

Appendix D – Technical note for Workstream B

Technical Note

Project Title:	Child Road Safety and Poverty Research
MVA Project Number:	C3A25400
Subject:	Workstream B
Note Number:	Final Version
	Confirm that the model and key findings of the NI deprivation research are still valid using the updated NI deprivation index
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Last updated:	13 June 2011

1 Introduction

- 1.1 This note reports the findings of Workstream B.
- 1.2 Workstream B consists of three consecutive tasks:
 - Task B1 - Receive and review the updated NI Deprivation dataset and the previous research dataset, models and R script analysis files
 - Task B2 - Re-run the initial casualty rate analyses
 - Task B3 - Re-run the Level 3 Models
- 1.3 The following sections report the findings from these three tasks in turn.
- 1.4 All table numbers and figures have been numbered according to the number given in the report of the preceding study (Deprivation and Child Pedestrian Road Casualties, Colin Buchanan, Jan 2010) to facilitate comparison.
- 1.5 Each section finished with a summary and conclusion explaining the relevance of the results and analyses.

2 Task B1 – Reproduce the model results from the previous study

- 2.1 The purpose of this task was to take a copy of the 10 year road casualty datasets that were used in the preceding study and re-fit the same 'Level 3' models to see that the results can be repeated. Having reproduced the same results, differences in results from further model runs can be attributed wholly to the inputs – updated deprivation data and population estimates.

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2.2 The data used in the preceding study was supplied in a single zip file - supporting_data.zip and contained the following files:

Ref	File	Contains
1	FSM by SOA – 0809 (age) 2 supp.xls	Free school meal information
2	Level1data.xls	Raw data used as model input for Level 1 modelling
3	Level2&3data.xls	Raw data used as model input for Level 2 and 3 modelling – includes description of composite variables
4	MET Office Sun and Rain.xls	MET Office sunshine hours and annual rainfall statistics
5	model_outputs_level1.doc	Model outputs for Level 1 modelling
6	model_outputs_level2_rural.doc	Model outputs for Level 2 modelling (rural)
7	model_outputs_level3_urban.doc	Model outputs for Level 2 modelling (urban)
8	model_outputs_level3_rural.doc	Model outputs for Level 3 modelling (rural)
9	model_outputs_level3_urban.doc	Model outputs for Level 3 modelling (urban)
10	model_outputs_level3_urban_and_rural.doc	Model outputs for Level 3 modelling (urban and rural)
11	READ ME.doc	This file
12	tabulated results_101109.doc	Tabulations used to generate summary tables and figures for report

2.3 The 10 year datasets, files 2 and 3 in the above table, was supplied in two forms:

- Casualty data aggregated to Super Output Area (SOA), the ‘SOA 10Y’ dataset, and
- The SOA casualty data (above) aggregated by combinations deprivation decile, age, gender and rural/ urban, the ‘Aggregated 10Y’ dataset.

2.4 The R script specifying the Level 1, 2 and 3 models and the model outputs (coefficients, p-values etc) are in files 5 to 10 in the above table. The R commands that specify and run the models were extracted from these files and a new R script was prepared to run the models and dump the results into comma separated variable (csv) files.

2.5 The results of the re-run models were then compared to the original results in files 5-10. The results matched exactly to 3 significant figures – there were some occasional very minor differences of less than 0.1%.

Summary conclusions

2.6 There were only very minor differences in the re-run model results when compared to the model results from the previous research. Given that the input data and software and commands used to perform the analysis are exactly the same one would not expect there to be any differences.

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However, there are occasions when re-run data analysis produce slightly different results in these circumstances. These can arise with models that are fitted using iterative algorithms like the negative binomial models in the study, which typically use a default setting for start point and convergence criteria. If either of these are slightly different, a re-run of a model may meet the convergence criteria at a slightly different point whilst have still determined essentially the same model.

2.1 It has been concluded that the datasets from the previous research have been received and correctly analysed. Therefore any subsequent differences in results from those of the previous research can be attributed wholly to the updated inputs.

3 Task B2 – Re-run the casualty rate analysis on 10 year casualty data with new deprivation data

3.1 The purpose of this task was to produce updated casualty rate analysis results: tables 5-9 and Figures 1-8 in the report from the preceding study. This involved three sub tasks:

- Update the SOA 10Y dataset with new deprivation data and newly available mid year population estimates – to produce an ‘Updated SOA 10Y’ dataset. Mid-year population estimates for 2003 and 2004 were averaged to produce a population estimate representing the end of 2003, mid way through the period covered by the 10Y dataset (Jan 1999 to Dec 2008). This data replaced the 2001 data used in the Colin Buchanan research.
- Aggregate the Updated SOA 10Y dataset by deprivation decile, age, gender and rural/urban – to produce an ‘Updated Aggregated 10Y’ dataset
- Analyse ‘Updated Aggregated 10Y’ to produce ‘updated’ versions of the tables 5-9 and Figures 1-8.

