



Social cost of road crashes and injuries 2014 update

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Technical queries and comments on this report should be referred to:

Financial, Economic and Statistical Analysis Team
Ministry of Transport
PO Box 3175
Wellington 6140
New Zealand

Email: info@transport.govt.nz

Tel: +64 4 439 9000

Fax: +64 4 439 9003

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Executive summary

- Road crashes impose intangible, financial and economic costs to society. These costs include reduced quality of life; reduced productivity; medical and other resource costs. The Ministry of Transport updates the social cost of road crashes and injuries annually to allow comparison of the costs and benefits of any road safety actions in current dollars.
- The update report provides estimates of average social costs per injury, after accounting for inflationary effects. For the average social cost per crash, it also accounts for any changes in the mix of crashes by area and severity, and the average number of injuries involved in a crash.
- The loss of life and life quality component represents over 90 percent of the total social cost of road injuries. A willingness-to-pay valuation technique is used to express pain and suffering from loss of life or life quality in dollar terms. The resulting estimate is referred as the willingness-to-pay based value of statistical life or VOSL. The VOSL was established at \$2 million in 1991 and is regularly indexed to the average hourly earnings to express the value in current dollars. The updated VOSL is \$3.95 million per fatality, at June 2014 prices.
- The updated average social cost per fatality is \$3,981,700. This estimate includes the updated VOSL, reduced productivity; medical and other resource costs. Apart from fatalities, not all serious and minor injuries are reported to New Zealand Police. A simple way to incorporate the costs associated with non-reported cases is to scale up the average social cost estimates to include the share of costs attributable to non-reported cases. With such an adjustment, the average social cost per reported serious injury is estimated at \$724,000 and \$70,000 per reported minor injury.
- In per-crash terms, the updated average social cost is estimated at \$4,582,600 per fatal crash, \$857,000 per reported serious crash and \$90,000 per reported minor crash. The estimates for serious and minor crashes have been scaled up to account for non-reported cases.
- The total social cost of motor vehicle injury crashes in 2013 is estimated at \$3.14 billion, at June 2014 prices. This represents a reduction of \$0.3 billion (or 8.6 percent) compared to the previous year (from \$3.43 billion in 2012).

Part 1 The 2014 update

1.1 Introduction

This is an annual update of the Social Cost of Road Crashes and Injuries statistics published by the Ministry of Transport. This update provides estimates of the average social costs per injury and per crash at June 2014 prices. The update accounts for any changes in the mix of crashes and severities by area and is based on crash and injury data from 2011 to 2013. Updated social cost estimates are incorporated into the NZ Transport Agency's Crash Analysis System to facilitate consistent appraisal of the safety benefits from the prevention of road crashes and injuries.

1.2 Estimation of injury and crash costs

The social cost of a road crash or a road injury is defined as the total cost that occurs as a result of the road crash or injury. Its value depends on the number of cost components¹ estimated and the estimation methods adopted.

In New Zealand, the social cost of a road crash or a road injury includes the following components:

- loss of life and life quality
- loss of output due to temporary incapacitation
- medical costs
- legal costs
- vehicle damage costs

These social cost components are either measurable or can be estimated in dollar terms. A willingness-to-pay valuation technique is used to express pain and suffering from loss of life or life quality in dollar terms (that is, the willingness-to-pay based value of statistical life or VOSL). Various methodologies have been developed to estimate the value of other social cost components. For a description of the methodology used to update the social cost components, please refer to the Appendix.

Estimation of the social cost of road crashes and injuries requires two stages of analysis. The first stage involves estimating the total number of crashes and injuries. While all fatal crashes are recorded by New Zealand Police in the official Traffic Crash Reports (TCRs), only some of the serious and minor injury crashes are. Hospitalisation data and Accident Compensation Corporation's (ACC) motor vehicle claims data are used in conjunction with TCRs to obtain the best estimates of the total numbers of road crashes and injuries. The estimated total numbers of crashes and injuries for the years 2011 to 2013 are given in Table 10. For the three years to 2013, only 59 percent of all serious injuries and 32 percent of all minor injuries are recorded in TCRs.

