

# The Social Cost of Road Crashes and Injuries 2013 update

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## Part 1 The 2013 update

### 1.1 Overview

This is an annual update of the Social Cost of Road Crashes and Injuries published by the Ministry of Transport. This update provides estimates of the average social costs per injury and per crash, in June 2013 prices. The update accounts for any changes in the mix of crashes by area and severity, and the average number of injuries received in a crash. The analysis is based on crash and injury data from 2010 to 2012.

### 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 components<sup>1</sup> 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 (ie 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 2010 to 2012 are given in Table 10. For the three years to 2012, only 59 percent of all serious injuries and 33 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 (ie 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).

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<sup>1</sup> 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.

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.

### 1.3 Average social cost per injury and per crash

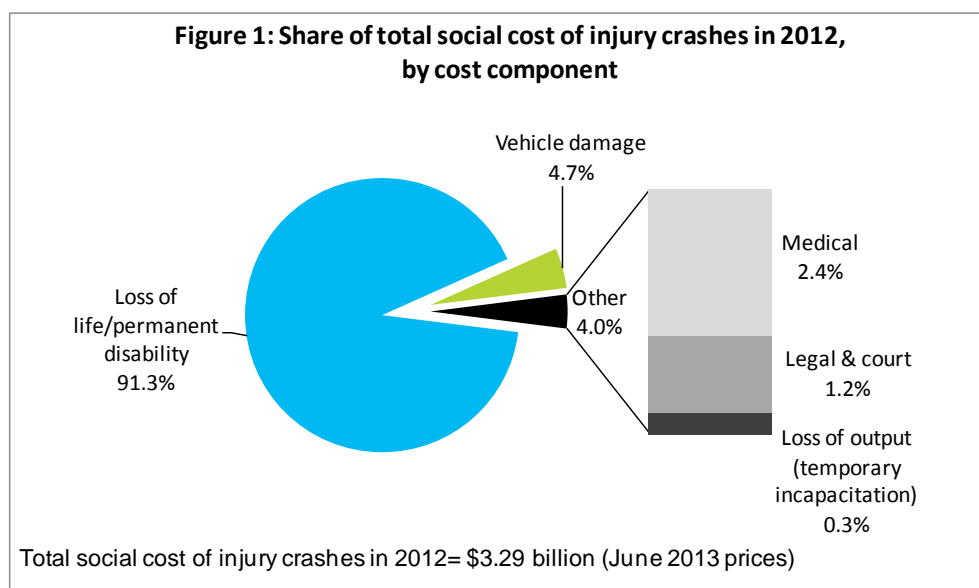
The updated value of statistical life is \$3.85 million per fatality, at June 2013 prices. Adding the other social cost components gives an updated average social cost per fatality of \$3,879,200. For non-fatal injuries, the updated average social cost is estimated at \$409,100 per serious injury and \$21,700 per minor injury. After scaling up the estimates to account for non-reported cases, the average social cost estimates increase to \$694,000 per reported serious injury and \$66,000 per reported minor injury.

In per-crash terms, the updated average social cost is estimated at \$4,536,300 per fatal crash, \$473,600 per serious crash and \$26,900 per minor crash. This is adjusted to \$826,000 per reported serious crash and \$85,000 per reported minor crash, after considering reporting rate adjustment. 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 2012

The total social cost of motor vehicle injury crashes in 2012 is estimated at approximately \$3.29 billion, at June 2013 prices. This represents an increase of \$0.03 billion (or 0.8 percent) compared to the previous year (from \$3.26 billion in 2011). This increase is attributable to an 8.5 percent increase in the total number of fatalities (from 284 in 2011 to 308 in 2012), despite a 4.3 percent reduction in the estimated total number of serious and minor injuries over that period (from 35,620 in 2011 to 34,090 in 2012)<sup>2</sup>.

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.