3.2 These three sub-tasks are described briefly as follows:

3.3 **Updated SOA 10Y dataset:** The following deprivation measures were updated by simply linking the SOA 10Y data and the deprivation data ([NIMDM 2010 Results SOA.xls](#) downloaded from the NISRA website) together by SOA code. The following variables were updated

Variable name	Description
mdmsco	Multiple Deprivation Measure Score
mdmcrm	Multiple Deprivation Measure: Crime Domain
mdmprx	Multiple Deprivation Measure: Proximity to Services Domain
mdmrank10	Multiple Deprivation Measure: Score ranked into deciles

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3.4 Updating the population data in the SOA 10Y dataset was complicated by the fact that the latest release of mid-year population estimates for 2001 through to 2008 ([SAPE_SOA_1008.xls](#)) are not available for the same age bands as that used in the SOA 10Y dataset. The following table show how they compare:

SOA 10Y	SAPE_SOA_1008
0-4	
5-7	
8-11	0-15
12-15	
16-24	16-39
25+	40-64
	65+

3.5 This meant that the best that could be achieved in the updating of the population estimates was, for each SOA, to rescale the lowest four age categories in the SOA 10Y data by a factor:

$$\text{Rescale factor} = \frac{0-4 + 5-7 + 8-11 + 12-15}{0-15}$$

3.6 And rescale the two highest categories in the SOA 10Y data by a factor:

$$\text{Rescale factor} = \frac{16-24 + 25+}{16-39 + 40-64 + 65+}$$

3.7 **Updated Aggregated 10Y** dataset: This was a simple task of aggregating the Updated SOA 10Y dataset (with new deprivation data and rescaled population) by deprivation decile, age, gender and rural/ urban.

3.8 **Updated tables and Figures:** The 'Updated Aggregated 10Y' was then analysed to produce 'updated' versions of the tables 5-9 and Figures 1-8 as follows. The tabular and graphical outputs reconfirm the strong correlation between casualties and deprivation and the variation by sex and age group as shown in the previous study undertaken by Colin Buchanan.

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Table 5: Child pedestrian casualty numbers by sex, Multiple Deprivation Measure (MDM, 2010) decile and age group (1999 - 2008)

Gender	Deprivation Decile	0-4	5-7	8-11	12-15	(all)
M	M1	8	10	23	39	80
M	M2	14	17	38	53	122
M	M3	14	20	37	40	111
M	M4	23	20	49	49	141
M	M5	18	25	29	52	124
M	M6	20	28	54	50	152
M	M7	28	32	71	64	195
M	M8	41	56	59	78	234
M	M9	74	64	85	92	315
M	M10	104	135	145	121	505
M	(all)	344	407	590	638	1,979
F	M1	0	6	12	26	44
F	M2	7	6	22	32	67
F	M3	6	10	23	29	68
F	M4	9	13	33	41	96
F	M5	12	14	22	31	79
F	M6	13	11	18	49	91
F	M7	15	32	46	48	141
F	M8	27	30	42	47	146
F	M9	25	55	57	63	200
F	M10	41	88	95	100	324
F	(all)	155	265	370	466	1,256
MF	M1	8	16	35	65	124
MF	M2	21	23	60	85	189
MF	M3	20	30	60	69	179
MF	M4	32	33	82	90	237
MF	M5	30	39	51	83	203
MF	M6	33	39	72	99	243
MF	M7	43	64	117	112	336
MF	M8	68	86	101	125	380
MF	M9	99	119	142	155	515
MF	M10	145	223	240	221	829
MF	(all)	499	672	960	1,104	3,235

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Table 6: Child population¹ by sex, Multiple Deprivation Measure (MDM) decile and age group (1999 - 2008)

Gender	Deprivation Decile	Age Group					(all)
		0-4	5-7	8-11	12-15		
M	M1	5,132	3,341	4,672	4,474	17,619	
M	M2	5,441	3,360	4,780	4,666	18,247	
M	M3	5,864	3,672	5,023	5,136	19,695	
M	M4	5,807	3,644	5,092	5,233	19,776	
M	M5	5,770	3,731	5,246	5,465	20,212	
M	M6	5,893	3,723	5,275	5,450	20,341	
M	M7	6,116	3,820	5,369	5,739	21,044	
M	M8	5,724	3,463	4,924	5,403	19,514	
M	M9	5,891	3,634	5,126	5,539	20,190	
M	M10	5,951	3,762	5,524	6,078	21,315	
M	(all)	57,589	36,150	51,031	53,183	197,953	
F	M1	4,873	3,211	4,343	4,276	16,703	
F	M2	5,105	3,239	4,357	4,392	17,093	
F	M3	5,439	3,467	4,858	4,819	18,583	
F	M4	5,618	3,446	4,887	4,973	18,924	
F	M5	5,442	3,457	5,020	5,238	19,157	
F	M6	5,608	3,449	4,825	5,178	19,060	
F	M7	5,787	3,565	5,114	5,438	19,904	
F	M8	5,371	3,260	4,690	5,136	18,457	
F	M9	5,587	3,358	4,982	5,254	19,181	
F	M10	5,664	3,725	5,520	5,823	20,732	
F	(all)	54,494	34,177	48,596	50,527	187,794	
MF	M1	10,005	6,552	9,015	8,750	34,322	
MF	M2	10,546	6,599	9,137	9,058	35,340	
MF	M3	11,303	7,139	9,881	9,955	38,278	
MF	M4	11,425	7,090	9,979	10,206	38,700	
MF	M5	11,212	7,188	10,266	10,703	39,369	
MF	M6	11,501	7,172	10,100	10,628	39,401	
MF	M7	11,903	7,385	10,483	11,177	40,948	
MF	M8	11,095	6,723	9,614	10,539	37,971	
MF	M9	11,478	6,992	10,108	10,793	39,371	
MF	M10	11,615	7,487	11,044	11,901	42,047	
MF	(all)	112,083	70,327	99,627	103,710	385,747	

1 Source: Northern Ireland Census 2001 scaled to 2003-04 Mid year population estimates.

Table 7: Child pedestrian casualty rates by sex, Multiple Deprivation Measure (MDM) decile and age group (1999 - 2008)

