Vulnerable Road Users on Irish Roads, 2006-2012: An Analysis of CT68 Data

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ABSTRACT

This study was undertaken to evaluate road safety trends between 2006 and 2012 across four separate road safety areas of inappropriate speeding, impaired driving through alcohol, drugs (prescription or non-prescription) or fatigue, not using seat belts and child safety restraints, and unsafe behaviour towards / by vulnerable road users as set out in the Road Safety Strategy 2007-2012. The study found that while the overall number of fatal collisions fell, and achieved the national target, a more in-depth look beneath the surface highlighted aspects of the road safety system that was not as effective or efficient. Injury Severity Ratios (rates of Fatal and Serious collisions / all collisions) were used to assess performance across the four road safety target areas. This paper describes the finding in respect of vulnerable road users (VRU).

The findings revealed was that vulnerable road users are highly involved in the collision figures relative to their proportion of the transport system and that while the average annual numbers of collisions have decreased significantly drivers were the main beneficiary. Road safety improvement must not wholly focus on a single global number because it masks the composite interdependent nature of road safety system, its performance and the many road safety areas and players within the complex system.

1 INTRODUCTION

The European Union has traditionally measured road safety improvement almost entirely by the reduction of fatalities. It is now recognised that serious injuries also need to be addressed because they constitute a major health problem with huge economic and human costs to society, with almost 1.5 million injuries reported on EU roads in 2011(European Commission, 2013).

This research examined collision data between 2006 and 2012. This time period was chosen because it coincided with the implementation of the Road Safety Strategy 2007-2012, during which the overarching aim of reducing fatalities to 60 deaths per million populations by 2012 was achieved. **Figure 1.1** illustrates that fatalities in 2011 were estimated at 35 fatalities per million population (Road Safety Authority, 2014).

This reduction, while a significant achievement, was reported as a single global figure that did not break down how the reductions were achieved or where reductions were attributable across the four main collision contributory factors of speeding, seat belt wearing, impaired driving and vulnerable road users, and the subgroups within these areas. Similarly the global figure reported fatalities and not the performance of serious and minor injury collision rates.

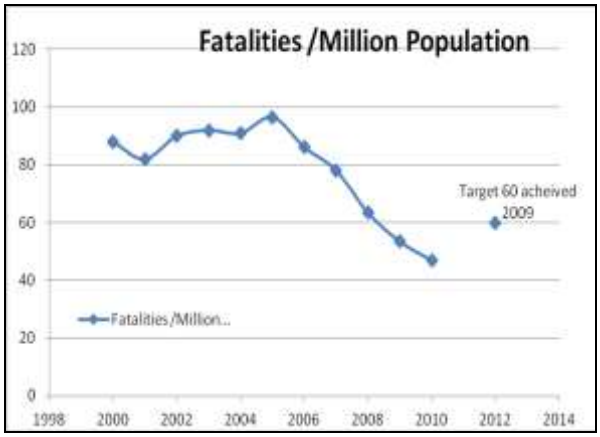

Figure 1.1 *Fatalities per million populations (Source: IRTAD 2011 Annual Report – OECD/ITF 2012)*

This study analysed CT68 data involving vulnerable road users holistically by including all injury collisions

(minor, serious and fatal) and looked at each road user separately to determine change in an attempt to provide an alternative and more robust road safety assessment method than reporting a single aggregate figure for the whole system.

2 LITERATURE REVIEW

Fatalities among vulnerable road users (VRU) have been decreasing at a slower rate than vehicle occupants and this trend is observed across Europe where fatalities among pedestrians and cyclists decreased by 34% and motorcyclists by only 18%, compared with 39 % for car drivers between 2001 and 2010 (ETSC, 2013).

Deaths among VRU represent over 44% of all road deaths across the EU; pedestrians represent 21%, cyclists 8% and motorcyclists 17% (ETSC, 2013, 2015).

In Ireland the road safety standing of VRU has not improved relative to the overall collision reductions in terms of their proportion of fatal collisions where over 33% is a VRU, 12% pedestrians, 15% motorcyclists, and 6.3% are cyclists (RSA, 2015).

Attitudes to Road Safety

Road user attitudes are an important component of any road safety system. This is evident from the self reporting results complied in a European study (SARTRE 4, 2013) in which over 90% of Irish VRU considered cycling to be dangerous. Similarly, 67% of Irish pedestrians consider walking to be dangerous. Ireland has one of the highest percentages of pedestrians who reported that they were involved in an accident in the last three years (more than 5%) compared to other EU countries.

The perceived risk of cycling is the highest in Ireland, Greece and Finland, all of which have lower than average kilometres cycled per day than other EU counties.

Satisfaction with road safety tends to be higher in countries with high cycling traffic volumes such as the Netherlands, Sweden, Finland and Germany and lower in countries with low cycling traffic volumes such as Cyprus and Ireland. On average 7% of European cyclists stated that they were involved in an accident in the last three years with Sweden, Austria and the Netherlands having the highest percentage, and Greece, Hungary and Poland the lowest percentage.

Male pedestrians and young individuals were found to have negative attitudes and higher non compliance behaviour compared to females. The attitude of VRU indicates that these road users engage in behaviours that may increase their risk of being involved in a collision.

Sustainable Transport Policy

The effectiveness of other policies may be influenced by VRU collision rates. A study of public attitudes to climate change and transport choices reported concerns about the safety of cycling (Thornton et al., 2010).