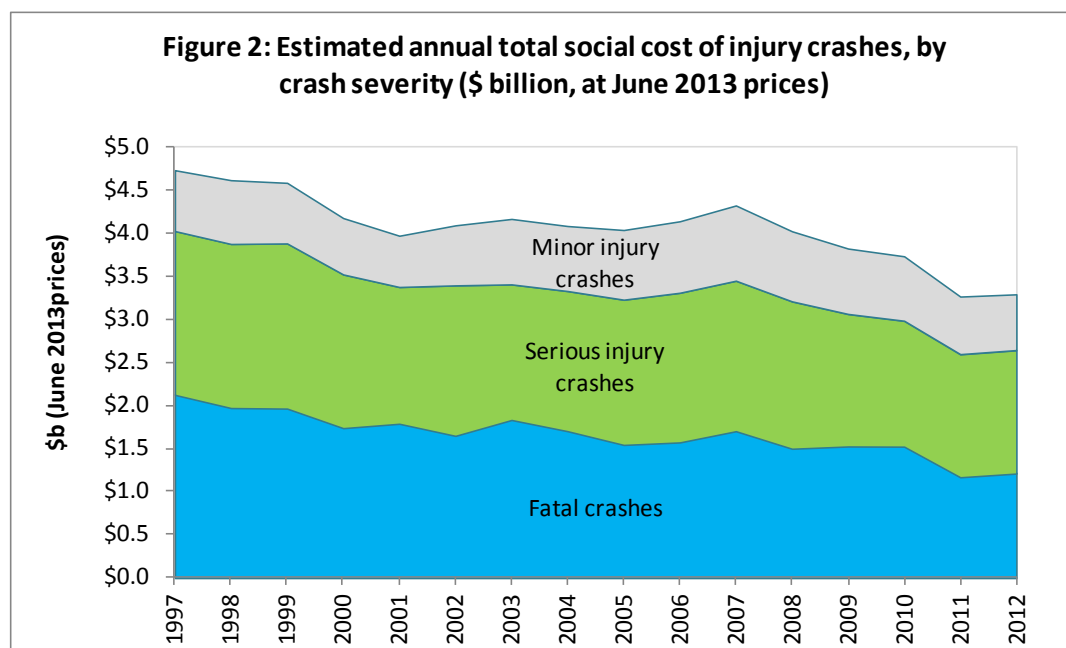


<sup>2</sup> These estimated total numbers of serious and minor injuries include those recorded by NZ Police, hospitals and ACC.

In addition, there are an estimated 195,400 non-injury crashes<sup>3</sup>, valued at a further \$0.55 billion. The total social cost of all motor vehicle crashes in 2012 is estimated at \$3.84 billion (increased from \$3.83 billion in 2011). 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 2012

Figure 2 shows the trend of the estimated annual total social cost of injury crashes for the years from 1997 to 2012.