Gender	Deprivation Decile	0-4	5-7	8-11	12-15	(all)
M	M1	0.16	0.30	0.49	0.87	0.45
M	M2	0.26	0.51	0.80	1.14	0.67
M	M3	0.24	0.54	0.74	0.78	0.56
M	M4	0.40	0.55	0.96	0.94	0.71
M	M5	0.31	0.67	0.55	0.95	0.61
M	M6	0.34	0.75	1.02	0.92	0.75
M	M7	0.46	0.84	1.32	1.12	0.93
M	M8	0.72	1.62	1.20	1.44	1.20
M	M9	1.26	1.76	1.66	1.66	1.56
M	M10	1.75	3.59	2.62	1.99	2.37
M	(all)	0.60	1.13	1.16	1.20	1.00
F	M1	0.00	0.19	0.28	0.61	0.26
F	M2	0.14	0.19	0.50	0.73	0.39
F	M3	0.11	0.29	0.47	0.60	0.37
F	M4	0.16	0.38	0.68	0.82	0.51
F	M5	0.22	0.41	0.44	0.59	0.41
F	M6	0.23	0.32	0.37	0.95	0.48
F	M7	0.26	0.90	0.90	0.88	0.71
F	M8	0.50	0.92	0.90	0.92	0.79
F	M9	0.45	1.64	1.14	1.20	1.04
F	M10	0.72	2.36	1.72	1.72	1.56
F	(all)	0.28	0.78	0.76	0.92	0.67
MF	M1	0.08	0.24	0.39	0.74	0.36
MF	M2	0.20	0.35	0.66	0.94	0.53
MF	M3	0.18	0.42	0.61	0.69	0.47
MF	M4	0.28	0.47	0.82	0.88	0.61
MF	M5	0.27	0.54	0.50	0.78	0.52
MF	M6	0.29	0.54	0.71	0.93	0.62
MF	M7	0.36	0.87	1.12	1.00	0.82
MF	M8	0.61	1.28	1.05	1.19	1.00
MF	M9	0.86	1.70	1.40	1.44	1.31
MF	M10	1.25	2.98	2.17	1.86	1.97
MF	(All)	0.45	0.96	0.96	1.06	0.84
M/F	Ratio	2.10	1.45	1.52	1.30	1.49

3.9 This analysis shows that the overall number of casualties (3,235) has not changed, confirming the fact that casualties part of the data has not been updated. However, the overall casualty rates have changed slightly as a result of the scaling of the population to 2003-04 mid-year population estimate in place of the 2001 population. The child population since 2001 has been declining gradually and in 2003-04 had decreased from 398,034 in 2001 to 385,747 in 2003-04 which represents a 3.1% decrease in the population. This has translated into a 3.1% increase in casualty rate.

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- 3.10 Updating the deprivation data has resulted in changes in individual casualty rates: over 70% of the measures are within +/- 20% of the previous results. Given that there has been a 3.1% increase in the overall casualty rate, one expects there to be a higher number of casualty rates which have increased than had decreased. If the 3.1% increase in casualty rates is factored out of the comparison of the old and new casualty rates, the data shows there were 57 casualty rates that reduced compared to 79 that increased. This shows that once the underlying decrease in population of 3.1% has been factored out, there is a relatively balanced change in the number or rates which increase and decrease suggesting that there is no systematic change in the distribution.
- 3.11 The largest increase in casualty rates was seen among males aged 5-7 in deprivation decile 8 where the rates changed from 1.17 to 1.62, an increase of 0.45 (38%). The largest decrease in casualty rates was seen in the neighbouring category, among males aged 5-7 in deprivation decile 7 where the rates changed from 1.23 to 0.84, a decrease of 0.39 (32%). These differences coincide with results where the original male 5-7 casualty rates do not increase gradually across deciles 6 to 9 (0.62, 1.23, 1.17, 1.51) whereas the new casualty rates do (0.75, 0.84, 1.62, 1.76).
- 3.12 In terms of the size of the relative changes, the largest increase were seen in females aged 5-7 in deprivation decile 5 which increased by a factor of 2.31. The largest relative decrease was again found in an adjacent category of deprivation in females aged 5-7: the casualty rate fell by over half, a factor of 0.48. Again these differences appear to be a result of some rather erratic relationship between increasing casualty rates and in deprivation deciles 4 to 7. In the original casualty rates the rates in these deciles are 0.28, 0.18, 0.67, 0.58 whilst the corresponding new casualty rates are 0.38, 0.41, 0.32, 0.90.
- 3.13 When the 3.1% decrease in population is factored out, the largest increase of 0.42 was seen among females aged 12-15 in deprivation decile 4, representing an increase of a factor 2.12. The largest decrease of 0.42 was seen in among males aged 5-7 in deprivation decile 7 representing an decrease of a factor 0.66.

Table 8: Spearman’s ranked correlation coefficients and significance levels for the relationship between deprivation decile and child pedestrian casualty rates by sex and age group (1999 - 2008)

Gender	0-4	5-7	8-11	12-15	All age groups
Spearman's ranked correlation coefficient ()					
Male	0.933	1.000	0.867	0.667	0.967
Female	0.967	0.933	0.717	0.733	0.983
All	0.967	1.000	0.833	0.783	0.983
Level of significance for Spearman's ranked correlation coefficient ()					
Male	0.1%	0.0%	1.0%	10.0%	0.1%
Female	0.1%	0.1%	5.0%	5.0%	0.0%
All	0.1%	0.0%	1.0%	5.0%	0.0%