The second stage involves calculating the impacts in monetary terms. Individual social cost components are updated to current prices using the price indices tabulated in Table 11. Adding all the social cost components gives the average social cost per incident (that is, crash or injury). To take into account the non-reported cases, a simple way is to scale up the average social cost estimates to include the share of costs attributable to non-reported cases. The average social cost obtained after such an adjustment is referred to as the average social cost per reported crash (or injury).

¹ The social cost estimates do not include transfer payments such as taxes or insurance premiums. Current estimates also exclude the costs associated with insurance administration, traffic delays due to road crashes and collateral damage (other than vehicle damage). While these costs can be very high in some specific cases, they are unlikely to materially affect the average cost estimates obtained at the aggregated level.

1.3 Average social cost per injury and per crash

The updated value of statistical life is \$3.95 million per fatality, at June 2014 prices. Adding the other social cost components gives an updated average social cost per fatality of \$3,981,700. For non-fatal injuries, the updated average social cost is estimated at \$419,300 per serious injury and \$22,400 per minor injury. After scaling up the estimates to account for non-reported cases, the average social cost estimates increase to \$724,000 per reported serious injury and \$70,000 per reported minor injury.

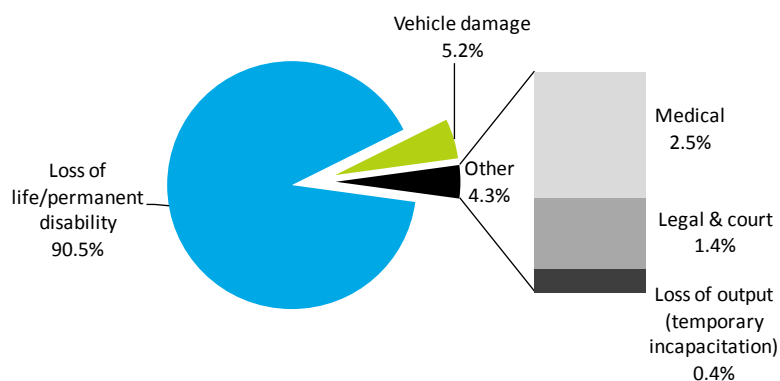
In per-crash terms, the updated average social cost is estimated at \$4,582,600 per fatal crash, \$485,000 per serious crash and \$27,500 per minor crash. This is adjusted to \$857,000 per reported serious crash and \$90,000 per reported minor crash, after scaling up the estimates to account for non-reported cases. Because each crash can result in multiple injuries of various injury severity, the average social cost per crash is higher than the average social cost per injury in all cases.

1.4 Total social cost of road injury crashes in 2013

The total social cost of motor vehicle injury crashes in 2013 is estimated at approximately \$3.14 billion, at June 2014 prices. This represents a reduction of \$0.3 billion (or 8.6 percent) compared to the previous year (from \$3.43 billion in 2012). This reduction is attributable mainly to a 17.9 percent reduction in the total number of fatalities (from 308 in 2012 to 253 in 2013). Over the same period, there was a 0.4 percent increase in the estimated total number of serious and minor injuries (from 34,090 in 2012 to 34,242 in 2013)².

Figure 1 shows loss of life and/or life quality due to permanent impairment accounted for approximately 91 percent of the total social cost of injury crashes. Vehicle damage accounted for around five percent, and other cost components made up the remaining four percent.

Figure 1: Share of total social cost of injury crashes in 2013, by cost component



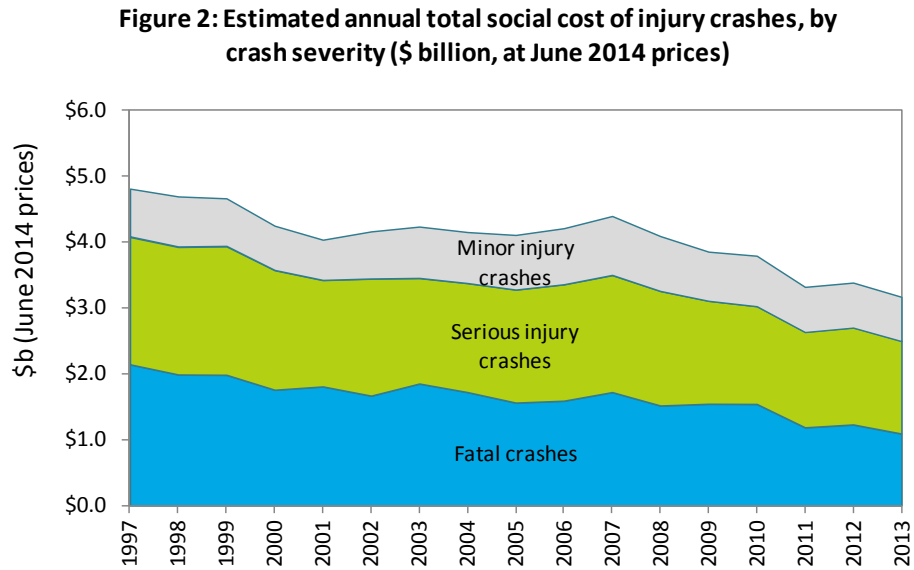
Total social cost of injury crashes in 2013 = \$3.14 billion (June 2014 prices)