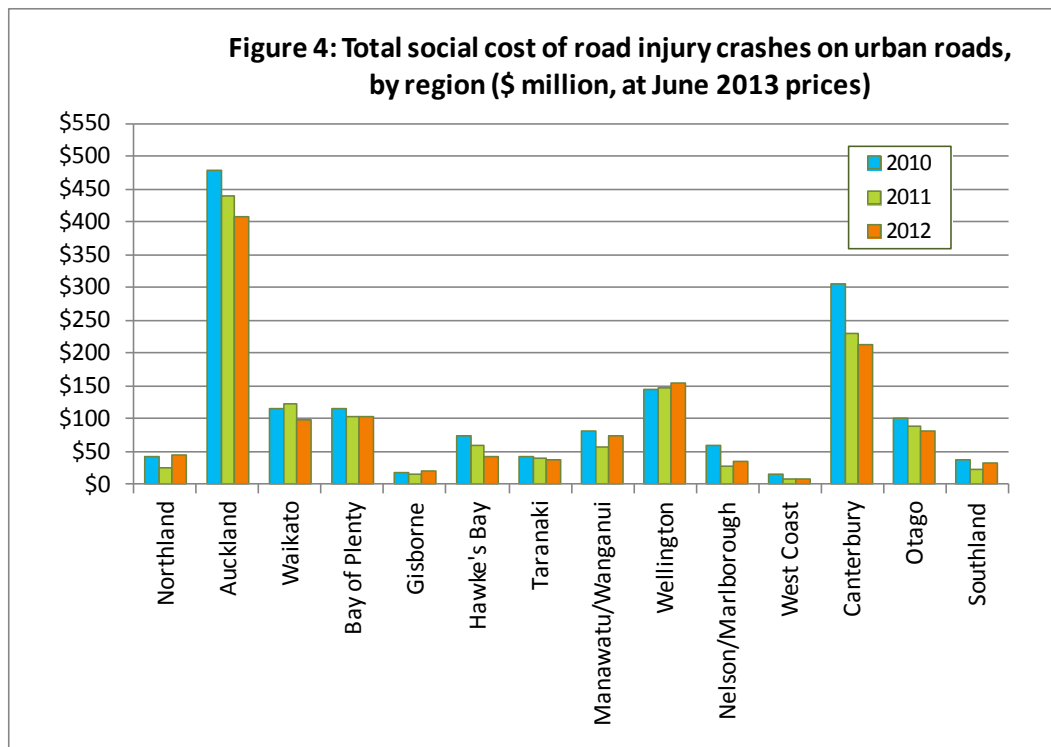
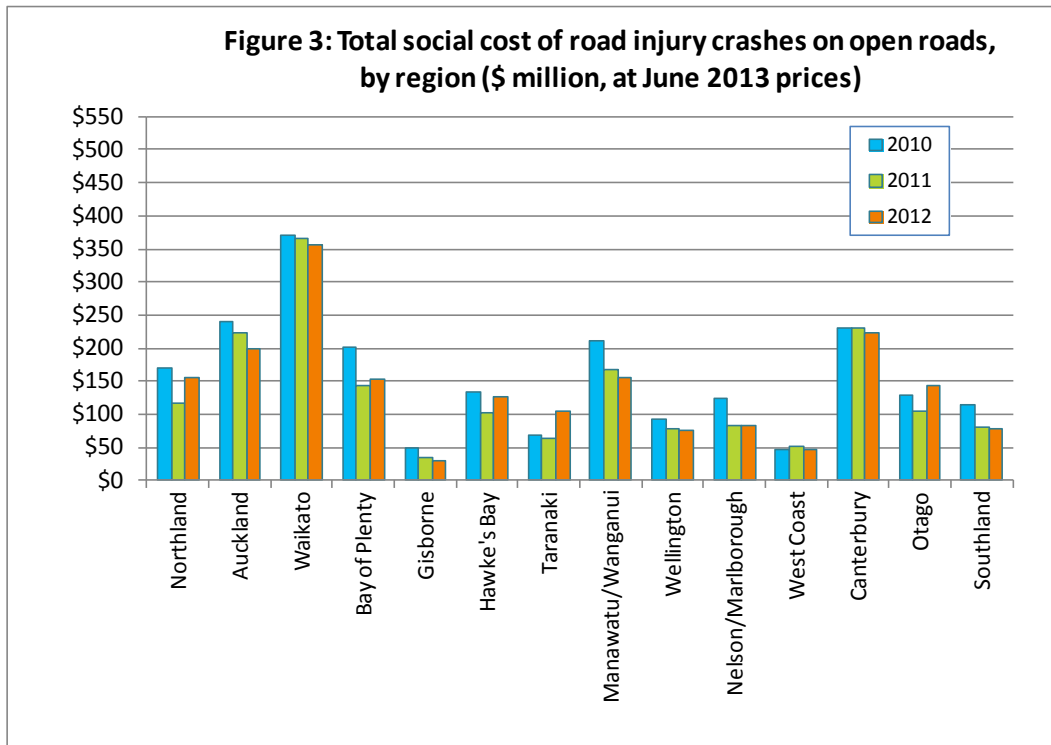


Note: This chart includes allowances for non-reported cases.