The effect of mobility shift from car to bicycle was investigated in the Netherlands. The models developed indicated that road safety does not benefit from this mobility shift. When 10% of the short car trips are exchanged for bicycle trips for all ages, the annual increase of up to 1% of the fatalities and an approximately 3.5% increase of all hospitalised casualties was predicted (Stipdonk, 2013).

With the National Cycle Policy setting a target to increase cycling from 2% to 10%, of all trips to work to be made by bicycle by 2020, this would equate to an extra 125,000 people commuting to work by bicycle (DoT, 2009). If this target is achieved there could potentially be an increase in the number of cyclist collisions particularly in urban areas based on the latest findings.

Under Reporting of VRU collisions

There is also recent evidence to suggest that the main data source does not capture all road collisions. The Health Service Executive (Bedford et. al., 2011) compared police data (collated by An Garda Siochana using the PULSE[1] system) with acute hospital admissions (from the HIPE[2] database) for road traffic collisions (RTC) between 2005 and 2009. This study found that out of 14,861 RTC related hospital discharges only 4,263 serious injuries matched. This represents an under reporting factor of approximately 3.5 as shown in **Table 2.1.**

Numbers of Serious injuries			
Year	**RSA data - from collisions database**	**HIPE data – from hospital discharge records**	**Ratio**
2005	1,021	3,080	3.02
2006	907	3,118	3.44
2007	860	2,964	3.45
2008	835	2,862	3.43
2009	640	2,837	4.43
Total	**4,263**	**14,861**	**3.49**

Table 2.1 – *Reported Serious Injuries – comparison of figures from different sources*

The study also found that cyclist collisions were severely under reported by an estimated factor of almost 10. The comparison of hospital serious injury records with police records showed that pedestrians account for 15.9% compared to 16.5%, cyclists 2.6% compared to 7.1%, motorcyclists 8.5% compared to

[1] ***PULSE*** *(Police Using Leading Systems Effectively) is a computer system used by An Garda Síochána, the police force of the Republic of Ireland. The data system was introduced in November 1999.*

[2] ***HIPE*** *(Hospital In-Patient Enquiry) Scheme operates in all acute hospitals nationally. HIPE started on a pilot basis in 1969 and then expanded and developed as a national database of coded discharge summaries from the 1970s onwards.*

9.1%, car occupants 63.2% compared to 60.4% and van/truck/other 9.9% compared with 7%.

Under reporting could be due to a number of factors, a study in the Netherlands found that cyclist only crashes account for up to 75% of the unreported cyclist collisions (Schepers, 2012) and their cause is not widely understood.

A more recent linked comparison of police and hospital data, this time for minor injuries, also revealed under reporting of these types of collisions which suggests that all injury severities concerning cyclists are under reported (Short, 2013).

The Harmonised European Approaches for Transport Costing and Project Assessment (HEATCO) guidance takes under reporting into account and suggests that the true estimate of road accidents may be double official statistics and that the actual rate of serious collisions in Ireland is around 1.5 times higher than the reported CT68 figures and even three times higher for minor injury collisions (HEATCO, 2006).

Exposure to Risk

The exposure to collision risk is influenced by distances travelled. Between 2008 and 2011 traffic volumes declined and accordingly there was a drop in reported collisions due to the reduced exposure to risk from traffic volumes illustrated below in **Figure 2.1**.

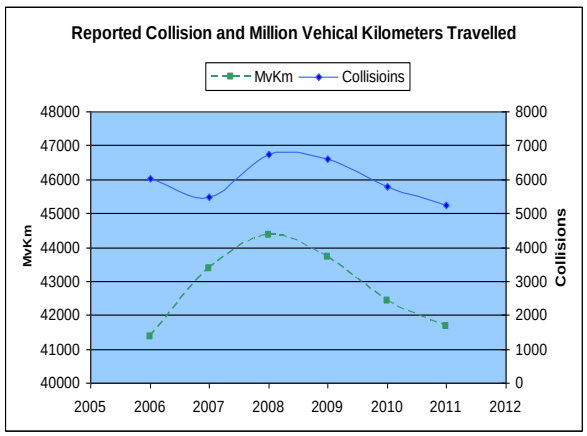

Figure 2.1 *Reported collisions plotted against Million Vehicle Kilometres travelled in Ireland between 2006-2011.*

A recent study into exposure to risk of cyclists estimated their collision rate per million kilometres travels similar to vehicle travel above. The numbers of cyclist fatalities was estimated to be 3.5 per 100 million km vehicles travelled. This rate indicates that the risk of a fatal crash is eight times higher than motorised users in Ireland and cyclist are also 40 times more likely to be injured or killed. This rate is higher than leading EU countries, such as Belgium and Germany, but is similar to figures reported in the UK (Caulfield. et al, 2014).

3 METHODOLOGY

Data for this research was drawn from *An Garda Siochana* CT68 data supplied by the Road Safety Authority. The analysis focused on collision trend changes between 2006 and 2011, using the Road Safety Authority CT68 dataset. The *An Garda Siochana* record relevant collision information at a local level, at the scene of the collision, using a CT68 form that is then entered into the PULSE system.