² These estimated total numbers of serious and minor injuries include those recorded by NZ Police, hospitals and ACC.

In addition, there are an estimated 204,470 non-injury crashes³, valued at a further \$0.6 billion. This gives a total social cost of all motor vehicle crashes in 2013 of \$3.73 billion (reduced from \$4.04 billion in 2012). These estimates include the costs associated with both reported and non-reported cases.

1.5 Annual total social cost of road crashes for the years from 1997 to 2013

Figure 2 shows the trend of the estimated annual total social cost of injury crashes for the years from 1997 to 2013.



Note: This chart includes allowances for non-reported cases.

³ Guria (1995) estimated that the number of non-injury crashes is 8.4 times the number of minor injury crashes. This analysis assumes this relativity remains the same. [Guria (1995), "Estimates of vehicle damage costs", Wellington, Land Transport Safety Authority.]

1.6 Social cost of injury crashes by area and region from 2011 to 2013

On average, around 57 percent of the total social cost of road injury crashes relates to crashes that occurred on open roads⁴. The regional distributions by area are plotted in Figures 3 and 4.

Figure 3: Total social cost of road injury crashes on open roads, by region (\$ million, at June 2014 prices)

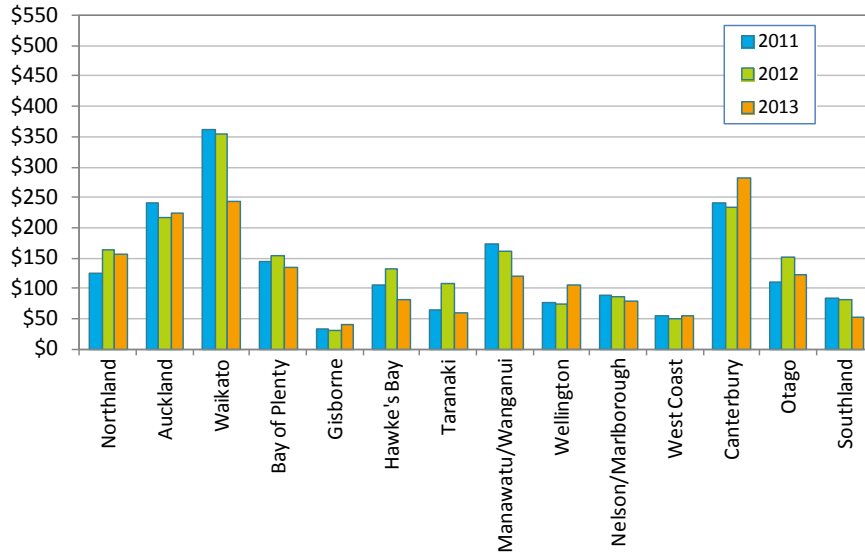
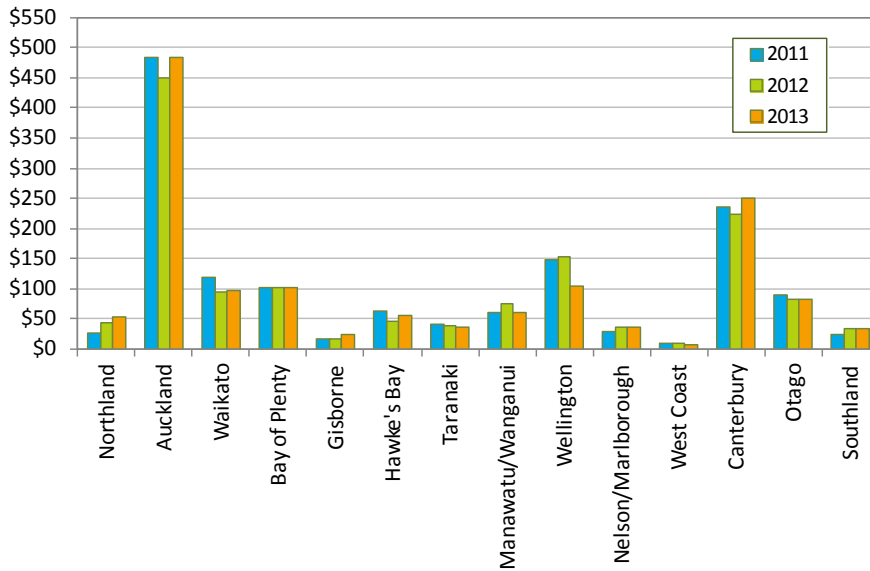