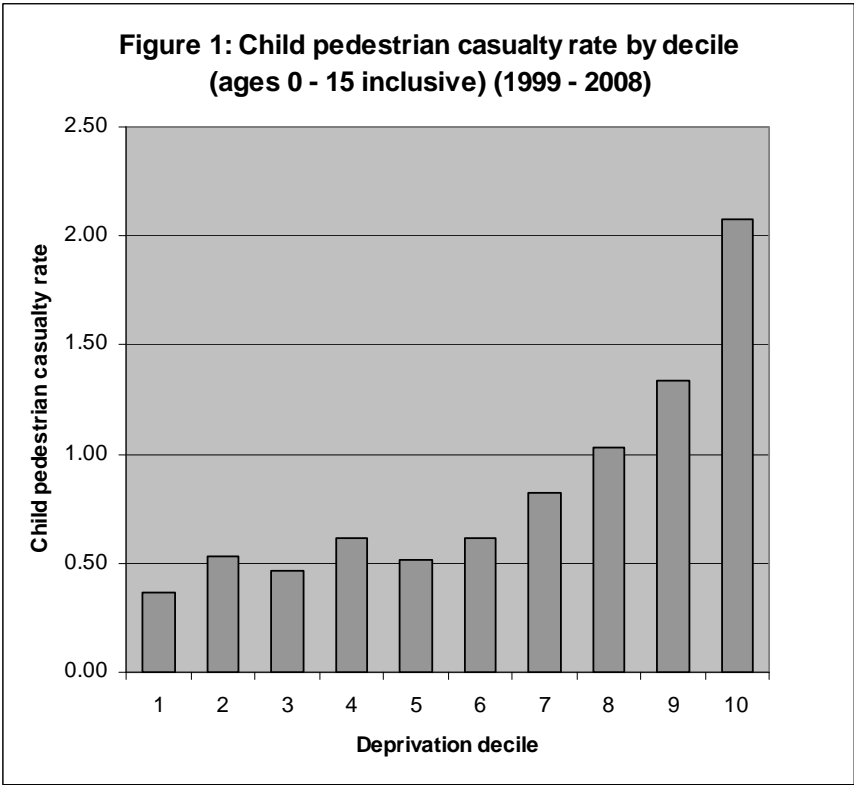
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Table 9: Deprivation disparity ratio of child pedestrian casualty rates¹ by sex, Multiple Deprivation Measure (MDM) decile and age group (1999 – 2008)

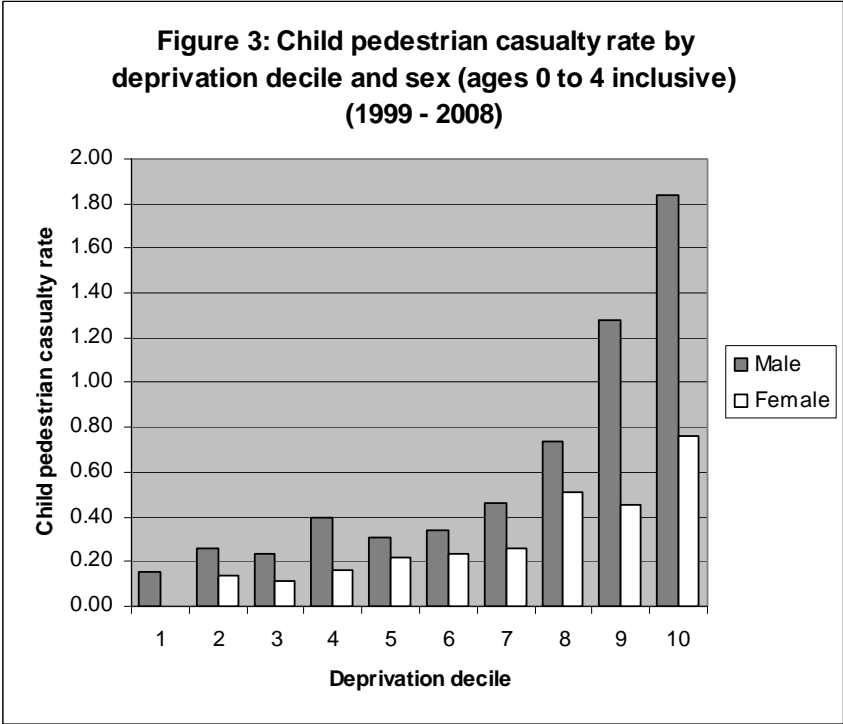
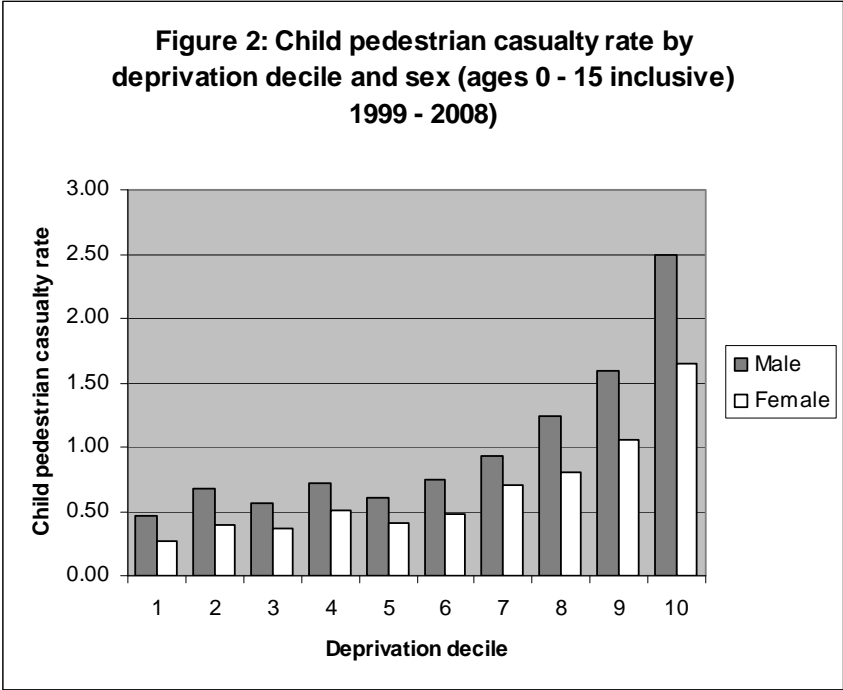
Gender	0-4	5-7	8-11	12-15	All age groups
Male	11.21	11.99	5.33	2.28	5.22
Female	8.78 ²	12.64	6.23	2.82	5.93
All	15.61	12.20	5.60	2.50	5.46