Whilst the database is comprehensive and is sufficiently representative of the variety of collisions that occur, it needs to be acknowledged that levels of collision reporting to *An Garda Siochana* may vary according to the particular collision circumstances. In particular pedal cycle collisions and pedestrian pedal cycle collisions are in the main not included in the database. However the level of reporting is likely to be consistent over time and therefore comparisons between the data years can be inferred.

The data available and the safety areas analysed are illustrated in **Figure 3.1** and highlights information limitations. To examine the temporal change in trends time series and trend analysis of the collision statistics was undertaken to show variations over time. The Poisson probability distribution is defined by the following formula:

$$P(x; \mu) = (e-\mu)\ (\mu x) / x! \quad (1)$$

The chi-square test for independence was also applied to compare two category variables from a single population such as drivers male and female. It was used in this way to determine whether there was a significant association between the two variables. The test statistic is a chi-square random variable (X2) defined by the following equation:

$$X2 = \Sigma\ [\ (Or,c - Er,c) / Er,c\ ] \quad (2)$$

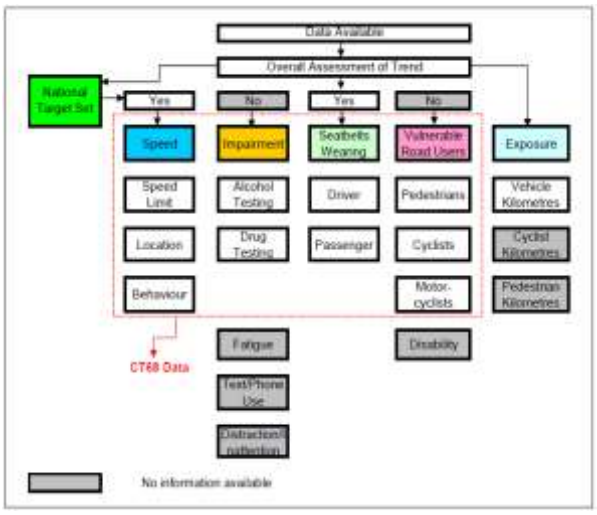

Figure 3.1 *Data available from CT68 RSA Database.*

4 RESULTS

Overall Trend

Fatal collisions have shown a consistent annual decrease since the 2006 baseline figure of 321. Serious injury collision numbers have also fallen, and minor injury collisions numbers have fluctuated. There was a 13% decrease in the overall number of fatal and injury road collisions between 2005 and 2011.

Fatal collisions decreased by 52% with an average annual decrease of 11.38%. Serious injury collisions decreased by 46.71% with an average decrease of 11.44%. Minor injury collisions showed little change which indicates that measures taken throughout the period appear to have reduced the occurrence of fatal and serious injuries or outcomes mitigated to minor injury as a result of preventative measures.

As discussed, drivers are the majority road user on Irish roads and as such they set the background from which to evaluate how the minority compares. Between 2006 and 2012 the number of drivers involved in fatal collisions more than halved, decreasing by 64.14%, serious injury decreased by 42.83% and minor injuries increased 18% as shown in **Table 4.1** and their ISR decreased from 0.15 to 0.07.

Looking more closely at the road users involved, collisions involving private cars fell by 12.5% with an average annual decrease of 1.7%. The greatest overall decrease was in the number of motorcycle collisions with a 34.82% overall reduction and an annual average decrease of 6.57%.

The numbers involved in fatal collisions are shown in **Figure 4.a** which illustrates each road user group. Private cars experienced the greatest change in collision numbers and represented the largest road user group. On average they are involved in 75% of all fatal collisions and dominate the change where VRU groups experienced little change over the same period.

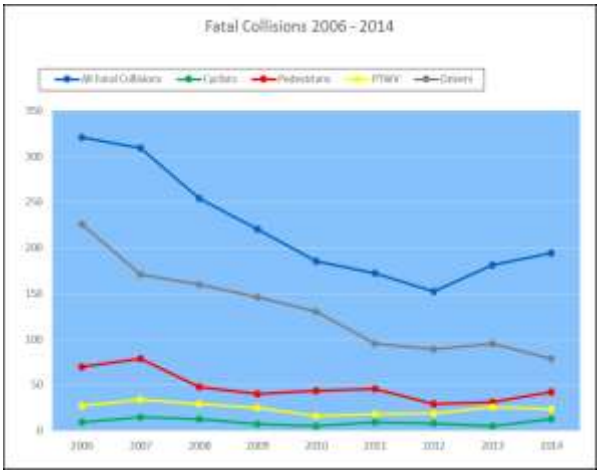

Figure 4.a. *Linear time-series plot of collisions 2006-2014 for all collisions (2013, 2014 Provisional figures)*

Drivers	Fatal	Serious	Minor	KSI	ISR	No. Cols
2006	251	509	4318	760	0.15	5078
2007	224	503	3917	727	0.16	4644
2008	181	516	5103	697	0.12	5800
2009	172	386	5078	558	0.10	5636
2010	142	328	4514	470	0.09	4984
2011	126	267	4052	393	0.09	4445
2012	90	291	5095	381	0.07	5476
% Change	-64.14	-42.83	17.99	-49.87	-53.51	7.84

Table 4.1 *Driver Collision Injury Severity Ratio*

When the relative ISR of male and female drivers were analysed, **Figure 4.b**, male drivers were found to have consistently higher ISR than female drivers and the magnitude of the difference has altered little over time.