Figure 4: Total social cost of road injury crashes on urban roads, by region (\$ million, at June 2014 prices)



⁴ In this report, open roads are defined as roads with a legal speed limit of over 70 kilometres per hour (kph). Urban roads are defined as roads with a legal speed limit of 70 kph or less.

Part 2 The social cost estimates

2.1 Average social cost by cost component

Tables 1 and 2 provide the estimates of average social costs per crash and per injury, including breakdowns by cost component. Table 3 provides the estimates of average social costs per non-injury crash by area. These estimates do not include adjustment for under-reporting and are suitable only for cases where the total number of crashes and injuries are known.

Table 1: Average social cost per crash, by cost component

Cost components	Crash type		
	Fatal	Serious	Minor
	June 2014 prices (\$)		
Loss of life/permanent disability	4,532,600	454,700	19,400
Loss of output (temporary disability)	700	1,600	300
Medical –			
Hospital/medical	7,600	10,100	200
Emergency/pre-hospital	3,900	1,400	800
Follow-on	1,800	5,000	100
Legal and court	24,600	5,000	1,000
Vehicle damage	11,400	7,100	5,700
Total	4,582,600	485,000	27,500

Notes:

1. Figures may not add to totals due to rounding.
2. These estimates have not been adjusted for the level of non-reporting.

Table 2: Average social cost per injury, by cost component

Cost components	Injury type		
	Fatal	Serious	Minor
	June 2014 prices (\$)		
Loss of life/permanent disability	3,948,300	394,800	15,800
Loss of output (temporary disability)	0	1,300	300
Medical –			
Hospital/medical	3,600	8,900	100
Emergency/pre-hospital	2,900	1,100	600
Follow-on	0	4,400	100
Legal and court	20,400	4,100	800
Vehicle damage	6,500	4,700	4,700
Total	3,981,700	419,300	22,400

Notes:

1. Figures may not add to totals due to rounding.
2. These estimates have not been adjusted for the level of non-reporting.

Table 3: Average social cost per non-injury crash

Per non-injury crash	June 2014 prices (\$)		
	All areas	Open roads	Urban roads
Non-injury crash – vehicle damage	2,900	3,100	2,800

Note: These estimates have not been adjusted for the level of non-reporting.

2.2 Average social cost per reported incident, by severity

Tables 4 to 6 provide the estimates of average social costs per reported crash and per reported injury, after adjusting for the level of non-reporting. The estimates for a combination of crash or injury types (fatal and serious, serious and minor, and all three) are useful for assessing safety risks that could cause severe injury to road users but have a low probability of occurrence (for example, in situations where the crash or injury numbers are small). If a programme is expected to reduce the number of injuries, but not the number of crashes, use the estimates from Table 6. Otherwise, use the estimates from Tables 4 and 5, depending on data availability and the purpose of the analysis.

