups – the greater rainfall, the higher the casualty rate
- URDG classification is generally positively correlated with child casualty rates and generally inversely correlated with adult casualty rates.

Table 2: Significance of coefficients for pedestrian casualties in all areas (urban and rural combined) by age and sex

Age Group	Sex	(Intercept)	MDM Score	MMD Crime	MDM Proximity	Traffic proxy	School places	Sunshine hours	Annual Rainfall	URDG classification
Child (0-15)	Both	0.001(+)	0.001(+)	0.001(+)	0.001(-)	0.001(+)	0.001(+)	0.001(-)	0.05(-)	0.05(+)
	Female	NS	0.001(+)	0.001(+)	0.001(-)	0.001(+)	0.001(+)	0.001(-)	0.001(-)	NS
	Male	NS	0.001(+)	0.001(+)	0.001(-)	0.001(+)	0.001(+)	0.05(-)	NS	0.05(+)
Child (0-4)	Both	NS	0.001(+)	0.001(+)	0.001(-)	0.001(+)	0.001(+)	0.001(-)	0.01(-)	NS
	Female	NS	0.001(+)	NS	0.001(-)	0.05(+)	0.001(+)	0.001(-)	NS	NS
	Male	NS	0.001(+)	0.001(+)	0.001(-)	0.01(+)	0.001(+)	0.01(-)	0.001(-)	0.05(+)
Child (5-7)	Both	NS	0.001(+)	0.01(+)	0.001(-)	NS	0.001(+)	0.001(-)	0.001(-)	0.001(+)
	Female	NS	0.001(+)	0.01(+)	NS	NS	0.001(+)	0.001(-)	0.01(-)	0.001(+)
	Male	NS	0.001(+)	NS	0.001(-)	0.05(+)	0.001(+)	0.01(-)	NS	NS
Child (8-11)	Both	0.05(-)	0.001(+)	0.001(+)	0.001(-)	0.001(+)	0.001(+)	NS	NS	NS
	Female	0.001(-)	0.001(+)	0.01(+)	0.001(-)	0.001(+)	0.001(+)	0.05(+)	NS	NS
	Male	NS	0.001(+)	0.001(+)	0.001(-)	0.01(+)	0.001(+)	0.01(-)	NS	0.01(+)
Child (12-15)	Both	0.05(-)	0.001(+)	0.001(+)	0.001(-)	0.001(+)	0.001(+)	NS	NS	NS
	Female	NS	0.001(+)	0.001(+)	0.001(-)	0.001(+)	0.001(+)	0.05(-)	0.05(-)	NS
	Male	0.001(-)	0.001(+)	0.001(+)	0.001(-)	0.001(+)	0.001(+)	NS	NS	NS
Young adult (16-24)	Both	0.001(-)	0.001(+)	0.001(+)	0.001(-)	0.001(+)	0.001(+)	0.001(+)	0.001(+)	0.001(-)
	Female	0.001(-)	0.001(+)	0.001(+)	0.001(-)	0.001(+)	0.001(+)	0.01(+)	0.01(+)	NS
	Male	0.001(-)	0.001(+)	0.001(+)	0.001(-)	0.001(+)	0.001(+)	0.001(+)	0.001(+)	0.001(-)
Adult (25 and over)	Both	NS	0.001(+)	0.001(+)	0.001(-)	0.001(+)	0.001(+)	NS	NS	0.001(-)
	Female	0.001(-)	0.001(+)	0.001(+)	0.001(-)	0.001(+)	0.001(+)	NS	NS	0.001(-)
	Male	NS	0.001(+)	0.001(+)	0.001(-)	0.001(+)	0.001(+)	NS	0.05(-)	0.001(-)
All	Both	0.001(+)	0.001(+)	0.001(+)	0.001(-)	0.001(+)	0.001(+)	NS	NS	0.001(-)
	Female	NS	0.001(+)	0.001(+)	0.001(-)	0.001(+)	0.001(+)	NS	NS	0.001(-)
	Male	0.001(+)	0.001(+)	0.001(+)	0.001(-)	0.001(+)	0.001(+)	NS	NS	0.001(-)

The cell values relate to the level of statistical significance of the coefficient modelled (NS means “not significant”)

The plus or minus sign in the brackets following the level of statistical significance indicates the sign attached to the coefficient. (eg the “+” for MDM score means that the higher the score the higher the number of casualties modelled.