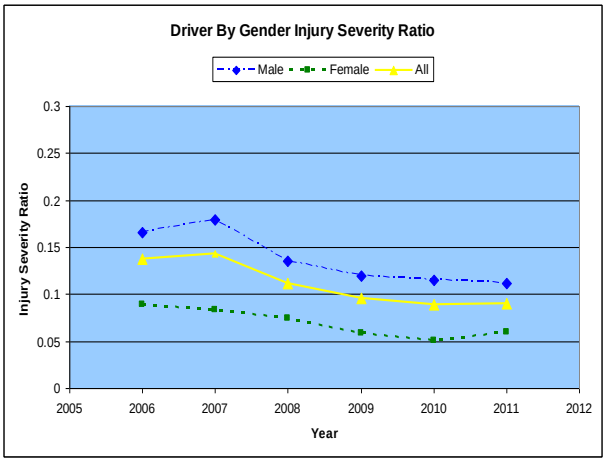

Figure 4.b *Injury Severity Ratio of drivers by gender*

Vulnerable Road Users

Vulnerable road users are pedestrians, cyclists, motorcyclists, mentally and physically impaired persons, older persons and young children. The VRU groups analysed in this study were divided into pedestrians, cyclists and motorcyclists. The available data does not provide information on the mental or physical impairment of an injured person.

VRU's, as a group, represent a relatively small proportion of the whole transport system. Their percentages (classified by means of travel to work, school or college) are shown in **Table 4.2.**

The average percentage of fatal pedestrian, cyclist and motorcyclist collisions, as a percentage of all fatal collisions was 22%, 3.8% and 11% respectively. The proportions of VRU's involved in fatal collisions are shown in **Figure 4.c.**

Means of travel	Mode Share (%)
Walk	**14.85**
Cycle	**2.19**
Bus, minibus or coach	10.33
Train, DART or LUAS	2.54
Motor cycle or scooter	**0.33**
Motor car	
Driver	**40.35**
Passenger	18.19
Other means (incl. lorry or van)	4.80
Work mainly at or from home	3.21
Not stated	3.21
Total	100.00

Table 4.2 *Persons usually resident and present in the State on census night, classified by means of travel to work, school or college at each census (Source: CSO.ie Table 1)*

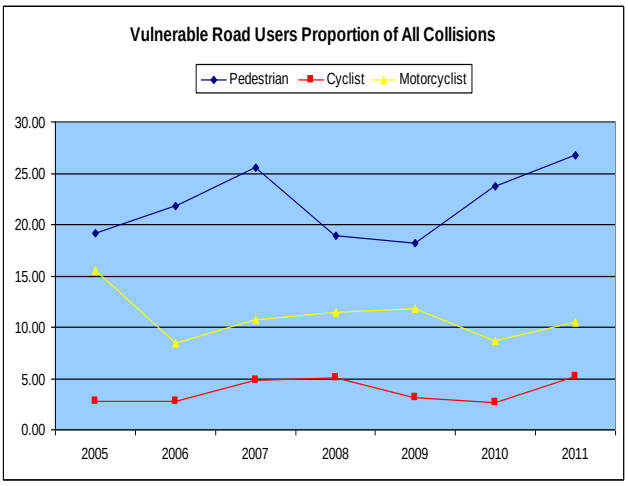

Figure 4.c *Linear time-series plot of the proportion of fatal vulnerable road users collisions*

All three VRU categories show an increasing trend in collision numbers. Comparing these proportions with the CSO modal share proportions indicates that there is a disproportionate collision risk across road user groups relative to their share of the transport system.

Cyclists

Cyclists are involved in approximately 5% of fatal collisions on Irish roads but represent only 2% of the modal share. Between 2006 and 2012 the number of cyclists involved in fatal collisions did not decrease significantly, serious injury decreased by 55.56% and minor injuries increased by 193.14%, **Table 4. 3**.

Cyclist	Fatal	Serious	Minor	KSI	ISR	No. Cols
2006	9	18	204	27	0.12	231
2007	15	19	238	34	0.13	272
2008	13	29	309	42	0.12	351
2009	7	21	346	28	0.07	374
2010	5	14	366	19	0.05	385
2011	9	16	385	25	0.06	410
2012	8	28	598	36	0.06	634
% Change	-11.11	55.56	193.14	33.33	-51.42	174.46

Table 4.3 *Cyclist Collision Injury Severity Ratio*

The ISR decreased from 0.12 in 2006 to 0.06 in 2012. This reduction of 51.42% was due to the very high increase in minor injury collisions rather than a significant KSI reduction.

The increase in the number of cyclist collisions typically doubled across all age groups between 2006 and 2012, **Appendix A**, except the 65+ age range and those aged 25-35 experienced the highest prevalence of collisions.

Male cyclists were involved in approximately 80% (79.5%) of all cyclist injury collisions. When the relative ISR of male and female cyclists were analysed, **Figure 4.d**, the ISR for female cyclists decreased consistently between 2006 and 2011.