Table 4: Average social cost per reported crash, by severity

Crash severity	June 2014 prices (\$)		
	All	Open roads	Urban roads
Fatal	4,582,000	4,698,000	4,264,000
Serious	857,000	900,000	817,000
Minor	90,000	95,000	86,000
Serious and minor	230,000	281,000	198,000
Fatal and serious	1,343,000	1,603,000	1,065,000
Fatal, serious and minor	345,000	500,000	245,000

Table 5: Average social cost per reported injury, by severity

Injury severity	June 2014 prices (\$)		
	All	Open roads	Urban roads
Fatal	3,982,000	3,982,000	3,982,000
Serious	724,000	706,000	744,000
Minor	70,000	70,000	71,000
Serious and minor	180,000	204,000	162,000
Fatal and serious	1,120,000	1,241,000	969,000
Fatal, serious and minor	266,000	354,000	200,000

Table 6: Average social cost per reported injury, excluding associated vehicle damage costs, by severity

Injury severity	June 2014 prices (\$)		
	All	Open roads	Urban roads
Fatal	3,975,000	3,975,000	3,975,000
Serious	716,000	698,000	736,000
Minor	56,000	54,000	57,000
Serious and minor	166,000	190,000	149,000
Fatal and serious	1,112,000	1,233,000	961,000
Fatal, serious and minor	253,000	340,000	187,000

2.3 Average social cost per reported injury crash, by vehicle movement

Table 7 provides estimates of the average social cost per reported crash by vehicle movement, using crash data from 2009 to 2013. These estimates have been adjusted for the level of non-reporting and are suitable for analysing policies or programmes that focus on specific vehicle movement classifications (for example, head-on crashes).

Table 7: Average social cost per reported injury crash (fatal, serious and minor), by vehicle movement

Vehicle movement classification	June 2014 prices (\$)		
	All	Open roads	Urban roads
Overtaking or lane change	442,000	579,000	280,000
Head-on, not overtaking	1,005,000	1,385,000	417,000
Lost control, straight roads	367,000	394,000	328,000
Cornering	409,000	437,000	353,000
Collision with obstruction	232,000	305,000	204,000
Rear-end collision	155,000	205,000	124,000
Turning versus same direction	248,000	400,000	176,000
Crossing, no turns	271,000	574,000	224,000
Crossing, vehicle turning	258,000	509,000	190,000
Vehicles merging	193,000	291,000	178,000
Right turn against	259,000	465,000	226,000
Vehicle manoeuvring	261,000	547,000	211,000
Pedestrian crossing road	341,000	1,226,000	308,000
Pedestrian other	563,000	1,380,000	419,000
Miscellaneous	644,000	719,000	573,000

2.4 Average social cost by local government region

Due to differences in physical locations, sizes of regions, the availability of facilities, and for other reasons, the proportions of injury crashes that are reported to New Zealand Police differ across regions. The mix of open roads and urban roads crashes also differs across regions. As a result, there are regional variations in the average social costs per reported injury and per crash.

Tables 8 and 9 provide the regional average social costs per reported crash and per reported injury respectively, using crash data from 2011 to 2013. These estimates have been adjusted for the level of non-reporting and are useful for the evaluation of regional programmes or policies.

Table 8: Average social cost per reported injury crash, by local government region

Region	Crash severity					
	Fatal	Serious	Minor	Serious and minor	Fatal and serious	Fatal, serious and minor
June 2014 prices (\$)						
All areas						
Northland	4,568,000	1,137,000	91,000	323,000	1,621,000	473,000
Auckland	4,427,000	833,000	89,000	179,000	1,235,000	242,000
Waikato	4,767,000	505,000	91,000	186,000	1,204,000	382,000
Bay of Plenty	4,625,000	1,008,000	90,000	300,000	1,464,000	439,000
Gisborne	6,872,000	1,349,000	88,000	318,000	2,102,000	502,000
Hawke's Bay	4,882,000	1,274,000	88,000	305,000	1,862,000	463,000
Taranaki	4,452,000	1,135,000	90,000	308,000	1,733,000	489,000
Manawatu-Wanganui	4,660,000	695,000	91,000	207,000	1,343,000	369,000
Wellington	4,337,000	773,000	85,000	211,000	1,081,000	281,000
Nelson-Marlborough	4,440,000	1,164,000	87,000	286,000	1,637,000	412,000
West Coast	4,699,000	730,000	92,000	262,000	1,586,000	566,000
Canterbury	4,261,000	920,000	91,000	266,000	1,344,000	385,000
Otago	4,751,000	777,000	93,000	240,000	1,136,000	335,000
Southland	4,618,000	1,130,000	95,000	311,000	1,427,000	393,000
New Zealand	4,582,000	857,000	90,000	230,000	1,343,000	345,000