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

<sup>3</sup> Guria (1995) estimated that minor injury crashes are reported at a rate 8.4 times that of non-injury crashes. This analysis assumes this relativity remains the same. [Guria (1995), "Estimates of vehicle damage costs", Wellington, Land Transport Safety Authority.]

<sup>4</sup> 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. The corresponding terminologies used in previous updates were rural areas (ie open roads) and urban areas (ie urban roads).



## 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 2013 prices (\$)		
Loss of life/permanent disability	4,490,300	443,800	19,100
Loss of output (temporary disability)	700	1,500	300
Medical –			
Hospital/medical	7,900	10,100	200
Emergency/pre-hospital	3,900	1,400	800
Follow-on	1,900	4,900	100
Legal and court	20,500	4,900	900
Vehicle damage	11,000	6,900	5,600
<b>Total</b>	<b>4,536,300</b>	<b>473,600</b>	<b>26,900</b>

Notes:

1. Figures may not sum 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 2013 prices (\$)		
Loss of life/permanent disability	3,850,300	385,000	15,400
Loss of output (temporary disability)	0	1,300	200
Medical –			
Hospital/medical	3,600	8,800	100
Emergency/pre-hospital	2,900	1,100	600
Follow-on	0	4,300	100
Legal and court	16,400	4,100	700
Vehicle damage	6,100	4,500	4,500
<b>Total</b>	<b>3,879,200</b>	<b>409,100</b>	<b>21,700</b>

Notes:

1. Figures may not sum 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 (Note)	June 2013 prices (\$)		
	All areas	Open roads	Urban roads
Non-injury crash – vehicle damage	2,800	3,100	2,700

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 (eg 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 2013 prices (\$)		
	All	Open roads	Urban roads
Fatal	4,536,000	4,640,000	4,260,000
Serious	826,000	871,000	783,000
Minor	85,000	91,000	82,000
Serious and minor	219,000	269,000	187,000
Fatal and serious	1,345,000	1,606,000	1,060,000
Fatal, serious and minor	342,000	498,000	240,000

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

Injury severity	June 2013 prices (\$)		
	All	Open roads	Urban roads
Fatal	3,879,000	3,879,000	3,879,000
Serious	694,000	687,000	703,000
Minor	66,000	66,000	67,000
Serious and minor	170,000	194,000	153,000
Fatal and serious	1,111,000	1,240,000	948,000
Fatal, serious and minor	261,000	348,000	195,000

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

Injury severity	June 2013 prices (\$)		
	All	Open roads	Urban roads
Fatal	3,873,000	3,873,000	3,873,000
Serious	687,000	679,000	695,000
Minor	52,000	51,000	54,000
Serious and minor	158,000	181,000	141,000
Fatal and serious	1,104,000	1,233,000	941,000
Fatal, serious and minor	248,000	335,000	182,000

### 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 2008 to 2012. 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 (eg head-on crashes).

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

Vehicle movement classification	June 2013 prices (\$)		
	All	Open roads	Urban roads
Overtaking or lane change	422,000	523,000	289,000
Head-on, not overtaking	976,000	1,354,000	383,000
Lost control, straight roads	369,000	398,000	328,000
Cornering	401,000	437,000	331,000
Collision with obstruction	221,000	298,000	191,000
Rear-end collision	151,000	198,000	120,000
Turning versus same direction	222,000	357,000	160,000
Crossing, no turns	260,000	538,000	219,000
Crossing, vehicle turning	251,000	510,000	181,000
Vehicles merging	183,000	284,000	166,000
Right turn against	251,000	456,000	215,000
Vehicle manoeuvring	239,000	471,000	198,000
Pedestrian crossing road	327,000	1,107,000	300,000
Pedestrian other	536,000	1,415,000	385,000
Miscellaneous	643,000	737,000	561,000