1 The deprivation disparity ratio is the casualty rate for decile 10 (most deprived) divided by the rate for decile 1 (most affluent). It is a measure of the additional risk of being involved as a pedestrian road collision casualty between children resident in the most affluent and most deprived areas.

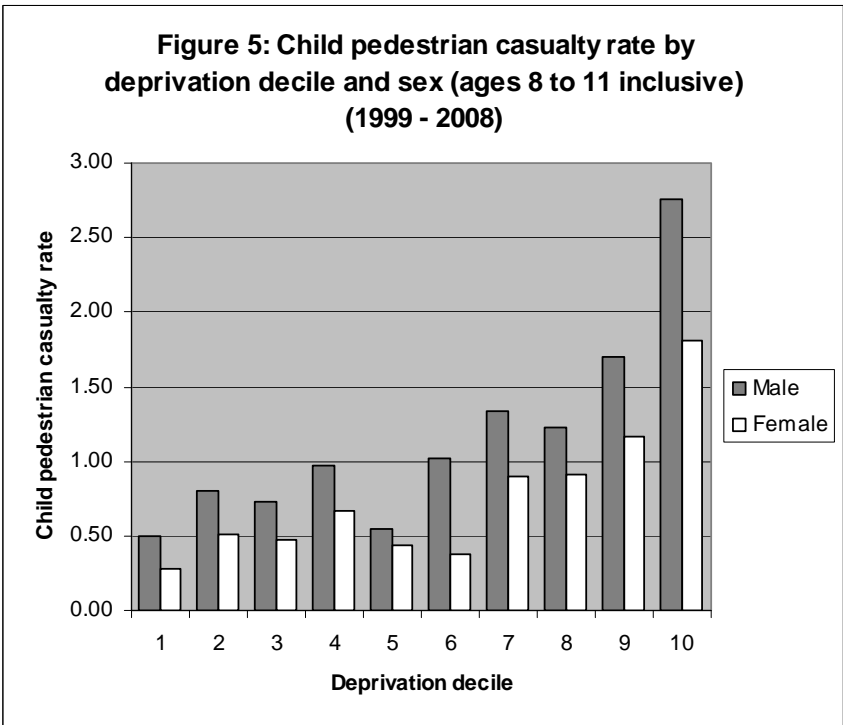
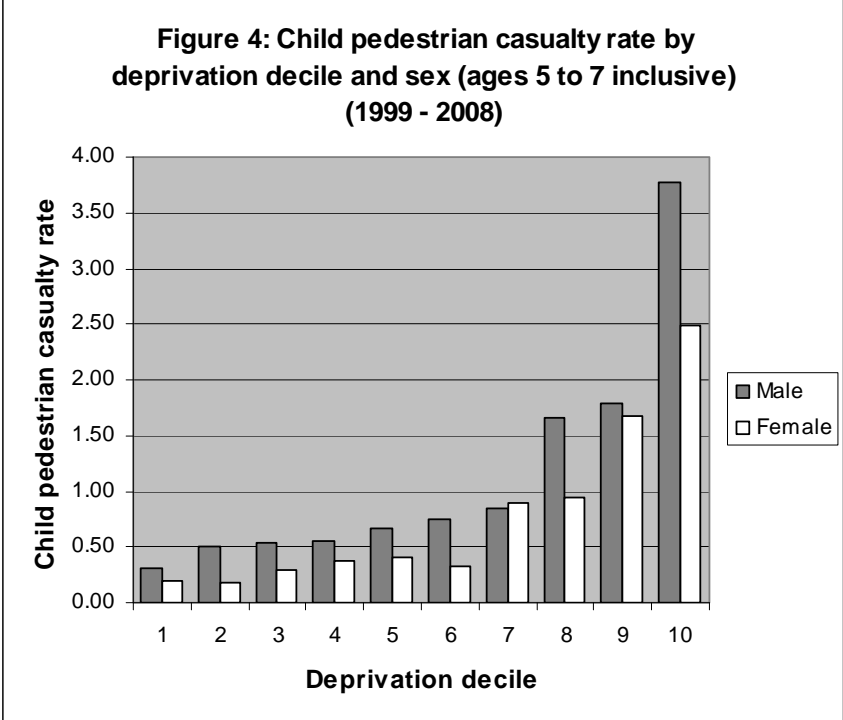
2 There were no casualties in MDM decile 1 recorded for females in the 0-4 age group. The average casualty rate for deciles 1-3 has been used in this instance as a proxy.