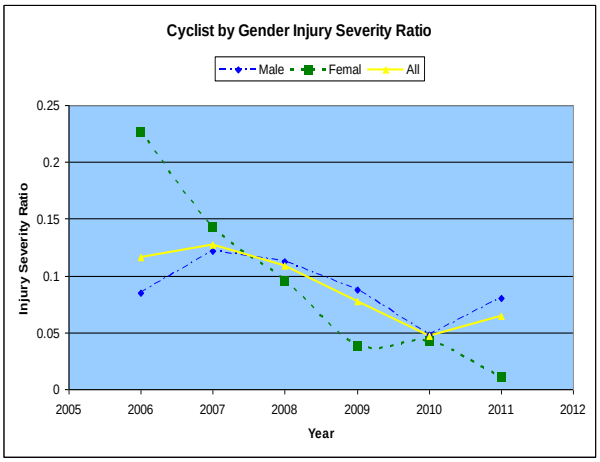

Figure 4.d *Injury Severity Ratio of Cyclist by Gender*

Pedestrians

Pedestrians are involved in approximately 22% of fatal collisions on Irish roads but represent under 15% of the model share. Between 2006 and 2012 the number of pedestrians involved in fatal collisions decreased by 58.57%, serious injury decreased by 36.43% and minor injuries increased by 5.77%, **Table 4.4.**

Ped	Fatal	Serious	Minor	KSI	ISR	No. Cols
2006	70	129	762	199	0.21	961
2007	79	146	732	225	0.24	957
2008	48	134	936	182	0.16	1118
2009	40	99	934	139	0.13	1073
2010	44	86	791	130	0.14	921
2011	46	89	806	135	0.14	941
2012	29	82	895	111	0.11	1006
% Change	-58.57	-36.43	17.45	-44.22	-46.72	4.68

Table 4.4. *Pedestrian Collision Injury Severity Ratio*

The ISR decreased from 0.21 in 2006 to 0.14 in 2011 and 0.11 in 2012, a reduction of 46.72%. Despite this progress pedestrian ISR are still higher than driver ISR at 0.06.

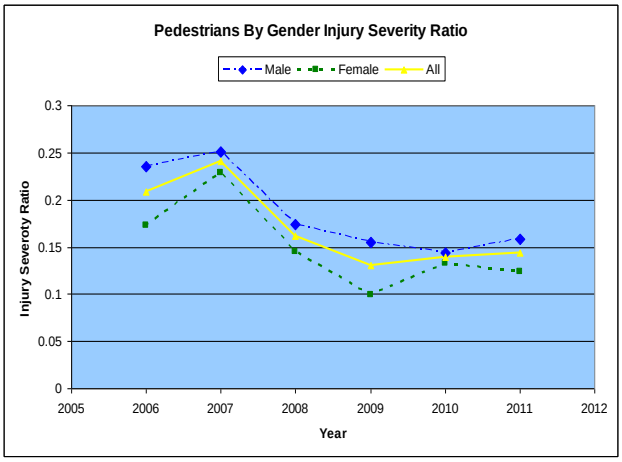

Figure 4.e *Injury Severity Ratio of Pedestrians by Gender*

When the relative ISR of male and female pedestrians were analysed, **Figure 4.e**, female pedestrian ISR figures were consistently lower than their male counterparts.

The decrease in numbers of fatal pedestrian collisions almost halved across the 0-14, 15-25, 55-64 and 65+ age groups and male pedestrians account for approximately 67.5% of pedestrian injury collisions, **Appendix A**. However, when male and female fatal pedestrian collisions are compared by age group a different trend emerges. Fatal collisions involving female pedestrians in the 65+ age group are most frequent. In males the 65+ age group is also high but there is a more even frequency across the age groups.

Motorcyclists

Motorcyclists are involved in approximately 11% of fatal collisions on Irish roads but account for less than 1% of the modal share. Between 2006 and 2012 the number of motorcyclists involved in a fatal collision decreased by 29.63%, serious injury decreased by 52.56% and minor injuries decreased by 32.64%, **Table 4.5**.

Motor Cyclist	Fatal	Serious	Minor	KSI	ISR	No. Cols
2006	27	78	432	105	0.20	537
2007	34	61	315	95	0.23	410
2008	29	60	444	89	0.17	533
2009	25	52	388	77	0.17	465
2010	16	46	330	63	0.16	392
2011	18	37	295	55	0.16	350
2012	19	37	291	56	0.16	347
%Change	-29.63	-52.56	-32.64	-46.67	-17.46	-35.38

Table 4.5. *Motorcycle Collision Injury Severity Ratio*

The total number of collisions decreased by 35.38% between 2006 and 2012 and the ISR decreased from 0.20 to 0.16 a reduction of 17.46% but are still higher than drivers.

Injury Severity Ratio

The Injury Severity Ratio (ISR) of all collisions between 2006 and 2012 fell from 0.16 to 0.10, **Figure 4.f** and **Appendix A**, which reflects the reduction in fatal and serious injury collisions.

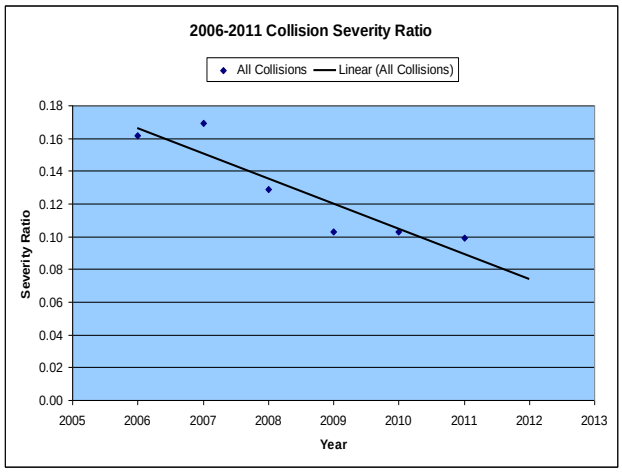

Figure 4.f *Linear time-series plot of Injury Severity Ratio 2006-2011 for all collisions.*

While ISR's have improved there has been a less pronounced improvement where VRU's are involved. **Figure 4.g** summarises the IRS's in each of the VRU cohorts discussed.