Table 8 continued

Region	Average social cost per reported crash June 2014 prices (\$)					
	Fatal	Serious	Crash severity		Fatal and serious	Fatal, serious and minor
			Minor	Serious and minor		
Open roads						
Northland	4,684,000	1,168,000	95,000	364,000	1,710,000	554,000
Auckland	4,495,000	880,000	94,000	192,000	1,587,000	318,000
Waikato	4,878,000	523,000	97,000	213,000	1,342,000	489,000
Bay of Plenty	4,688,000	1,119,000	97,000	365,000	1,803,000	617,000
Gisborne	6,499,000	1,385,000	96,000	393,000	2,237,000	662,000
Hawke's Bay	5,121,000	1,388,000	94,000	398,000	2,180,000	680,000
Taranaki	4,492,000	1,141,000	91,000	334,000	1,971,000	628,000
Manawatu-Wanganui	4,797,000	705,000	97,000	249,000	1,533,000	521,000
Wellington	4,544,000	867,000	91,000	258,000	1,506,000	442,000
Nelson-Marlborough	4,439,000	1,235,000	94,000	359,000	1,881,000	585,000
West Coast	4,733,000	722,000	92,000	280,000	1,737,000	688,000
Canterbury	4,309,000	986,000	97,000	330,000	1,650,000	575,000
Otago	4,990,000	829,000	98,000	297,000	1,341,000	469,000
Southland	4,742,000	1,167,000	99,000	362,000	1,519,000	477,000
New Zealand	4,698,000	900,000	95,000	281,000	1,603,000	500,000
Urban roads						
Northland	3,990,000	1,047,000	86,000	244,000	1,337,000	310,000
Auckland	4,365,000	817,000	87,000	174,000	1,100,000	217,000
Waikato	4,272,000	465,000	86,000	149,000	862,000	228,000
Bay of Plenty	4,428,000	912,000	86,000	257,000	1,126,000	312,000
Gisborne (note)	4,264,000	1,293,000	82,000	248,000	1,065,000	346,000
Hawke's Bay	4,044,000	1,128,000	84,000	233,000	1,390,000	286,000
Taranaki	4,240,000	1,127,000	88,000	281,000	1,359,000	339,000
Manawatu-Wanganui	4,066,000	679,000	85,000	168,000	980,000	221,000
Wellington	3,992,000	737,000	83,000	196,000	890,000	228,000
Nelson-Marlborough	4,447,000	1,050,000	82,000	217,000	1,161,000	237,000
West Coast	3,984,000	756,000	93,000	224,000	925,000	265,000
Canterbury	4,141,000	874,000	88,000	234,000	1,089,000	284,000
Otago	4,034,000	717,000	90,000	199,000	884,000	235,000
Southland	4,123,000	1,050,000	90,000	241,000	1,221,000	277,000
New Zealand	4,264,000	817,000	86,000	198,000	1,065,000	245,000

Note: Over the years from 2011 to 2013, there were only two fatal crashes on Gisborne's urban areas. This has inhibited robust estimation of the corresponding average social cost. Therefore, the national average estimates of the average social cost per reported fatal crash and per reported fatal and serious crash are used in this table.

