

An aerial, black and white photograph of a road intersection. A road with white lane markings and a central divider runs diagonally from the bottom left towards the top right. A white car is in the bottom left lane, a dark car is in the middle lane, and a white van is in the top right lane. To the left of the road, there are large, dense trees and a building with a corrugated metal roof. The top left corner of the image is obscured by a grey diagonal shape.

# Social cost of road crashes and injuries

June 2019 update



Ministry of **Transport**

TE MANATŪ WAKA

New Zealand Government

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## Executive Summary

### Purpose

Road crashes impose intangible, financial and economic costs to society. These costs include reduced quality of life for survivors; reduced economic productivity; and 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 number 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

- Over 90 percent of the total social cost is made up of loss of life and life quality. This is calculated using a willingness-to-pay valuation technique, which puts a dollar value on pain and suffering from loss of life and life quality. 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 today's dollars.
- The updated VOSL is \$4.53 million per fatality, at June 2019 prices. Work is underway to revise the methodology used to estimate VOSL along with other non-market transport impacts over the coming year, with an intention to replace the 1991 methodology.
- The updated average social cost per fatality is \$4,562,000, \$477,600 per serious injury and \$25,500 per minor injury. Often a crash can involve multiple fatal, serious and minor injuries. In per-crash terms, the average social cost is then estimated at \$5,374,100 per fatal crash, \$551,700 per serious injury crash and \$30,800 per minor injury crash. These estimates include the updated VOSL (for fatality) or loss of life quality (for serious and minor injuries), reduced economic productivity; medical and other resource costs.

- Unlike 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 2018 is estimated at \$4.9 billion, at June 2019 prices. This represents a decrease of \$0.2 million (or 3.7 percent) compared to the previous year (from \$5.1 billion in 2017), due to a fall in the estimated total number of fatal and serious crashes (fatal -3% and serious -9%).

## Contents

Executive Summary .....	3
Part 1 - The 2019 update .....	7
1.1 Introduction.....	7
1.2 Estimation of injury and crash costs.....	7
1.3 Average social cost per injury and per crash .....	8
1.4 Total social cost of road injury crashes in 2018.....	9
1.5 Annual total social cost of road crashes (2000 – 2018).....	10
1.6 Social cost of fatal and injury crashes by area and region (2016 – 2018).....	11
Part 2 - The social cost estimates .....	12
2.1 Average social cost by cost component.....	12
2.2 Average social cost per incident, by severity .....	13
2.3 Average social cost per reported injury crash, by vehicle movement .....	15
2.4 Average social cost by local government region .....	16
2.5 Crash statistics and price indices.....	20
Appendix: Methodology.....	22

## List of tables

Table 1: Change in fatal, serious and minor crash numbers, 2017-2018.....	9
Table 2: Average social cost per crash by cost component.....	12
Table 3: Average social cost per injury, by cost component .....	13
Table 4: Average social cost per non-injury crash .....	13
Table 5: Average social cost per crash by severity.....	14
Table 6: Average social cost per injury by severity .....	14
Table 7: Average social cost per injury, excluding associated vehicle damage costs, by severity .....	14
Table 8: Average social cost per reported injury crash by vehicle movement.....	15
Table 9: Average social cost per reported injury crash by local government region.....	16
Table 10: Average social cost per reported injury by local government region .....	18
Table 11: Reported and estimated number of crashes and injuries from 2016-2018 .....	20
Table 12: Price indices for updating unit costs .....	21

## List of figures

Figure 1: Share of total social cost of fatal and injury crashes in 2018 .....	9
Figure 2: Estimated annual total social cost of fatal and injury crashes, by crash severity (\$ billion, at June 2019 prices).....	10
Figure 3: Total social cost of fatal and injury crashes on open roads by region (\$ million, at June 2019 prices) .....	11
Figure 4: Total social cost of fatal and injury crashes on urban roads, by region (\$ million, at June 2019 prices) .....	11

## Part 1 - The 2019 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 2019 prices. The update accounts for any changes in the numbers of crashes by area and severity, and is based on crash and injury data from 2016 to 2018.

To ensure we target our road safety resources most effectively, the cost of any safety interventions should be evaluated against the resulting benefit expressed in terms of social cost. When there are a number of potential solutions to a transport problem, using social cost information allows us to make consistent comparisons between solutions, especially when these solutions have different impacts on the risks of crashes and the injuries that may be sustained in them. Updated social cost estimates are incorporated into Waka Kotahi NZ Transport Agency's Crash Analysis System (CAS) to facilitate this.