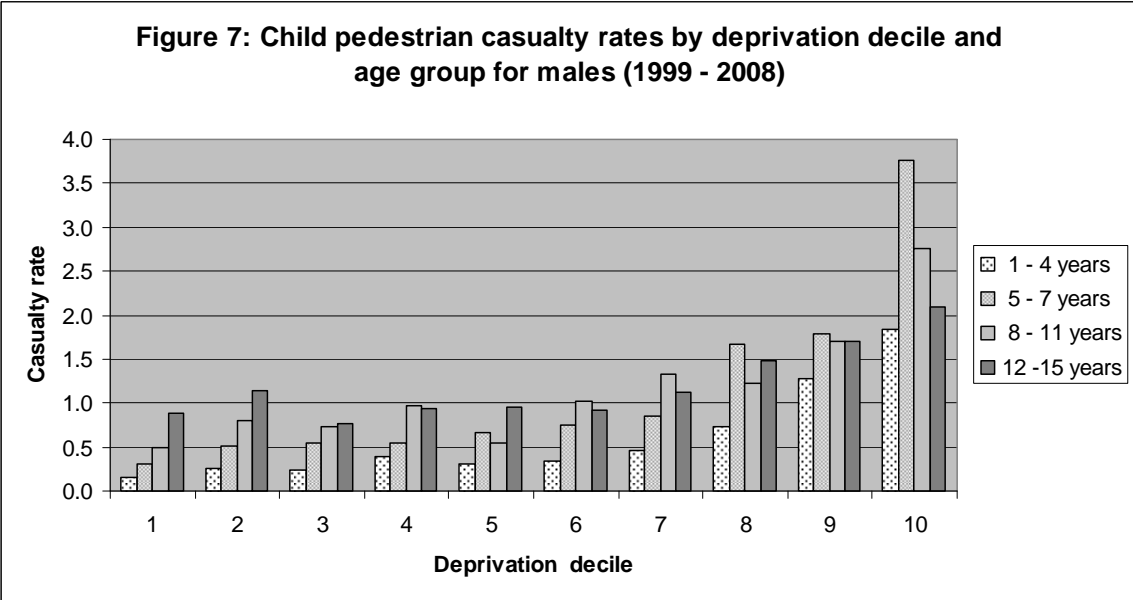
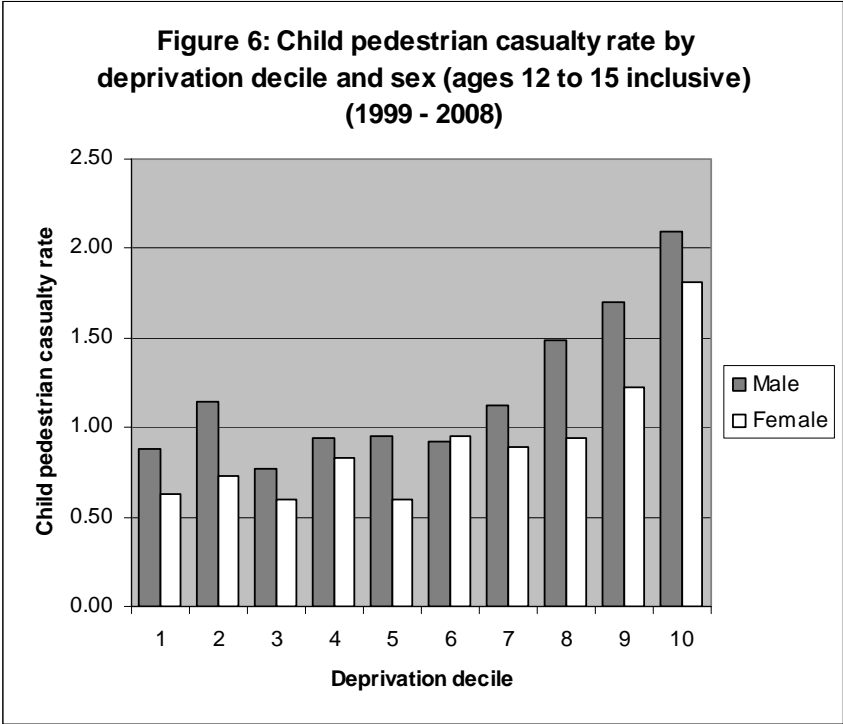
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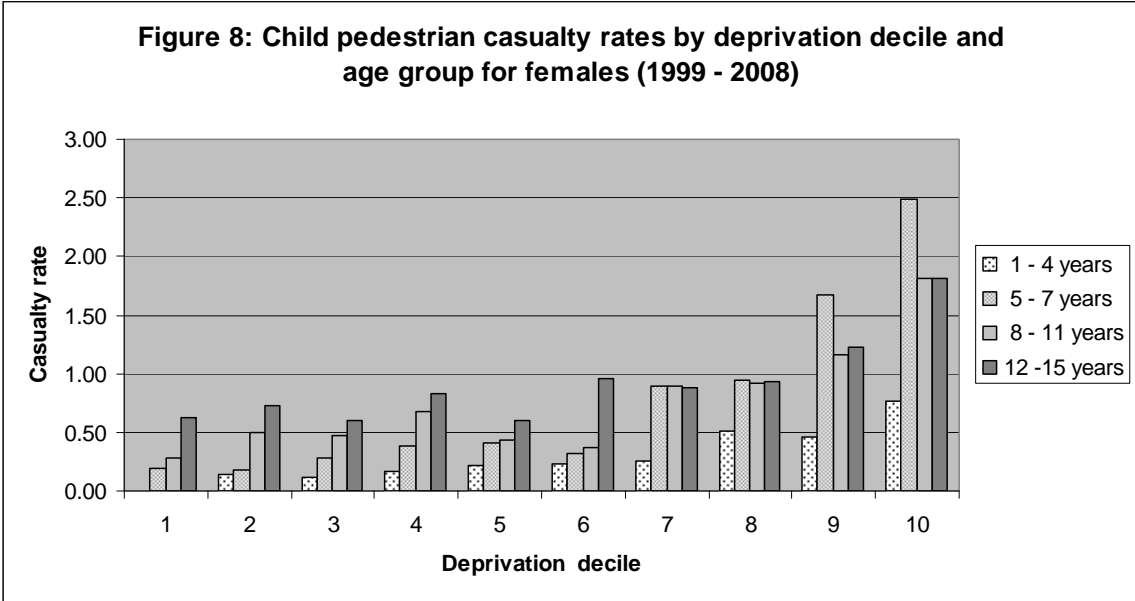


