



# Social cost of road crashes and injuries 2018 update

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## Executive summary

### Purpose

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.

This report provides estimates of average social costs after accounting for:

- any inflationary effects that affect different cost components;
- any changes in the mix of crashes by area and severity; and
- any changes in the average number of injuries involved in a crash by area and severity.

### Updated estimates

- 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 \$4.34 million per fatality, at June 2018 prices. Work has been planned to update the VOSL along with other non-market transport impacts over the coming year, with an intention to replace the 1991 value.
- The updated average social cost per fatality is \$4,369,700, \$458,400 per serious injury and \$24,700 per minor injury. In per-crash terms, the updated average social cost is estimated at \$5,071,600 per fatal crash, \$525,600 per serious injury crash and \$29,900 per minor injury crash. These estimates include the updated VOSL (for fatality) or loss of life quality (for serious and minor injuries), reduced productivity; medical and other resource costs.
- Apart from fatal crashes, many injury crashes are not reported to the New Zealand Police. As a result, only some of the serious and minor injury crashes are recorded in the official Traffic Crash Reports (TCRs) maintained by New Zealand Police. 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 total social cost of motor vehicle injury crashes in 2017 is estimated at \$4.8 billion, at June 2018 prices. This represents an increase of \$0.6 billion (or 15 percent) compared to the previous year (from \$4.2 billion in 2016), due to large increases in the number of crashes for all severity types (fatal +20%, serious +13% and minor +11%).



## Part 1 The 2018 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 2018 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 2015 to 2017.

To ensure limited road safety resources are utilised efficiently, the cost of any safety interventions should be evaluated against the resulting benefit expressed in terms of social cost. When there are different solutions or options to a transport problem, social cost information also facilitates consistent comparison between solutions or options, especially when these solutions have different impacts on injury and crash risks.

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 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 (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 2015 to 2017 are given in Table 10. For the three years to 2017, only 58 percent of all serious injuries and 29 percent of all minor injuries are recorded in TCRs.

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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.

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).

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

The updated value of statistical life is \$4.34 million per fatality, at June 2018 prices. Adding the other social cost components gives an updated average social cost per fatality of \$4,369,700. For non-fatal injuries, the updated average social cost is estimated at \$458,400 per serious injury and \$24,700 per minor injury. These per-injury estimates are useful for establishing the social cost of a specific crash considering the number of injuries sustained in that crash.

After scaling up the estimates to account for non-reported cases, the average social cost estimates increase to \$926,000 per reported serious injury and \$107,000 per reported minor injury. These per-injury estimates are useful for assessing interventions that aim to reduce the number of injuries (including both reported and non-reported) but not crashes.

This report also provides social cost estimates in per-crash terms to allow assessment of the potential safety benefits from interventions that aim to reduce the number of crashes. The updated average social cost is estimated at \$5.07 million per fatal crash, \$525,600 per serious injury crash and \$29,900 per minor injury crash. This is adjusted to \$926,000 per reported serious injury crash and \$107,000 per reported minor injury 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 2017

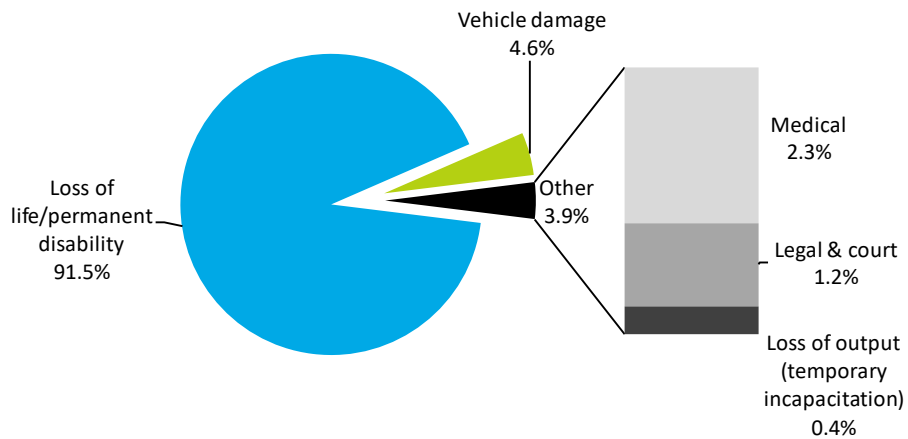
The total social cost of motor vehicle fatal and injury crashes in 2017 is estimated at approximately \$4.8 billion, at June 2018 prices. This represents an increase of \$0.6 billion (or 15 percent) compared to the previous year (\$4.2 billion in 2016). This increase reflects a 16 percent increase in the total number of fatalities (from 327 in 2016 to 378 in 2017), a 11 percent increase in the estimated total number of serious and minor injuries (from 38,218 in 2016 to 42,398 in 2017)<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.