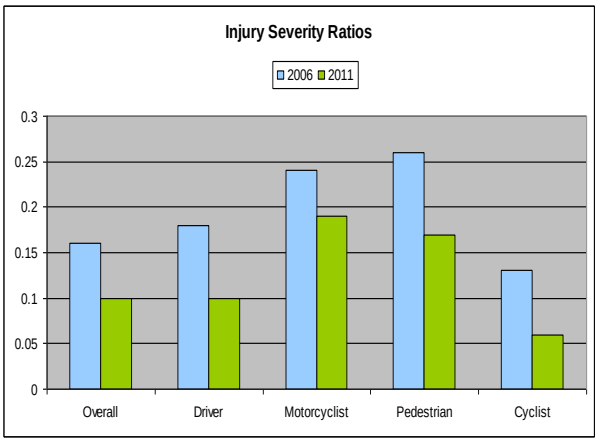

Figure 4.g *Summary of the overall injury severity ratios*

So while the picture looks good for motorised users, disaggregate analysis of the data shows that there is considerable scope for further improvement where VRU users are concerned.

5 DISCUSSION

The focus of the existing literature on national collision statistics has been the attainment of a target to reduce the overall number of fatal collisions. Injury severity has not been to the forefront of research or the comparative severity and performance between road users.

The study found that while the overall number of fatal collisions fell and achieved the national target, there was a different story beneath the surface of a well publicised success. By disaggregating the data and using the ISR the study revealed that there is lack of parity across road users and that not all road users have benefited equally from the national improvement.

This study observed an overall drop in the ISR across all VRU sub groups examined.

Motorcyclists and pedestrians were found to IRS nearly double the overall ISR figure. Cyclists stand out as having a very low apparent ISR (0.06 by 2012) and relatively high increase in the number of minor collisions. This ISR was surprisingly low and does not appear to reflect the high level of perceived risk reported by Irish VRU (SARTRE 4, 2013) and is considerably lower than UK figures (0.20 in 2012). A similar ISR ratio would have been expected because the fatalities per million vehicle kilometres travelled are similar to UK figures.

There is a trend for a higher accident risk for cyclists in countries with large volumes of cycling traffic. This is somewhat counter intuitive and unexpected given the prevalence of better cycling infrastructure, more experienced cyclists and longer standing tradition of cycling in these countries, but there may also be a better accident reporting culture for these cyclists than

countries like Ireland with a very small modal share of the transport system. The low ISR may be due to under reporting and this would certainly be supported by recent research highlighting severe under reporting of serious injury collisions amongst cyclists by a factor of 10 (Bedford et al., 2011). Therefore the low ISR is most likely due to under reporting and not a reduction in collision severity and rates.

The attitude of pedestrians and cyclists to risk taking has also been shown to be a problem (SARTRE 4, 2013). In Ireland this appears to be more prevalent among males and their ISR reflects this where males were found to have consistently higher ISR than females.

The analysis carried out in this study shows that there is still gender disparity and males are over represented. If male road users behaved and adopted female attitudes to road use in line with their female counterparts it is expected that the road mortality rate in Europe would fall by 20% (ETSC, 2013).

Given that there is an aging population in Ireland the numbers of collisions involving pedestrian 65+ needs to be addressed urgently. With the population of older and very old persons projected to reach 1.04 million by 2046 (CSO, 2013) there could be up to 560,000 more older people than young.

6 CONCLUSIONS

It is clear from the analysis carried out in this study that the measure of road safety improvement must not wholly focus on a single global number as exemplified in the statement "The rate of fatalities per million population is now 41, less than half of the rate in 2001" (RSA, 2011). An overall average performance number is too simple a description of such a complex system. Global figures mask the composite nature of road safety, and its performance, which is a complex and interdependent system of many road safety areas and players.

The present manner of analysing road safety improvements i.e. based on the total number of road fatalities and the total fatality rate is insufficient to achieve a thorough understanding of road safety changes and developments over time. By looking at the results in a disaggregate form, and also looking at the relative ISR, the areas where road safety efforts have been ineffective or successful becomes more transparent. For this reason it would be more advantageous to divide the total number of road fatalities into subgroups and to investigate each individual subgroup. In this way the road user sub groups at higher risk become apparent.

VRU still have a long way to go in terms of the relative number and severity of collision outcomes. The ISR of VRU needs to be addressed and brought to the forefront of national discussion surrounding road safety improvement, so that there is equity of risk and knowledge within the whole transport system.

Roads are shared multifunctional spaces, and as such should afford equal safety or risk for all users. The new Road Safety Strategy 2012-2020 'Closing the Gap', does not have a target for VRU's. Setting targets draws emphasis to and raises the status of a problem within the strategy through implementation, monitoring and evaluating the target performance.

The under representation of cyclist collisions highlights that not all road collisions are being captured and documented in police data and a permanent means of linking hospital data and police data should be developed and reported annually.