### 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 incurred as a result of the road crash or injury. Its value depends on the number of cost components<sup>1</sup> we include and the methods we adopt to estimate them. For a description of the methodology, please refer to the Appendix.

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

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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.

VOSL). Various methodologies have been developed to estimate the value of other social cost components.

Estimating 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 TCRs, only some of the serious and minor injury crashes are. Hospitalisation data and ACC's 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 2016 to 2018 are given in Table 10. For the three years to 2018, only 56 percent of all serious injuries and 29 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 account for unreported incidents, Waka Kotahi matches its CAS data against hospital admissions (from road crashes), which provides an estimate for the number of unreported incidents. From this we estimate a multiplier to scale up the average social cost estimate to include the costs of unreported incidents. 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 \$4.53 million per fatality, at June 2019 prices. Adding the other social cost components gives an updated average social cost per fatality of \$4,562,000. For non-fatal injuries, the updated average social cost is estimated at \$477,600 per serious injury and \$25,500 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 \$850,000 per reported serious injury and \$87,000 per reported minor injury.

This report also provides social cost estimates in per-crash terms. The updated average social cost is estimated at \$5,374,100 per fatal crash, \$551,700 per serious injury crash and \$30,800 per minor injury crash. This is adjusted to \$1,005,000 per reported serious injury crash and \$110,000 per reported minor injury crash, after scaling up the estimates to account for non-reported cases.



## 1.4 Total social cost of road injury crashes in 2018

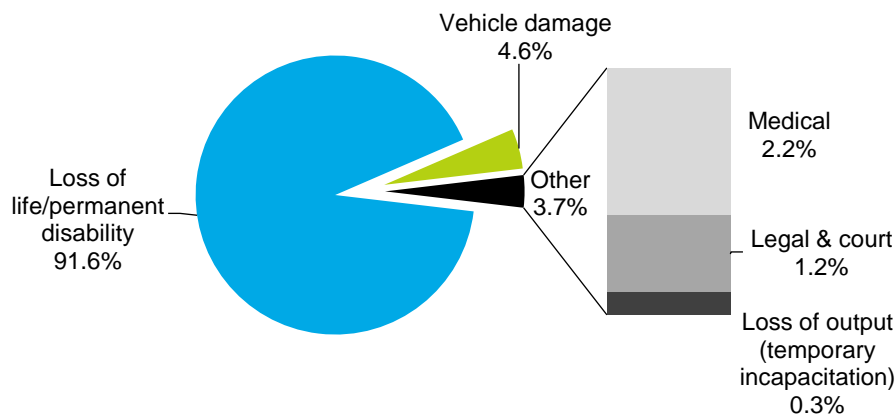
The total social cost of motor vehicle fatal and injury crashes in 2018 is estimated at approximately \$4.9 billion, a \$0.2 billion decrease compared to 2017 (in June 2019 prices)<sup>2</sup>. The changes in fatal, serious and minor injuries this represents are summarised in Table 1.

Table 1: Change in fatal, serious and minor crash numbers, 2017-2018

	2017	2018	Change
<b>Fatal</b>	342	331	-3%
<b>Serious</b>	4,199	3,834	-9%
<b>Minor</b>	29,891	32,006	+7%

Figure 1 shows loss of life and/or life quality due to permanent impairment accounted for approximately 92 percent of the total social cost of injury crashes. Vehicle damage accounted for around 5 percent, and other cost components made up the remaining proportion.

Figure 1: Share of total social cost of fatal and injury crashes in 2018



Total social cost of injury crashes in 2018 = \$4.9 billion (June 2019 prices)

In addition, there are an estimated 269,000 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 2018 of \$5.7 billion (decreased from \$5.9 billion in 2017). These estimates include the costs associated with both reported and non-reported cases.