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Summary conclusions

- 3.14 The following principal values have been recalculated:
 - casualty rates (Table 7);
 - correlation coefficients (Table 8); and
 - deprivation disparity Ratios (table 9).
- 3.15 These compare closely with the previous research results although there were some differences which could be traced to specific changes made to the new data which incorporated updated population estimates and deprivation measures.
- 3.16 Overall casualty rates increased by 3.1% reflecting the fact that the population had decreased by 3.1% between 2001 and 2003-04. Updated deprivation data did not have any noticeable effect on the relationship between increasing casualty rates with increasing deprivation decile. Whilst the correlation coefficients had all changed slightly there was no general improvement or worsening in the correlation coefficients or the level of significance, confirming that the relationships identified in the previous study continued to hold with the updated data.
- 3.17 There were a very small number of relatively large changes in the individual casualty rates for specific combinations of age, gender and deprivation decile, however these were attributed to some small absolute changes to relatively small casualty rate measures and were generally a consequence of comparing detailed disaggregate measure of specific populations.
- 3.18 A comparison of the existing and updated deprivation disparity ratios results did reveal some differences which suggest that overall disparity ratios have increased slightly. Theses changes can be attributed to the updated deprivation data.
- 3.19 Overall, the comparison with the previous research results confirm that the findings of the previous research hold good on the updated data.

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4 Task B3 - Re-run the Level 3 Models on 10 year casualty data with new deprivation data

- 4.1 The purpose of this task was to re-run the Final Level 3 models on the new data. It was not a requirement to seek to re-optimize the models.
- 4.2 The results have been summarised to present significance codes and where the model coefficients are significant at the 95% level, a '+' or '-' has been included to indicate whether the variable has a positive or negative relationship with the casualty rate. The significance codes represent the following levels:
 - *** 0 to <0.001
 - ** 0.001 to <0.01
 - * 0.01 to <0.05
 - . 0.05 to <0.1
 - " " >=0.1
- 4.3 Comparing the signs and significance codes for the models fitted to the previous and update data, there is a great deal of similarity between the two sets of models. The sign of well over 9 out of 10 coefficients has not changed as a result of fitting the model to updated data. Both the sign and the level of significance (code) are the same for over 7 out of 10 coefficients.
- 4.4 The models fitted to the new data have remained significant. The levels of significance of the model coefficients have tended to improve slightly for the rural and urban models, and worsen very slightly for the rural+urban models. The deviance goodness of fit measures show that the models fitted to the new data are a slight improvement on the old ones. In particular, nearly all the models for the four lowest age groups (children), for rural, urban and rural+urban have an improved fit.
- 4.5 As was found in the original models, ten of the 18 models for the child age groupings in rural areas did not fully converge and the results may not be robust. However, the model coefficients for these models are mostly highly significant which suggests that the models are likely to be performing reasonably well.

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Table A 9: Significance of coefficients for pedestrian casualties in urban areas by age and sex for the Level 3 Model

Age group	Gender	(Inter cept)	MDM Score	MDM Crime	MDM Proxi mity	Traffic Proxy	School places	Sun shine hours	rain
0-15	Both	*** +	*** +	*** +	*** -	*** +	*** +	*** -	*** -
	Male	*** +	*** +	*** +	*** -	*** +	*** +	*** -	*** -
	Female	*** +	*** +	*** +	*** -	*** +	*** +	*** -	*** -
0-4	Both	** +	*** +	*** +	** -	*** +	*** +	*** -	*** -
	Male		*** +	*** +	. -	* +	* +	** -	*** -
	Female		*** +	* +	* -	*** +	** +	** -	. -
5-7	Both	*** +	*** +	** +	*** -	* +	*** +	*** -	*** -
	Male	* +	*** +		*** -	** +	*** +	*** -	. -
	Female	* +	*** +	* +			*** +	*** -	*** -
8-11	Both		*** +	*** +	*** -	*** +	*** +		
	Male	. +	*** +	*** +	*** -	*** +	*** +	** -	** -
	Female	** -	*** +	*** +	*** -	*** +	*** +		
12-15	Both	. +	*** +	*** +	*** -	*** +	*** +	. -	** -
	Male	. -	*** +	*** +		*** +	*** +		
	Female	* +	** +	*** +	*** -	*** +	*** +	*** -	*** -
16-24	Both	*** -	*** +	*** +	*** -	*** +	*** +	*** +	** +
	Male	*** -	*** +	*** +	*** -	*** +	*** +	* +	* +
	Female	*** -	* +	*** +	*** -	*** +	* +	** +	* +
25+	Both	** +	*** +	*** +	*** -	*** +	*** +		*** -
	Male	* +	*** +	*** +	*** -	*** +	*** +		*** -
	Female	* -		*** +	*** -	*** +	*** +	** +	
All	Both	*** +	*** +	*** +	*** -	*** +	*** +	** -	*** -
	Male	*** +	*** +	*** +	*** -	*** +	*** +	** -	*** -
	Female	*** +	*** +	*** +	*** -	*** +	*** +		