## 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 2010 to 2012. 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 2013 prices (\$)						
<b>All areas</b>						
Northland	4,503,000	1,091,000	86,000	308,000	1,575,000	455,000
Auckland	4,235,000	716,000	84,000	157,000	1,129,000	219,000
Waikato	4,768,000	549,000	88,000	185,000	1,356,000	401,000
Bay of Plenty	4,612,000	1,028,000	84,000	297,000	1,589,000	470,000
Gisborne	6,726,000	1,438,000	82,000	311,000	2,251,000	502,000
Hawke's Bay	4,892,000	1,143,000	84,000	274,000	1,827,000	453,000
Taranaki	4,386,000	1,094,000	87,000	286,000	1,727,000	469,000
Manawatu-Wanganui	4,610,000	661,000	86,000	198,000	1,450,000	402,000
Wellington	4,262,000	806,000	81,000	217,000	1,022,000	267,000
Nelson-Marlborough	4,590,000	1,087,000	82,000	284,000	1,727,000	469,000
West Coast	4,467,000	714,000	85,000	248,000	1,430,000	490,000
Canterbury	4,308,000	862,000	86,000	260,000	1,258,000	373,000
Otago	4,434,000	771,000	88,000	233,000	1,133,000	329,000
Southland	4,394,000	1,108,000	90,000	313,000	1,487,000	427,000
<b>New Zealand</b>	<b>4,536,000</b>	<b>826,000</b>	<b>85,000</b>	<b>219,000</b>	<b>1,345,000</b>	<b>342,000</b>

Table 8 continued

Region	Average social cost per reported crash June 2013 prices (\$)					
	Fatal	Serious	Crash severity		Fatal and serious	Fatal, serious and minor
			Minor	Serious and minor		
<b>Open roads</b>						
Northland	4,456,000	1,113,000	91,000	337,000	1,675,000	529,000
Auckland	4,370,000	743,000	88,000	170,000	1,447,000	292,000
Waikato	4,857,000	564,000	92,000	211,000	1,515,000	521,000
Bay of Plenty	4,709,000	1,116,000	91,000	367,000	1,926,000	683,000
Gisborne	6,134,000	1,507,000	93,000	431,000	2,499,000	780,000
Hawke's Bay	5,234,000	1,219,000	90,000	371,000	2,083,000	682,000
Taranaki	4,451,000	1,092,000	91,000	315,000	1,963,000	615,000
Manawatu-Wanganui	4,702,000	674,000	94,000	239,000	1,660,000	574,000
Wellington	4,594,000	891,000	89,000	254,000	1,300,000	362,000
Nelson-Marlborough	4,444,000	1,119,000	86,000	370,000	1,835,000	655,000
West Coast	4,528,000	695,000	86,000	262,000	1,542,000	585,000
Canterbury	4,212,000	928,000	92,000	315,000	1,490,000	518,000
Otago	4,632,000	794,000	94,000	278,000	1,311,000	450,000
Southland	4,475,000	1,120,000	92,000	370,000	1,553,000	529,000
<b>New Zealand</b>	<b>4,640,000</b>	<b>871,000</b>	<b>91,000</b>	<b>269,000</b>	<b>1,606,000</b>	<b>498,000</b>
<b>Urban roads</b>						
Northland	4,954,000	1,030,000	80,000	248,000	1,251,000	297,000
Auckland	4,112,000	707,000	82,000	153,000	1,000,000	195,000
Waikato	4,325,000	516,000	83,000	149,000	949,000	230,000
Bay of Plenty	4,308,000	946,000	80,000	250,000	1,215,000	318,000
Gisborne (note)	4,260,000	1,335,000	76,000	223,000	1,060,000	285,000
Hawke's Bay	3,922,000	1,028,000	80,000	200,000	1,398,000	268,000
Taranaki	4,086,000	1,097,000	85,000	258,000	1,357,000	320,000
Manawatu-Wanganui	4,208,000	637,000	81,000	159,000	1,034,000	229,000
Wellington	3,887,000	773,000	78,000	204,000	903,000	233,000
Nelson-Marlborough	5,236,000	1,022,000	80,000	204,000	1,483,000	283,000
West Coast	3,881,000	769,000	85,000	219,000	1,029,000	283,000
Canterbury	4,478,000	818,000	84,000	232,000	1,084,000	298,000
Otago	3,888,000	745,000	85,000	201,000	925,000	240,000
Southland	3,983,000	1,077,000	88,000	231,000	1,296,000	275,000
<b>New Zealand</b>	<b>4,260,000</b>	<b>783,000</b>	<b>82,000</b>	<b>187,000</b>	<b>1,060,000</b>	<b>240,000</b>