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<sup>2</sup> This report uses information recorded by NZ Police, hospitals and ACC to estimate the total numbers of serious and minor injuries that occurred on New Zealand roads. Estimates for previous years have been revised using the latest information obtained.

**Figure 1: Share of total social cost of fatal and injury crashes in 2017 by cost component**



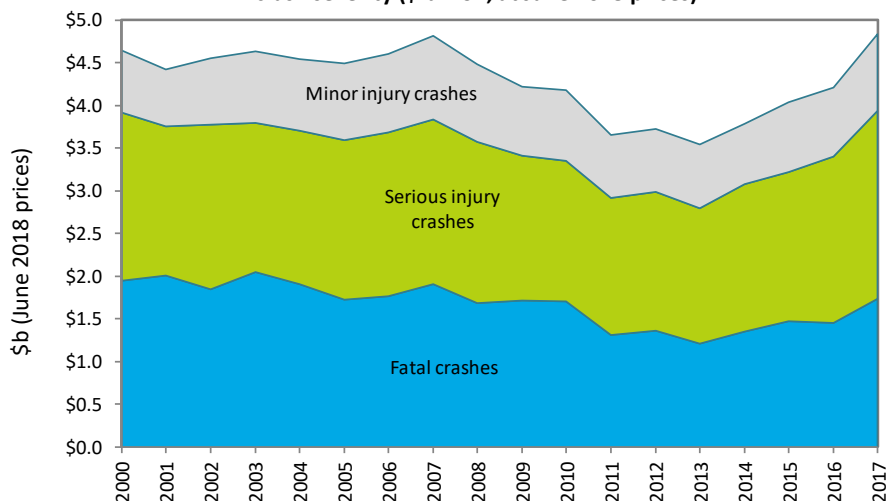
Total social cost of injury crashes in 2017 = \$4.8 billion (June 2018 prices)

In addition, there are an estimated 251,000 non-injury crashes<sup>3</sup>, valued at a further \$0.8 billion. This gives a total social cost of all motor vehicle crashes in 2017 of \$5.6 billion (increased from \$4.9 billion in 2016). These estimates include the costs associated with both reported and non-reported cases.

### 1.5 Annual total social cost of road crashes (2000 – 2017)

Figure 2 shows the trend of the estimated annual total social cost of injury crashes for the years from 2000 to 2017.

**Figure 2: Estimated annual total social cost of fatal and injury crashes, by crash severity (\$ billion, at June 2018 prices)**



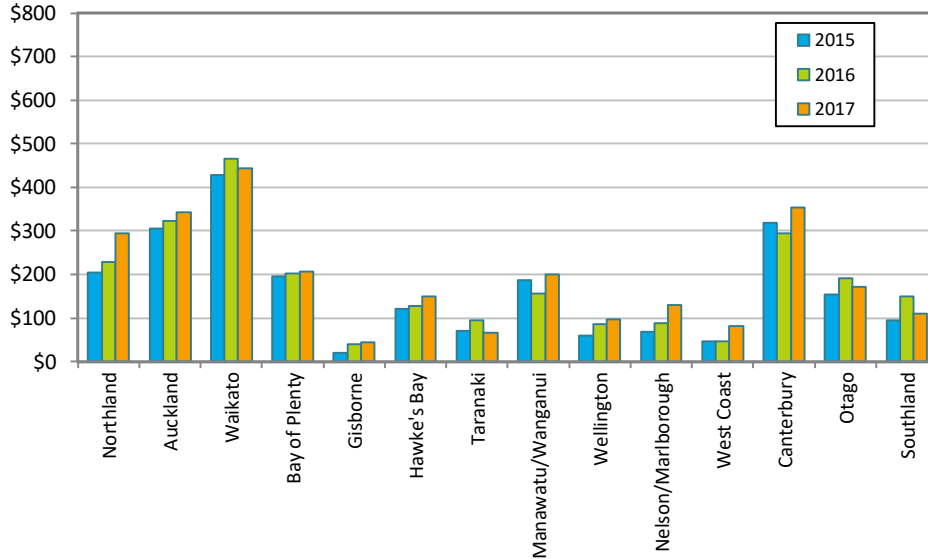
Note: This chart includes allowances for non-reported cases.