4.6 Using the Model

Having developed the model it was used to calculate the number of child pedestrian casualties in each SOA. This value could be compared with the observed number to determine the performance of an SOA in terms of relative safety. The performance measure was defined as the:

observed casualty total – estimated casualty total

Where the performance measure is positive this represents an increase in casualty totals. Conversely, where the number is negative this represents a decrease in casualty totals. The poorest and best performing SOAs were identified and tabulated as a source of information to assist in understanding any systematic explanation for their distribution. Tables 3 and 4 shows the 25 poorest and 25 best performing SOAs respectively as an example of the outputs generated.

Table 3: 25 poorest performing SOAs in terms of child pedestrian casualties

SOA Code	Local Government District	SOA Name	Observed (O)	Modelled (M)	Residual (O-M)
95MM12S3	Derry	Crevagh_3	16	3.3	12.7
95GG01S2	Belfast	Andersonstown_2	20	7.6	12.4
95GG44S2	Belfast	The Mount_2	24	11.6	12.4
95GG18S2	Belfast	Clonard_2	23	10.8	12.2
95BB06W1	Ards	Central_Ards	24	12.8	11.2
95SS06S3	Lisburn	Collin Glen_3	17	7	10
95GG17S2	Belfast	Cliftonville_2	15	5.5	9.5
95GG22S1	Belfast	Falls Park_1	21	11.5	9.5
95II05S2	Castlereagh	Carryduff East_2	12	2.7	9.3
95NN07S2	Down	Cathedral_2	15	6.3	8.7
95XX05W1	North Down	Bangor Castle	17	8.5	8.5
95GG29S2	Belfast	Island_2	16	7.8	8.2
95KK04W1	Cookstown	Gortalowry	11	2.9	8.1
95SS06S1	Lisburn	Collin Glen_1	12	4	8
95GG25S1	Belfast	Glen Road_1	17	9.1	7.9
95DD08W1	Ballymena	Castle Demesne	16	8.2	7.8
95WW18W1	Newtownabbey	Hightown	11	3.8	7.2
95GG28S2	Belfast	Highfield_2	12	4.8	7.2
95GG06S2	Belfast	Ballysillan_2	11	3.9	7.1
95GG05S1	Belfast	Ballynafeigh_1	13	6.1	6.9
95VV18S1	Newry and Mourne	Kilkeel Central_1	9	2.2	6.8
95ZZ14S2	Strabane	South_2	9	2.4	6.6
95GG31S3	Belfast	Ladybrook_3	12	5.5	6.5
95GG27S2	Belfast	Glencolin_2	12	5.6	6.4
95GG48S1	Belfast	Whiterock_1	15	8.7	6.3

An examination of this poorest performing list might reveal similarities between the SOAs identified and might suggest a systematic explanation for

the poor performance. If such an explanation was identified, appropriate remedial measures could be initiated.

Table 4: 25 best performing SOAs in terms of child pedestrian casualties

SOA Code	Local Government District	SOA Name	Observed (O)	Modelled (M)	Residual (O-M)
95GG19S2	Belfast	Crumlin_2	6	19.6	-13.6
95GG40S2	Belfast	Shankill_2	10	23.1	-13.1
95GG47S1	Belfast	Water Works_1	20	32	-12
95PP09W1	Fermanagh	Devenish	2	13.2	-11.2
95GG39S3	Belfast	Shaftesbury_3	4	13.1	-9.1
95GG20S1	Belfast	Duncairn_1	13	21.3	-8.3
95GG21S2	Belfast	Falls_2	14	22.2	-8.2
95MM27S1	Derry	Strand_1_Derry	11	18.7	-7.7
95VV28S2	Newry and Mourne	St Patrick's_2	1	8	-7
95GG04S3	Belfast	Ballymacarrett_3	8	14.8	-6.8
95MM27S2	Derry	Strand_2_Derry	1	7.1	-6.1
95GG29S1	Belfast	Island_1	5	10.9	-5.9
95MM08S1	Derry	Clondermot_1	1	6.5	-5.5
95LL13S2	Craigavon	Drumgor_2	5	10.3	-5.3
95GG35S1	Belfast	New Lodge_1	16	21.3	-5.3
95GG35S2	Belfast	New Lodge_2	12	17.2	-5.2
95GG12S4	Belfast	Botanic_4	5	10.1	-5.1
95GG04S1	Belfast	Ballymacarrett_1	5	10	-5
95LL09S2	Craigavon	Court_2	4	8.8	-4.8
95GG19S1	Belfast	Crumlin_1	9	13.8	-4.8
95GG39S2	Belfast	Shaftesbury_2	15	19.8	-4.8
95GG07S3	Belfast	Beechmount_3	3	7.7	-4.7
95GG51S1	Belfast	Woodvale_1	2	6.7	-4.7
95RR03W1	Limavady	Coolessan	4	8.7	-4.7
95ZZ16S2	Strabane	West_2	0	4.6	-4.6