Note: Over the three years to 2012, there was only one fatal crash on Gisborne's urban roads. 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 2013 prices (\$)						
<b>All areas</b>						
Northland	3,879,000	889,000	66,000	229,000	1,268,000	331,000
Auckland	3,879,000	621,000	67,000	126,000	969,000	174,000
Waikato	3,879,000	450,000	64,000	139,000	1,051,000	289,000
Bay of Plenty	3,879,000	844,000	66,000	226,000	1,282,000	349,000
Gisborne	3,879,000	1,178,000	68,000	237,000	1,731,000	375,000
Hawke's Bay	3,879,000	931,000	67,000	216,000	1,459,000	349,000
Taranaki	3,879,000	886,000	67,000	217,000	1,397,000	351,000
Manawatu-Wanganui	3,879,000	547,000	65,000	152,000	1,159,000	298,000
Wellington	3,879,000	713,000	67,000	178,000	900,000	217,000
Nelson-Marlborough	3,879,000	931,000	67,000	232,000	1,444,000	373,000
West Coast	3,879,000	583,000	65,000	194,000	1,133,000	368,000
Canterbury	3,879,000	754,000	66,000	201,000	1,093,000	286,000
Otago	3,879,000	643,000	65,000	174,000	934,000	241,000
Southland	3,879,000	873,000	66,000	223,000	1,174,000	301,000
<b>New Zealand</b>	<b>3,879,000</b>	<b>694,000</b>	<b>66,000</b>	<b>170,000</b>	<b>1,111,000</b>	<b>261,000</b>
<b>Open roads</b>						
Northland	3,879,000	879,000	66,000	240,000	1,310,000	366,000
Auckland	3,879,000	605,000	67,000	131,000	1,146,000	217,000
Waikato	3,879,000	449,000	63,000	152,000	1,132,000	352,000
Bay of Plenty	3,879,000	826,000	65,000	250,000	1,417,000	450,000
Gisborne	3,879,000	1,177,000	68,000	276,000	1,865,000	492,000
Hawke's Bay	3,879,000	914,000	67,000	267,000	1,524,000	476,000
Taranaki	3,879,000	874,000	67,000	231,000	1,569,000	441,000
Manawatu-Wanganui	3,879,000	542,000	64,000	171,000	1,272,000	389,000
Wellington	3,879,000	702,000	66,000	187,000	1,011,000	261,000
Nelson-Marlborough	3,879,000	925,000	68,000	288,000	1,499,000	497,000
West Coast	3,879,000	578,000	65,000	206,000	1,220,000	433,000
Canterbury	3,879,000	745,000	66,000	224,000	1,202,000	363,000
Otago	3,879,000	634,000	65,000	193,000	1,021,000	303,000
Southland	3,879,000	867,000	66,000	253,000	1,205,000	356,000
<b>New Zealand</b>	<b>3,879,000</b>	<b>687,000</b>	<b>66,000</b>	<b>194,000</b>	<b>1,240,000</b>	<b>348,000</b>