<sup>3</sup> 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.]

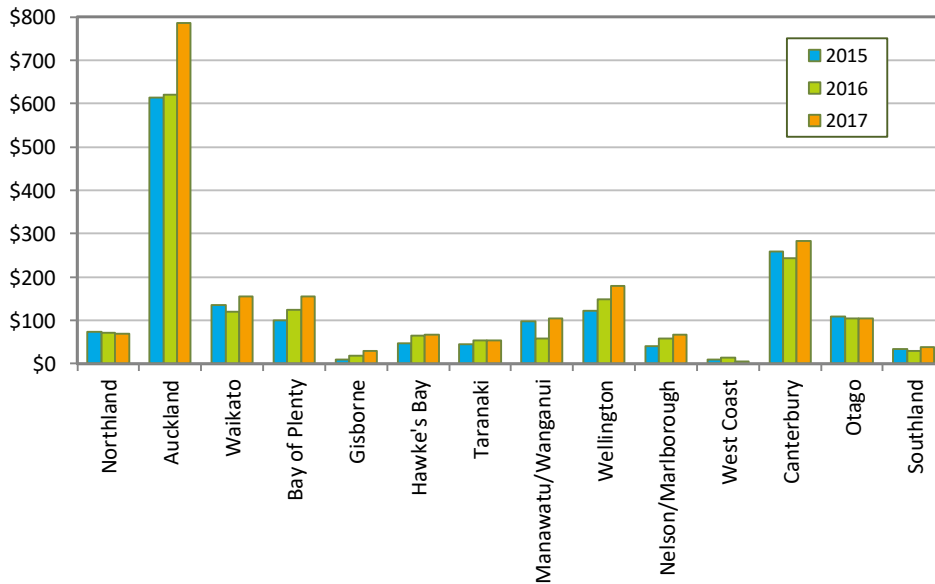
## 1.6 Social cost of fatal and injury crashes by area and region (2015 – 2017)

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

**Figure 3: Total social cost of fatal and injury crashes on open roads, by region (\$ million, at June 2018 prices)**



**Figure 4: Total social cost of fatal and injury crashes on urban roads, by region (\$ million, at June 2018 prices)**



<sup>4</sup> In this report, open roads are defined as roads with a legal speed limit of over 70 kilometres per hour (km/h). Urban roads are defined as roads with a legal speed limit of 70 km/h 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 2018 prices (\$)		
Loss of life/permanent disability	5,020,100	495,100	21,000
Loss of output (temporary disability)	800	1,800	400
Medical –			
Hospital/medical	8,100	10,600	200
Emergency/pre-hospital	4,100	1,500	800
Follow-on	1,900	5,200	100
Legal and court	24,300	3,600	1,200
Vehicle damage	12,200	7,700	6,200
<b>Total</b>	<b>5,071,600</b>	<b>525,600</b>	<b>29,900</b>

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 2018 prices (\$)		
Loss of life/permanent disability	4,335,700	433,600	17,300
Loss of output (temporary disability)	0	1,500	300
Medical –			
Hospital/medical	3,800	9,400	100
Emergency/pre-hospital	3,000	1,100	700
Follow-on	0	4,600	100
Legal and court	20,300	2,900	1,000
Vehicle damage	6,900	5,200	5,100
<b>Total</b>	<b>4,369,700</b>	<b>458,400</b>	<b>24,700</b>

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 2018 prices (\$)		
	All areas	Open roads	Urban roads
Non-injury crash – vehicle damage	3,200	3,400	3,000

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 2018 prices (\$)		
	All	Open roads	Urban roads
Fatal	5,071,000	5,193,000	4,748,000
Serious	926,000	989,000	869,000
Minor	107,000	113,000	103,000
Serious and minor	279,000	328,000	246,000
Fatal and serious	1,453,000	1,754,000	1,143,000
Fatal, serious and minor	422,000	581,000	308,000

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

Injury severity	June 2018 prices (\$)		
	All	Open roads	Urban roads
Fatal	4,370,000	4,370,000	4,370,000
Serious	791,000	791,000	790,000
Minor	84,000	83,000	85,000
Serious and minor	221,000	243,000	204,000
Fatal and serious	1,222,000	1,379,000	1,035,000
Fatal, serious and minor	328,000	418,000	254,000

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

Injury severity	June 2018 prices (\$)		
	All	Open roads	Urban roads
Fatal	4,363,000	4,363,000	4,363,000
Serious	782,000	782,000	782,000
Minor	67,000	65,000	68,000
Serious and minor	205,000	227,000	188,000
Fatal and serious	1,213,000	1,370,000	1,027,000
Fatal, serious and minor	313,000	402,000	239,000