Table 9: Average social cost per reported injury, by local government region

Region	Injury severity					
	Fatal	Serious	Minor	Serious and minor	Fatal and serious	Fatal, serious and minor
June 2014 prices (\$)						
All areas						
Northland	3,982,000	907,000	70,000	239,000	1,291,000	345,000
Auckland	3,982,000	723,000	72,000	144,000	1,066,000	194,000
Waikato	3,982,000	422,000	67,000	141,000	962,000	279,000
Bay of Plenty	3,982,000	822,000	69,000	225,000	1,186,000	324,000
Gisborne	3,982,000	1,169,000	72,000	252,000	1,690,000	387,000
Hawke's Bay	3,982,000	1,050,000	72,000	244,000	1,519,000	366,000
Taranaki	3,982,000	924,000	71,000	239,000	1,404,000	371,000
Manawatu-Wanganui	3,982,000	584,000	69,000	161,000	1,100,000	279,000
Wellington	3,982,000	693,000	71,000	176,000	960,000	232,000
Nelson-Marlborough	3,982,000	991,000	72,000	231,000	1,389,000	328,000
West Coast	3,982,000	625,000	69,000	205,000	1,307,000	426,000
Canterbury	3,982,000	805,000	71,000	207,000	1,172,000	297,000
Otago	3,982,000	640,000	70,000	181,000	919,000	247,000
Southland	3,982,000	896,000	70,000	225,000	1,121,000	279,000
New Zealand	3,982,000	724,000	70,000	180,000	1,120,000	266,000
Open roads						
Northland	3,982,000	898,000	70,000	259,000	1,310,000	385,000
Auckland	3,982,000	707,000	72,000	148,000	1,264,000	240,000
Waikato	3,982,000	422,000	67,000	153,000	1,028,000	336,000
Bay of Plenty	3,982,000	809,000	68,000	243,000	1,314,000	403,000
Gisborne	3,982,000	1,158,000	73,000	283,000	1,744,000	461,000
Hawke's Bay	3,982,000	1,037,000	72,000	295,000	1,623,000	495,000
Taranaki	3,982,000	907,000	71,000	254,000	1,564,000	463,000
Manawatu-Wanganui	3,982,000	580,000	68,000	181,000	1,215,000	364,000
Wellington	3,982,000	676,000	70,000	196,000	1,159,000	326,000
Nelson-Marlborough	3,982,000	985,000	72,000	269,000	1,518,000	435,000
West Coast	3,982,000	620,000	70,000	220,000	1,419,000	515,000
Canterbury	3,982,000	789,000	70,000	237,000	1,327,000	405,000
Otago	3,982,000	633,000	69,000	208,000	994,000	318,000
Southland	3,982,000	887,000	70,000	246,000	1,140,000	317,000
New Zealand	3,982,000	706,000	70,000	204,000	1,240,000	354,000

Table 9 continued

Urban roads		Average social cost per reported injury June 2014 prices (\$)				
Region	Fatal	Serious	Injury severity		Fatal and serious	Fatal, serious and minor
			Minor	Serious and minor		
Northland	3,982,000	941,000	71,000	197,000	1,217,000	251,000
Auckland	3,982,000	730,000	71,000	142,000	981,000	177,000
Waikato	3,982,000	423,000	69,000	122,000	771,000	184,000
Bay of Plenty	3,982,000	837,000	70,000	210,000	1,027,000	254,000
Gisborne	3,982,000	1,189,000	72,000	217,000	1,588,000	297,000
Hawke's Bay	3,982,000	1,071,000	72,000	198,000	1,322,000	242,000
Taranaki	3,982,000	947,000	71,000	222,000	1,139,000	266,000
Manawatu-Wanganui	3,982,000	592,000	71,000	139,000	858,000	182,000
Wellington	3,982,000	701,000	71,000	168,000	850,000	195,000
Nelson-Marlborough	3,982,000	1,001,000	71,000	188,000	1,095,000	203,000
West Coast	3,982,000	639,000	70,000	170,000	791,000	201,000
Canterbury	3,982,000	819,000	71,000	190,000	1,022,000	231,000
Otago	3,982,000	651,000	70,000	157,000	806,000	185,000
Southland	3,982,000	919,000	71,000	191,000	1,069,000	218,000
New Zealand	3,982,000	744,000	71,000	162,000	969,000	200,000

2.5 Crash statistics and price indices

Table 10: Reported and estimated number of crashes and injuries from 2011 to 2013