Technical Note Confirm that the model and key findings of the NI deprivation research are still valid using the updated NI deprivation index

Table A 10: Significance of coefficients for pedestrian casualties in rural areas by age and sex for the Level 3 Model

Age group	Gender	(Intercept)	MDM Score	MDM Crime	MDM Proximity	Traffic Proxy	School places	Sun shine hours	rain						
0-15	Both	**	-	***	+	***	+	***	+	***	+				
	Male	***	-	***	+	***	+	***	-	***	+				
	Female	*	-	***	+	***	+	***	-	*	+				
0-4	Both			***	+	***	-	*	-			W			
	Male			***	+	*	-	***	-	**	+	W			
	Female			***	+	***	+	**	-	*	-	W			
5-7	Both	**	-	***	+	***	-	*	+			W			
	Male	***	-	***	+	**	-	**	+			W			
	Female			***	+	*	+	***	-	*	+	W			
8-11	Both	*	-	***	+	***	+	***	+	*	+	W			
	Male	.	-	***	+	***	+	*	-	***	+	W			
	Female	*	-			**	+	***	-	**	+	W			
12-15	Both	***	-			***	+	***	+	***	+				
	Male	***	-			**	+	***	+	*	+	***	+		
	Female	***	-			**	+	***	+	*	+	**	+	W	
16-24	Both	***	-	***	+	***	+	***	+	***	+	***	+		
	Male	***	-	***	+	**	+	*	-	***	+	***	+		
	Female	***	-			***	+	.	+	**	+	***	+		
25+	Both			***	+	***	+	***	+	**	+	**	+		
	Male	.	-	***	+	***	+	***	+	***	+				
	Female	*	-	***	+	***	+	***	-	***	+		***	+	
All	Both			***	+	***	+	***	-	***	+	***	+	***	+
	Male	**	-	***	+	***	+	***	-	***	+	***	+	***	+
	Female			***	+	***	+	***	-	***	+	***	+	***	+

A "W" in the right hand column means that the model did not fully converge and the outputs may not be robust

Table A 11: Significance of coefficients for pedestrian casualties in urban and rural combined areas by age and sex for the Level 3 Model

Age group	Gender	(Intercept)	MDM Score	MDM Crime	MDM Proximity	Traffic Proxy	School places	Sun shine hours	rain	Urban Rural
0-15	Both	*** +	*** +	*** +	*** -	*** +	*** +	*** -	** -	
	Male	** +	*** +	*** +	*** -	*** +	*** +	* -	.	-
	Female	*** +	*** +	*** +	*** -	*** +	*** +	*** -	*** -	** -
0-4	Both	* +	*** +	*** +	*** -	*** +	*** +	*** -	*** -	
	Male		*** +	*** +	** -	*** +	** +	** -	*** -	
	Female		*** +	*** +	.	** +	** +	*** -	* -	
5-7	Both	* +	*** +	** +	*** -	* +	*** +	*** -	* -	
	Male		*** +		*** -	*** +	*** +	* -		
	Female	.	*** +	* +	*** -		*** +	*** -	* -	
8-11	Both		*** +	*** +	*** -	*** +	*** +			
	Male		*** +	*** +	*** -	*** +	*** +	* -		* +
	Female	** -	*** +	*** +	*** -	*** +	*** +	* +		*** -
12-15	Both		*** +	*** +	.	*** +	*** +			
	Male	*** -	*** +	*** +		*** +	*** +	.	+	
	Female		*** +	*** +	* -	*** +	*** +	* -	* -	
16-24	Both	*** -	*** +	*** +		*** +	*** +	*** +	*** +	*** -
	Male	*** -	*** +	*** +		*** +	*** +	*** +	*** +	*** -
	Female	*** -	*** +	*** +		*** +	* +	** +	.	+
25+	Both	*** +	*** +	*** +	** -	*** +	*** +		*** -	*** -
	Male	* +	*** +	*** +		*** +	*** +	.	-	*** -
	Female		*** +	*** +	*** -	*** +	*** +			*** -
All	Both	*** +	*** +	*** +	*** -	*** +	*** +		.	-
	Male	*** +	*** +	*** +	*** -	*** +	*** +		.	-
	Female	*** +	*** +	*** +	*** -	*** +	*** +			*** -

Summary conclusions

- 4.6 There were some differences in the model results concerning the sign of a small proportion of model coefficients suggesting that the relationships between casualty rates and the factors in question had changed from a positive to an inverse relationship or vice-versa. However these differences only affect a relatively small proportion of factors across the blocks of models covering each combination of age and gender URDG classification and did not display any systematic changes. There were also some changes in the level of statistical significance of the model coefficients but again any loss of significance level was compensated by improvements in the significance level of other factors.
- 4.7 Overall the models fitted to the new data were performing as well as they did in the previous research and exhibit the same relationships between casualty rates and the model factors.

5 Conclusions

- 5.1 The process of updating the population estimates and deprivation data has led to some differences in each set of results produced in this workstream but none of the changes have revealed any systematic shifts in the scale or character of the relationship between casualty rates and deprivation.
- 5.2 Casualty rates have increased as a result of a decrease in the child population in Northern Ireland between 2001 and 2003-04.
- 5.3 Casualty rate analysis of the updated data continue to show statistically significant positive correlation between casualty rates and deprivation level.
- 5.4 The final level 3 model developed in the previous research confirms that each of the factors found to be statistically significant are also significant when fitted to updated data and overall exhibit the same relationships observed previously.
- 5.5 Workstream B has shown that the updated data provides a sound basis for developing new models of new 3-year and 11-year casualty data to explore how scale and character of the relationships between casualty rates and factors associated with road safety change for these periods.