In looking through this best performing list it may be possible to identify why casualty rates are lower than expected and this might point to the effectiveness of existing interventions and policies which were implemented in these areas.

5. CONCLUSIONS OF THE STUDY

5.1 The link between Deprivation and Child Pedestrian casualty Rates

The modelling process established a clear link between deprivation and child pedestrian road casualty rates. The effect is found to be relative to the degree of deprivation with child pedestrian casualty rates rising as deprivation rises.

Overall, children resident in SOAs comprising the most deprived 10% of SOAs are 4.8 times more likely to be injured as a pedestrian in a road collision as children resident in the least deprived 10% of SOAs.

The statistical modelling carried out has shown that key variables relating to how busy an area is, proximity to services, crime and number of school places are linked to the child pedestrian casualty rates. Other variables - weather conditions, URDG classification and local government district are also linked but less robustly to casualty rates.

The reliability of the model was good with very high levels of consistency across the age groups and sexes for the key variables with moderate consistency for the other variables.

5.2 Implications for road safety planning

The modelling process highlighted a number of key implications relating to road safety planning.

The key finding is that there is a clear link between deprivation and child pedestrian casualty rates in Northern Ireland. From a road safety planning point of view this would strongly suggest that road safety initiatives should target or at least be prioritised in part on areas of deprivation

The number of school places in an SOA (as a proxy for the number of children travelling to and from a school in that area as opposed to the number of children living in the area) is a consistent and highly significant variable. This suggests that the presence of schools adds significant additional risk for children. This perhaps not surprising as most children will attend school just under 200 days a year and many will travel as pedestrians either alone or accompanied by an adult. The model, however, shows quantitatively that there is a highly significant additional risk. This finding would support interventions which make travel to school safer including through improved infrastructure and possible pedestrian skills training. This effect is additional to impact deprivation has on casualty rates and suggests that priorities for interventions of this type be given to deprived areas. Part time 20 mph zones may also be an effective counter measure.

The traffic proxy variable has also been found to be a consistent and highly significant variable. This, too, is perhaps not a surprising conclusion but the modelling process has quantitatively shown a strong and robust link between traffic and child pedestrian casualty rates. This suggests that busier areas should be a focus for an intervention strategy perhaps involving speed reduction strategies.

The model can be used to identify areas of concern (child pedestrian casualty “blackspots”) which might respond to site specific intervention. The production of a list of areas of concern for investigation could prove helpful in implementing low cost remedial measures.

The model could also be used to identify good practice by preparing a list of areas where there are fewer casualties than predicted by the model outputs.

These areas could be the subject of a review to determine if there are any underlying reasons why casualty rates are lower than expected.

Child pedestrian casualty rates are modelled to be higher in urban areas than in rural areas. Whilst the traffic proxy variable is a measure of traffic in an area, it is not a measure of the traffic density on roads which will be higher in urban than in rural areas. Also in urban areas it is likely that individual walking trips will involve more street crossings than in rural areas. Consequently, some priority should be given to interventions relating to urban areas.

Finally, proximity to services is seen to be linked to casualty rates where the closer children live to services the higher the casualty rates. This is perhaps more widely related to planning issues and suggests that road safety ought to be a key consideration in the design of regeneration and major development schemes.