All areas								
	Reported	Reported injuries			Estimated	Estimated injuries		
	crashes	Fatal	Serious	Minor	crashes	Fatal	Serious	Minor
Fatal	764	845	307	345	764	845	307	345
Serious	5,095	0	5,801	1,903	9,009	0	10,241	3,331
Minor	22,871	0	0	28,088	74,665	0	0	91,700
Total	28,730	845	6,108	30,336	84,438	845	10,548	95,376
Open roads								
	Reported	Reported injuries			Estimated	Estimated injuries		
	crashes	Fatal	Serious	Minor	crashes	Fatal	Serious	Minor
Fatal	561	632	270	270	561	632	270	270
Serious	2,472	0	2,973	1,231	4,316	0	5,194	2,148
Minor	8,269	0	0	10,596	26,994	0	0	34,594
Total	11,302	632	3,243	12,097	31,871	632	5,464	37,012
Urban roads								
	Reported	Reported injuries			Estimated	Estimated injuries		
	crashes	Fatal	Serious	Minor	crashes	Fatal	Serious	Minor
Fatal	203	213	37	75	203	213	37	75
Serious	2,623	0	2,828	672	4,693	0	5,047	1,183
Minor	14,602	0	0	17,492	47,671	0	0	57,106
Total	17,428	213	2,865	18,239	52,567	213	5,084	58,364

Table 11: Price indices for updating unit costs

Cost components	Indices/measures	Infoshare table references	Period	Indices/values	% change over the 12 months to June 2014
Loss of life and life quality	Average hourly earnings (ordinary time)	QEX001AA	June 2013	\$27.53	+2.5%
Loss of output			June 2014	\$28.23	
Medical cost	Producers price input index – Health and community services	PPI021AA (Base: Dec 2010=1000)	June 2013 June 2014	1033 1043	+1.0%
Legal and court cost	Producers price input index – Legal services: Personal and Corporate	PPI018AA (Base: Dec 2010=1000)	June 2013 June 2014	1109 1148	+3.5%
Vehicle damage cost	Consumers price index – Vehicle servicing & repairs	CPI013AA (Base: June 2006 =1000)	June 2013 June 2014	1256 1292	+2.9%

Source: Infoshare, Statistics New Zealand.

2.6 Appendix: Methodology

The following section describes the methods used to update various social cost components.

Loss of life and life quality

The loss of life and life quality component represents an estimated value of pain and suffering to the injured and to their family. For non-fatal injuries, it also includes the loss of output due to permanent disability. These values were established through a Value of Safety survey (conducted in 1991). The survey was conducted to understand how respondents trade off between safety and wealth. Such information is then used to determine the willingness-to-pay value for avoiding one premature death (known as the willingness-to-pay value of statistical life) and one serious or minor injury. This willingness-to-pay approach has been widely used by many countries and is considered the most appropriate approach for use in safety intervention analysis.

The value of statistical life was established at \$2 million in 1991. It is regularly indexed to the average hourly earnings to express the value in current dollars. The updated value in 2014 prices is \$3.95 million per fatality. The loss of life and life quality component represents over 90 percent of the total social cost of injury crashes.

Loss of output due to temporary disability

Many injuries result in workers taking time off work. While the lost earnings are either met by employers or by Accident Compensation Corporation, such disruption affects gross output. Estimates of loss of output per injury are determined using average length of hospital stay (as a proxy for the average time lost per injury) and average daily earnings (as a proxy of loss of output) obtained from the latest Household Income Survey published by Statistics New Zealand.

For a serious injury, the average time lost per injury was 11.1 days and the average daily earnings per person (considering the age and gender profiles of 2011-2013 crash data) was \$120.50. These give an average loss of output of \$1,335 per serious injury. A similar estimate was also derived for minor injuries. In aggregate terms, loss of output due to temporary disability accounts for less than 1 percent of the total social cost of injury crashes.

Medical costs

The methodology for estimating medical costs was developed in the mid-1990s. It uses injury and cost data obtained from Dunedin and Waikato hospitals to determine the average cost associated with emergency treatment, hospital in-patient treatment and follow-on treatment by injury severity. Estimates for these average costs are updated annually to current dollars using the producers' input price index for health and community services. In aggregate terms, medical costs account for just over 2 percent of the total social cost of injury crashes.

Legal and court costs

Legal and court costs include three components: the justice system costs, the cost to New Zealand Police of crash attendance and investigation and the cost of imprisonment. These are based on actual administrative data obtained from New Zealand Police's Road Policing Programme and from the Ministry of Justice. In aggregate terms, legal and court costs account for around 1 percent of the total social cost of injury crashes.

Vehicle damage cost

Estimates of vehicle damage costs were established in the mid-1990s based on insurance claims data. They are updated annually for price changes using the consumer price index under the vehicle servicing and repairs category. In aggregate terms, property damage costs account for nearly 5 percent of the total social cost of injury crashes.