Table 9 continued

Urban roads		Average social cost per reported injury June 2013 prices (\$)				
Region	Fatal	Serious	Injury severity		Fatal and serious	Fatal, serious and minor
			Minor	Serious and minor		
Northland	3,879,000	923,000	67,000	204,000	1,110,000	243,000
Auckland	3,879,000	627,000	67,000	125,000	889,000	158,000
Waikato	3,879,000	452,000	66,000	121,000	813,000	182,000
Bay of Plenty	3,879,000	864,000	67,000	206,000	1,098,000	259,000
Gisborne	3,879,000	1,178,000	68,000	198,000	1,468,000	249,000
Hawke's Bay	3,879,000	964,000	67,000	169,000	1,318,000	226,000
Taranaki	3,879,000	903,000	67,000	203,000	1,118,000	249,000
Manawatu-Wanganui	3,879,000	557,000	66,000	131,000	901,000	188,000
Wellington	3,879,000	719,000	67,000	174,000	843,000	199,000
Nelson-Marlborough	3,879,000	942,000	67,000	173,000	1,309,000	236,000
West Coast	3,879,000	599,000	67,000	169,000	818,000	220,000
Canterbury	3,879,000	762,000	67,000	187,000	999,000	240,000
Otago	3,879,000	653,000	66,000	157,000	818,000	188,000
Southland	3,879,000	888,000	67,000	175,000	1,078,000	207,000
<b>New Zealand</b>	<b>3,879,000</b>	<b>703,000</b>	<b>67,000</b>	<b>153,000</b>	<b>948,000</b>	<b>195,000</b>

## 2.5 Crash statistics and price indices

**Table 10: Reported and estimated number of crashes and injuries from 2010 to 2012**

All areas								
	Reported	Reported injuries			Estimated	Estimated injuries		
	crashes	Fatal	Serious	Minor	crashes	Fatal	Serious	Minor
Fatal	863	967	379	386	863	967	379	386
Serious	5,301	0	6,037	2,062	9,244	0	10,510	3,592
Minor	24,105	0	0	29,830	76,365	0	0	94,502
<b>Total</b>	<b>30,269</b>	<b>967</b>	<b>6,416</b>	<b>32,278</b>	<b>86,472</b>	<b>967</b>	<b>10,889</b>	<b>98,480</b>
Open roads								
	Reported	Reported injuries			Estimated	Estimated injuries		
	crashes	Fatal	Serious	Minor	crashes	Fatal	Serious	Minor
Fatal	628	715	326	317	628	715	326	317
Serious	2,592	0	3,080	1,344	4,542	0	5,392	2,361
Minor	8,773	0	0	11,380	27,794	0	0	36,052
<b>Total</b>	<b>11,993</b>	<b>715</b>	<b>3,406</b>	<b>13,041</b>	<b>32,964</b>	<b>715</b>	<b>5,718</b>	<b>38,730</b>
Urban roads								
	Reported	Reported injuries			Estimated	Estimated injuries		
	crashes	Fatal	Serious	Minor	crashes	Fatal	Serious	Minor
Fatal	235	252	53	69	235	252	53	69
Serious	2,709	0	2,957	718	4,702	0	5,118	1,231
Minor	15,332	0	0	18,450	48,571	0	0	58,450
<b>Total</b>	<b>18,276</b>	<b>252</b>	<b>3,010</b>	<b>19,237</b>	<b>53,508</b>	<b>252</b>	<b>5,171</b>	<b>59,750</b>

**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 2013
Loss of life and life quality	Average hourly earnings (ordinary time)	QEX001AA	June 2012	\$26.96	+2.1%
Loss of output			June 2013	\$27.53	
Medical cost	Producers price input index – Health and community services	PPI021AA (Base: Dec 2010=1000)	June 2012 June 2013	1035 1033	-0.2%
Legal and court cost	Producers price input index – Legal services: Personal and Corporate	PPI018AA (Base: Dec 2010=1000)	June 2012 June 2013	1059 1109	+4.7%
Vehicle damage cost	Consumers price index – Vehicle servicing & repairs	CPI013AA (Base: June 2006 =1000)	June 2012 June 2013	1244 1256	+1.0%

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 2013 prices is \$3.85 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 10.9 days and the average daily earnings per person (considering the age and gender profiles of 2010-2012 crash data) was \$115.80. These give an average loss of output of \$1,266 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 and 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.