The existing systems do not support this type of collaborative approach. In the absence of more accurate information systems, the true economic and social impact of serious injury collisions cannot be reliably determined. This is a barrier to performance evaluation and meaningful future investment and should be investigated to determine how this could be implemented.

National government policies are increasingly involved in promoting cycling and walking as a sustainable and alternative mode of transport. government set targets for increasing sustainable mobility by 2020, i.e. to have 55% of all journeys to work made by foot, bicycle or public transport (with cycling making up 10% of this cohort as set out in the Smarter Travel (2009) policy document). The target set is ambitious given the 2011 CSO census which shows that walking, cycling and public transport make up 14%, 2% and 13% of journeys respectively. However, this in turn will require more attention to road safety policies, and road safety perception of such activities that may be obstacles to encouraging transfer to alternative modes of transport, to successfully achieve policies and their targets.

If VRU road safety is not addressed, and cycling numbers increase, it may result in further increased cyclist casualties (Stipdonk, 2013). Urban road safety should be integrated into the urban mobility plans to overcome barriers to their implementation and success. Moreover, education should be employed to address risky behaviour of both pedestrians and cyclists.

Age and gender in terms of road safety must also be considered. As an aging population Ireland will have more old people than young people and the needs of these road users must be factored into future road safety strategies. Gender differences should be taken into account when developing road safety policies and used to pinpoint and target the worst offenders. Road traffic law enforcement is an effective deterrent (Elvik et al., 2009 and Phillips et al., 2011). Gender differences should therefore be acknowledged when developing road safety policies.

7 RECOMMENDATIONS

Whilst using the ISR was useful, capturing all injury collisions and show comparative injury risk between

road users, it needs to be reviewed in tandam with relative risk exposure. In order to track the change collision rates, taking account of exposure to travel mode risk (kilometres travelled per population) by each road user group, should be reported with annual collisions figures. A target rate should be set for the ISR and exposure risk level for each user group. The targets and results should be presented in a chart to act as a type of 'road safety barometer' to illustrate the performance of each road user group in the transport system. The targets should be benchmarks for the purpose of comparison with other countries (Wegman et al., 2010).

Large volumes of statistical tables and charts are difficult to digest and understand particularly when road safety performance information has a wide spectrum of users: *An Garda Siochana* Department of Transport, Department of Finance, Health Service Executive, sustainable travel and mobility policies, health and safety at work. A 'road safety barometer' chart would convey information on the state of road safety 'at a glance'. Thus, instead of a single global statement on fatalities, a simple visual representation in chart form could be used. Total numbers are typically reported as shown in **Figure 7.1**, what stands out is car users. VRU don't appear to preform too badly. By comparison Figure 7.2

Adopting an annual target review promotes a 'data led' policy approach to encourage more use of data to understand the problem of road safety and provide 'feedback' to inform future decision making. Policy makers need clear concise information presented in an accessible format that is readily understood.

While there was an overall drop in the ISR the analysis gives a clear indication of where future improvements can be made and which groups of road users need to be targeted. It also shows where the large improvements have been made and these should be monitored to ensure that collision figures do not start to regress.

Significant research has been undertaken into the development of safety mitigation for vehicles, but comparatively little has been done for bicycles and pedestrians. Changing the way road safety performance is reported would help to highlight these groups that should hopefully lead to more research in this area.

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Appendix A

4. Cyclists

Age Group	*Frequency*					
	2011	**2010**	**2009**	**2008**	**2007**	**2006**
0-14	55	54	52	31	48	25
15-24	71	49	70	63	44	26
25-34	96	112	94	100	67	64
35-44	70	73	70	51	39	32
45-54	61	52	39	34	37	25
55-64	28	33	30	25	15	13
65+	15	17	11	17	13	10
Total	396	390	366	321	263	195
%Male	76.7	75.9	78.9	85.3	77.1	83.1