5.3 Specific interventions

The literature review identified a number of potential specific interventions which would be appropriate in combating high child pedestrian casualty rates (paragraph 2.4.61 refers). These are:

- a national "traffic club" scheme
- road crossing training for children (Kerbcraft)
- complementary speed enforcement devices and speed management programmes
- improvements to infrastructure (including traffic calming and 20mph zones)
- road safety inputs to the master planning of regeneration projects
- local transport plans should include pedestrian reduction targets
- a distribution of road safety measures which targets poorer socio-economic environments.

It is stressed from the findings of the literature review and from the authors' experience that interventions should not be *ad hoc* activities, rather that they form part of a complementary and integrated road safety delivery strategy.

6. ROAD SAFETY PLANNING IN NORTHERN IRELAND – THE NEXT STEPS

6.1 Road Safety Strategy NI

In Northern Ireland (NI) road safety is the responsibility of the Department of the Environment (DOE), supported by a number of road safety partners i.e. Department for Regional Development – Roads Service, Police Service of NI, NI Fire and Rescue Service, NI Ambulance Service and the Department of Education.

The planning and delivery of road safety activity is guided by NI's Road Safety Strategy to 2020 (due to be published March 2011) which sets out the key challenges, vision and targets to be achieved over its 10 year lifespan. The

implementation of almost 200 action measures set out in the Strategy will contribute to the delivery of the vision and the achievement of challenging casualty reduction targets by 2020.

As a result of this research, and particularly taking account of the key finding that there is a clear link between deprivation and child pedestrian casualty rates in NI, a number of those measures will focus specifically on addressing the increased road safety risk caused by deprivation. A key performance indicator comparing the pedestrian casualty rate of the most and least deprived areas in NI will monitor the effectiveness of those interventions on an ongoing basis throughout the life of the Strategy. Such measures include:

- expanding and supplementing existing data sources in order to help target interventions more effectively and develop our understanding of road safety problems and trends, particularly focusing on rurality, deprivation and purpose of journey,
- considering the road safety of young people aged 16-24 who are not in employment, education or training, with a particular focus on areas of deprivation, and
- considering how best to address research findings suggesting child pedestrian casualties (urban and rural) are linked to deprivation and any correlation with presence of schools and traffic activity.

6.2 Research and data

Research is a crucial means of understanding particular road safety problems and developing appropriate initiatives and measures to address them. As a result of this project DOE will take account of the impact of deprivation in the development and implementation of its road safety research programme, either directly through taking forward a specific piece of research or indirectly through the consideration of deprivation as a contributing factor to other road safety issues.

The Department will also be seeking to improve the range and quality of data captured and used to investigate and understand the impact of deprivation.

6.3 Further investigations

DOE is currently undertaking a research project, due to be complete by April 2011, which builds on the findings of the earlier research and carries out further investigations in order to develop a comprehensive programme of action measures to address the increased road safety risk faced by children in deprived areas. This work aims to:

- Investigate the range of potential measures to address the increased road safety risk for children living in deprived areas in NI. This work draws on the findings of the literature review, conclusions and recommendations of the earlier research.
- Confirm that the model and key findings developed as part of the earlier research are still valid following updates in the NI deprivation index and population data.
- Extend the analysis to include child cyclists and car occupants.

- Investigate the specific problems and issues which contribute to the poor road safety performance of areas of high deprivation in NI. This includes an investigation into the behaviour and attitudes of children and parents of children living in such areas and also area based problems which may contribute to the problem.
- Investigate the measures have already been successful in improving the safety performance of areas of high deprivation in NI.
- Develop a prioritised 5 year programme of measures aimed at reducing collisions and casualties involving children living in deprived areas. This may include measures which will be introduced across all deprived areas in NI, specific area-based measures or a re-prioritisation of existing road safety activity towards deprived areas.

As can be seen, while work is underway to learn from and build on the key findings and implications of Colin Buchanan's initial investigations this is largely at the research and planning stage. It can, however, be said that the research has clearly set a robust starting point from which to develop potential interventions to address the increased road safety risk for those in deprived areas.

In general, the research has clearly focused attention on the issue and has positioned it at the forefront of policy makers' minds in considering how they will improve road safety in NI. This is an issue that must be tackled both to improve the lives of the people affected but also to improve road safety generally as the margins grow ever tighter and the number of casualties and collisions in NI hopefully continue to fall.

Notes

[1]R Development Core Team (2005). R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. ISBN 3-900051-07-0, URL http://www.R-project.org.