### 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 2013 to 2017. 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 2018 prices (\$)		
	All	Open roads	Urban roads
Overtaking or lane change	460,000	609,000	265,000
Head-on, not overtaking	1,109,000	1,505,000	490,000
Lost control, straight roads	411,000	440,000	371,000
Cornering	456,000	475,000	414,000
Collision with obstruction	286,000	426,000	243,000
Rear-end collision	192,000	236,000	158,000
Turning versus same direction	321,000	499,000	235,000
Crossing, no turns	325,000	762,000	258,000
Crossing, vehicle turning	326,000	623,000	240,000
Vehicles merging	234,000	393,000	206,000
Right turn against	314,000	646,000	258,000
Vehicle manoeuvring	294,000	642,000	232,000
Pedestrian crossing road	413,000	1,613,000	370,000
Pedestrian other	566,000	1,490,000	448,000
Miscellaneous	683,000	753,000	618,000

## 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 2015 to 2017. 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 2018 prices (\$)					
<b>All areas</b>						
Northland	4,879,000	1,105,000	109,000	387,000	1,781,000	645,000
Auckland	4,868,000	841,000	106,000	236,000	1,167,000	307,000
Waikato	5,466,000	646,000	107,000	227,000	1,549,000	484,000
Bay of Plenty	5,022,000	1,401,000	103,000	358,000	2,090,000	564,000
Gisborne	5,396,000	1,208,000	107,000	364,000	1,719,000	523,000
Hawke's Bay	4,881,000	1,166,000	106,000	351,000	1,691,000	517,000
Taranaki	5,368,000	1,268,000	108,000	407,000	1,684,000	548,000
Manawatu-Wanganui	5,234,000	810,000	110,000	266,000	1,443,000	445,000
Wellington	4,846,000	622,000	100,000	207,000	907,000	275,000
Nelson-Marlborough	4,850,000	1,110,000	105,000	329,000	1,562,000	463,000
West Coast	4,494,000	839,000	107,000	290,000	1,538,000	526,000
Canterbury	5,067,000	1,031,000	109,000	324,000	1,554,000	483,000
Otago	4,942,000	974,000	112,000	305,000	1,407,000	429,000
Southland	5,183,000	1,255,000	111,000	367,000	1,853,000	554,000
<b>New Zealand</b>	<b>5,071,000</b>	<b>926,000</b>	<b>107,000</b>	<b>279,000</b>	<b>1,453,000</b>	<b>422,000</b>

Table 8 continued

Region	Average social cost per reported crash June 2018 prices (\$)					
	Fatal	Serious	Crash severity		Fatal and serious	Fatal, serious and minor
			Minor	Serious and minor		
<b>Open roads</b>						
Northland	4,981,000	1,135,000	114,000	415,000	1,911,000	732,000
Auckland	4,963,000	892,000	111,000	240,000	1,410,000	350,000
Waikato	5,610,000	663,000	112,000	248,000	1,722,000	585,000
Bay of Plenty	5,232,000	1,479,000	111,000	443,000	2,405,000	796,000
Gisborne	5,832,000	1,322,000	105,000	447,000	1,979,000	693,000
Hawke's Bay	4,949,000	1,206,000	114,000	443,000	1,930,000	748,000
Taranaki	4,796,000	1,297,000	111,000	465,000	1,742,000	646,000
Manawatu-Wanganui	5,264,000	828,000	118,000	308,000	1,662,000	597,000
Wellington	4,958,000	649,000	108,000	241,000	1,131,000	383,000
Nelson-Marlborough	4,980,000	1,151,000	112,000	378,000	1,744,000	585,000
West Coast	4,506,000	830,000	109,000	297,000	1,604,000	570,000
Canterbury	5,223,000	1,109,000	113,000	426,000	1,919,000	768,000
Otago	5,024,000	1,040,000	119,000	357,000	1,656,000	567,000
Southland	5,236,000	1,310,000	112,000	432,000	2,085,000	729,000
<b>New Zealand</b>	<b>5,193,000</b>	<b>989,000</b>	<b>113,000</b>	<b>328,000</b>	<b>1,754,000</b>	<b>581,000</b>
<b>Urban roads</b>						
Northland	4,408,000	1,030,000	101,000	331,000	1,429,000	461,000
Auckland	4,796,000	823,000	103,000	234,000	1,075,000	289,000
Waikato	4,837,000	606,000	102,000	195,000	1,121,000	311,000
Bay of Plenty	4,462,000	1,316,000	98,000	296,000	1,688,000	385,000
Gisborne	4,379,000	1,058,000	108,000	290,000	1,351,000	364,000
Hawke's Bay	4,391,000	1,106,000	101,000	273,000	1,264,000	308,000
Taranaki	7,086,000	1,228,000	105,000	348,000	1,598,000	446,000
Manawatu-Wanganui	5,102,000	784,000	103,000	226,000	1,085,000	291,000
Wellington	4,728,000	610,000	97,000	196,000	806,000	239,000
Nelson-Marlborough	4,444,000	1,057,000	100,000	281,000	1,299,000	341,000
West Coast	4,371,000	877,000	103,000	271,000	1,226,000	367,000
Canterbury	4,629,000	968,000	106,000	273,000	1,210,000	331,000
Otago	4,635,000	900,000	106,000	262,000	1,095,000	308,000
Southland	4,384,000	1,136,000	110,000	280,000	1,248,000	304,000
<b>New Zealand</b>	<b>4,748,000</b>	<b>869,000</b>	<b>103,000</b>	<b>246,000</b>	<b>1,143,000</b>	<b>308,000</b>