Table 4.5.5 *Cyclist collisions by Age group.*

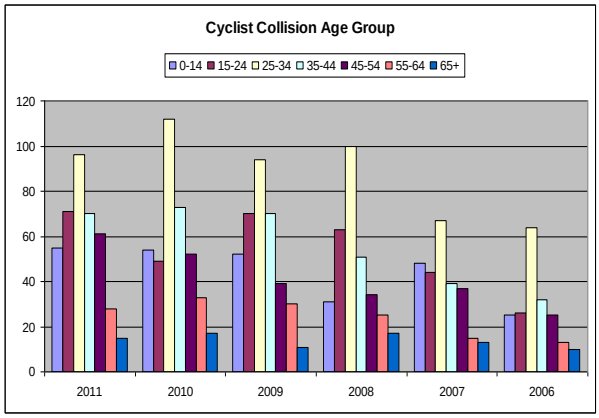

Figure 4.5.e *Cyclist Collisions by age groups between 2006 and 2011*

Pedestrians

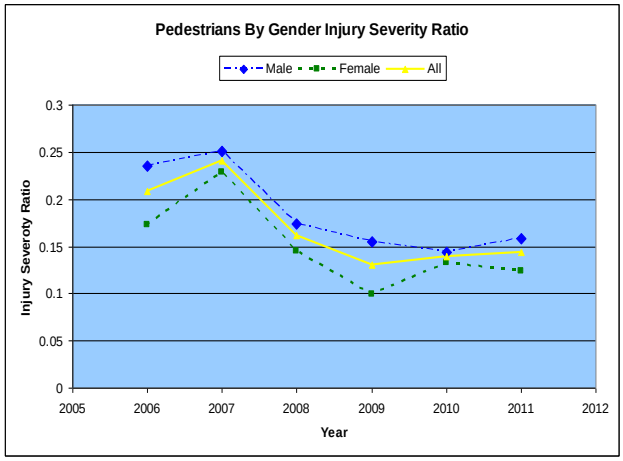

Figure 4.5.g *Injury Severity Ratio of Pedestrians by Gender*

Age Group	*Frequency*					
	2006	**2007**	**2008**	**2009**	**2010**	**2011**
0-14	6	4	8	7	4	3
15-24	11	13	9	4*	6	5
25-34	6	3	4	5	3	7
35-44	6	7	4	3	7	9
45-54	3	8	7	4	7	4
55-64	8	10	4	7	7	3
65+	29	32	12	10	10	15
Total	69	77	48	40	44	46
%Male	68.12	64.94	64.58	65.00	72.73	69.57

Table 4.5.7 *Fatal Pedestrians by Age group and male pedestrian percentage*

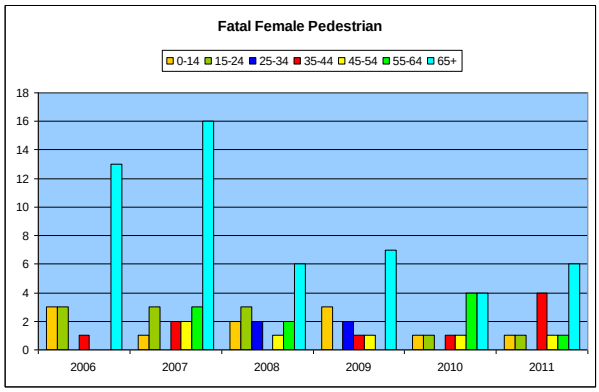

Figure 4.5.h *Fatal female pedestrians by age grouping 2006 to 2011.*

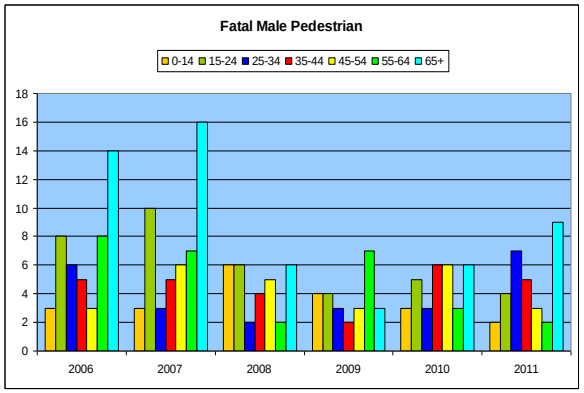

Figure 4.5.i *Fatal male pedestrians by age grouping 2006 to 2011.*

Injury Severity Ratios

	Fatal	Serious	Minor	KSI	ISR	No. Cols
2006	321	653	5044	974	0.16	6018
2007	309	618	4540	927	0.17	5467
2008	254	613	5864	867	0.13	6731
2009	220	463	5932	683	0.1	6615
2010	185	409	5186	594	0.1	5780
2011	172	348	4710	520	0.11	5230
2012	152	333	5125	485	0.09	5610
2013	181	-	-	-	-	-
%Change	-52.65	-49.00	1.61	-50.21	-43.75	-6.78

Table 4.6 *Overall Collision Injury Severity Ratio*

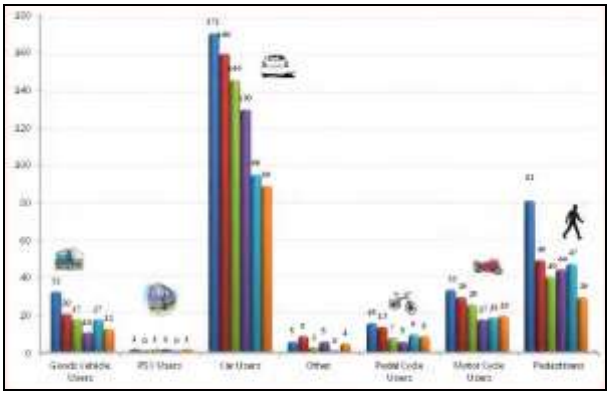

Figure 7.1 *RSA Road Collision Facts 2012 Figure A4-Total number of road deaths by user type.*

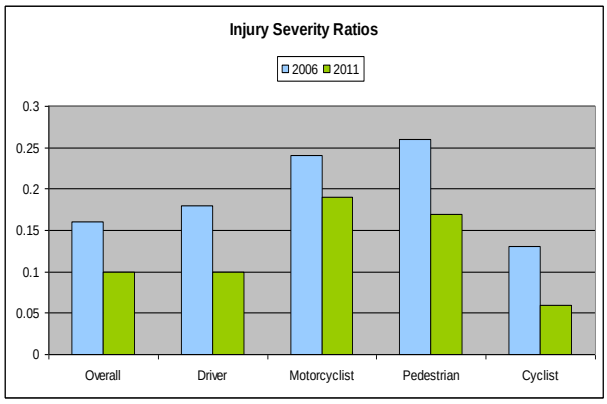

Figure 7.2 *Injury severity ratios for each road user group.*