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

Region	Fatal	Serious	Injury severity		Fatal and serious	Fatal, serious and minor
			Minor	Serious and minor		
June 2018 prices (\$)						
<b>All areas</b>						
Northland	4,370,000	924,000	83,000	293,000	1,488,000	482,000
Auckland	4,370,000	741,000	85,000	191,000	1,022,000	247,000
Waikato	4,370,000	543,000	82,000	181,000	1,222,000	366,000
Bay of Plenty	4,370,000	1,136,000	85,000	283,000	1,693,000	437,000
Gisborne	4,370,000	973,000	85,000	286,000	1,372,000	405,000
Hawke's Bay	4,370,000	983,000	84,000	271,000	1,420,000	394,000
Taranaki	4,370,000	1,120,000	85,000	315,000	1,469,000	421,000
Manawatu-Wanganui	4,370,000	697,000	84,000	206,000	1,210,000	337,000
Wellington	4,370,000	568,000	85,000	176,000	822,000	232,000
Nelson-Marlborough	4,370,000	957,000	85,000	266,000	1,321,000	365,000
West Coast	4,370,000	641,000	79,000	212,000	1,207,000	380,000
Canterbury	4,370,000	883,000	84,000	252,000	1,313,000	371,000
Otago	4,370,000	789,000	83,000	228,000	1,123,000	314,000
Southland	4,370,000	1,044,000	84,000	271,000	1,536,000	406,000
<b>New Zealand</b>	<b>4,370,000</b>	<b>791,000</b>	<b>84,000</b>	<b>221,000</b>	<b>1,222,000</b>	<b>328,000</b>
<b>Open roads</b>						
Northland	4,370,000	915,000	84,000	304,000	1,539,000	529,000
Auckland	4,370,000	734,000	86,000	185,000	1,151,000	267,000
Waikato	4,370,000	541,000	82,000	189,000	1,306,000	420,000
Bay of Plenty	4,370,000	1,107,000	83,000	315,000	1,807,000	552,000
Gisborne	4,370,000	965,000	85,000	341,000	1,429,000	517,000
Hawke's Bay	4,370,000	967,000	82,000	313,000	1,547,000	520,000
Taranaki	4,370,000	1,113,000	84,000	341,000	1,499,000	472,000
Manawatu-Wanganui	4,370,000	688,000	82,000	223,000	1,334,000	417,000
Wellington	4,370,000	566,000	83,000	189,000	976,000	296,000
Nelson-Marlborough	4,370,000	935,000	84,000	284,000	1,381,000	422,000
West Coast	4,370,000	639,000	79,000	213,000	1,266,000	405,000
Canterbury	4,370,000	867,000	82,000	306,000	1,484,000	538,000
Otago	4,370,000	779,000	83,000	246,000	1,226,000	380,000
Southland	4,370,000	1,036,000	83,000	305,000	1,653,000	510,000
<b>New Zealand</b>	<b>4,370,000</b>	<b>791,000</b>	<b>83,000</b>	<b>243,000</b>	<b>1,379,000</b>	<b>418,000</b>

Table 9 continued

Urban roads		Average social cost per reported injury June 2018 prices (\$)				
Region	Fatal	Serious	Injury severity		Fatal and serious	Fatal, serious and minor
			Minor	Serious and minor		
Northland	4,370,000	947,000	83,000	267,000	1,328,000	374,000
Auckland	4,370,000	743,000	84,000	193,000	967,000	237,000
Waikato	4,370,000	547,000	84,000	166,000	982,000	259,000
Bay of Plenty	4,370,000	1,176,000	86,000	254,000	1,518,000	329,000
Gisborne	4,370,000	986,000	85,000	233,000	1,268,000	293,000
Hawke's Bay	4,370,000	1,011,000	85,000	228,000	1,161,000	257,000
Taranaki	4,370,000	1,129,000	86,000	285,000	1,423,000	361,000
Manawatu-Wanganui	4,370,000	710,000	85,000	187,000	981,000	240,000
Wellington	4,370,000	569,000	85,000	171,000	747,000	208,000
Nelson-Marlborough	4,370,000	992,000	86,000	244,000	1,220,000	296,000
West Coast	4,370,000	649,000	83,000	210,000	936,000	286,000
Canterbury	4,370,000	899,000	85,000	221,000	1,120,000	267,000
Otago	4,370,000	803,000	84,000	210,000	969,000	245,000
Southland	4,370,000	1,064,000	86,000	219,000	1,173,000	238,000
<b>New Zealand</b>	<b>4,370,000</b>	<b>790,000</b>	<b>85,000</b>	<b>204,000</b>	<b>1,035,000</b>	<b>254,000</b>

## 2.5 Crash statistics and price indices

**Table 10: Reported and estimated number of crashes and injuries from 2015 to 2017**

All areas								
	Reported	Reported injuries			Estimated	Estimated injuries		
	crashes	Fatal	Serious	Minor	crashes	Fatal	Serious	Minor
Fatal	918	1,024	373	406	918	1,024	373	406
Serious	6,304	0	7,107	2,111	11,108	0	12,532	3,794
Minor	23,601	0	0	28,610	84,015	0	0	101,845
<b>Total</b>	<b>30,823</b>	<b>1,024</b>	<b>7,480</b>	<b>31,127</b>	<b>96,041</b>	<b>1,024</b>	<b>12,905</b>	<b>106,045</b>
Open roads								
	Reported	Reported injuries			Estimated	Estimated injuries		
	crashes	Fatal	Serious	Minor	crashes	Fatal	Serious	Minor
Fatal	667	758	314	327	667	758	314	327
Serious	3,001	0	3,543	1,327	5,368	0	6,343	2,411
Minor	9,191	0	0	11,586	32,719	0	0	41,244
<b>Total</b>	<b>12,859</b>	<b>758</b>	<b>3,857</b>	<b>13,240</b>	<b>38,754</b>	<b>758</b>	<b>6,657</b>	<b>43,982</b>
Urban roads								
	Reported	Reported injuries			Estimated	Estimated injuries		
	crashes	Fatal	Serious	Minor	crashes	Fatal	Serious	Minor
Fatal	251	266	59	79	251	266	59	79
Serious	3,303	0	3,564	784	5,740	0	6,189	1,383
Minor	14,410	0	0	17,024	51,296	0	0	60,601
<b>Total</b>	<b>17,964</b>	<b>266</b>	<b>3,623</b>	<b>17,887</b>	<b>57,287</b>	<b>266</b>	<b>6,248</b>	<b>62,063</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 2018
Loss of life and life quality	Average hourly earnings (ordinary time)	QEX001AA	June 2018	\$31.00	+3.0%
Loss of output			June 2017	\$30.09	
			June 2016	\$29.62	
Medical cost	Producers price input index – Health and community services	PPI020AA (Base: Dec 2010=1000)	June 2018 June 2017 June 2016	1102 1081 1056	+1.9%
Legal and court cost	Producers price input index – Legal services: Personal and Corporate	PPI027AA (Base: Dec 2010=1000)	June 2018 June 2017 June 2016	1147 1126 1100	+1.9%
Vehicle damage cost	Consumers price index – Vehicle servicing & repairs	CPI013AA (Base: June 2017 =1000)	June 2018 June 2017 June 2016	1023 1000 990	+2.3%

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 (VOSL) 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 2018 prices is \$4.34 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), based on the latest income statistics collected as part of the Household Labour Force Survey published by Statistics New Zealand.

For a serious injury, the average time lost per injury was 10.7 days and the average daily earnings per person (considering the age and gender profiles of 2015-2017 crash data) was \$143.80. These give an average loss of output of \$1,540 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.