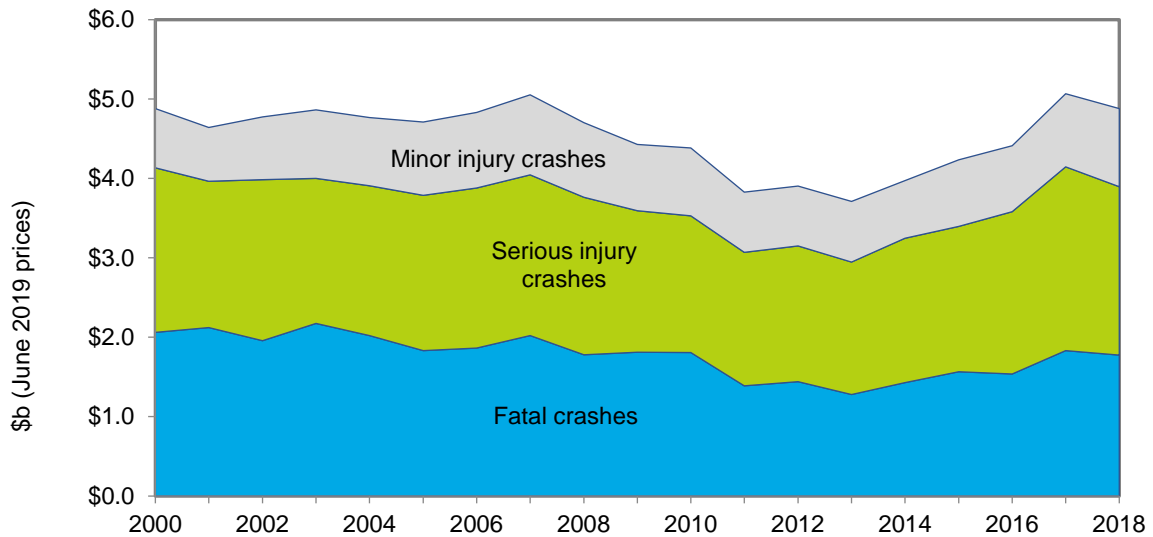
<sup>2</sup> This report uses information recorded by NZ Police, hospitals and ACC to estimate the total numbers of serious and minor injuries that occurred on New Zealand roads. Estimates for previous years have been revised using the latest information obtained.

<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.]

### 1.5 Annual total social cost of road crashes (2000 – 2018)

Figure 2 shows the trend of the estimated annual total social cost of injury crashes for the years from 2000 to 2018.

Figure 2: Estimated annual total social cost of fatal and injury crashes, by crash severity (\$ billion, at June 2019 prices)



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

### 1.6 Social cost of fatal and injury crashes by area and region (2016 – 2018)

On average, around 58 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 2019 prices)

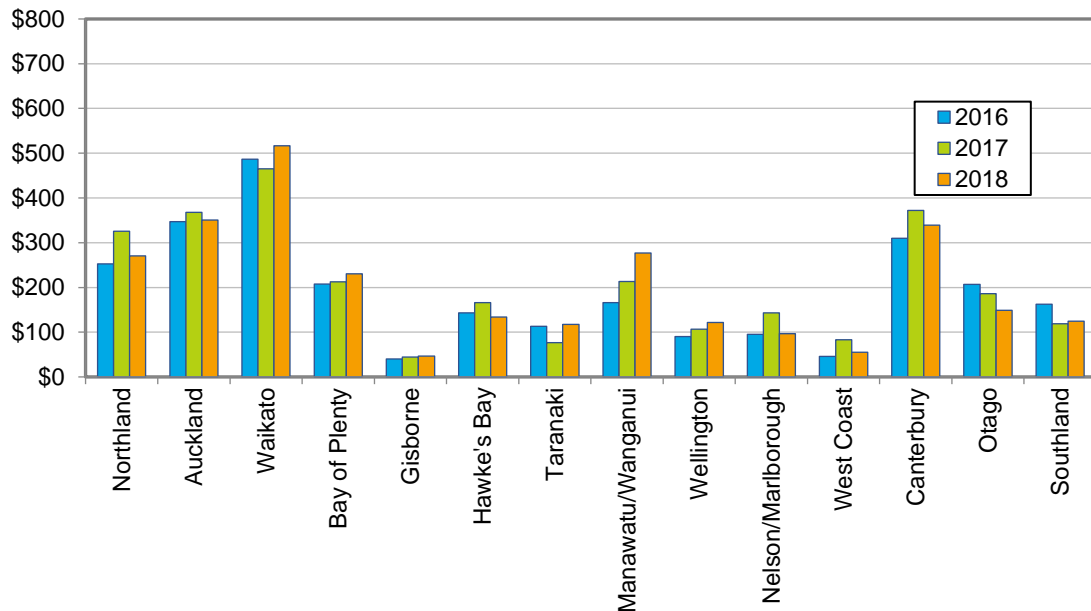
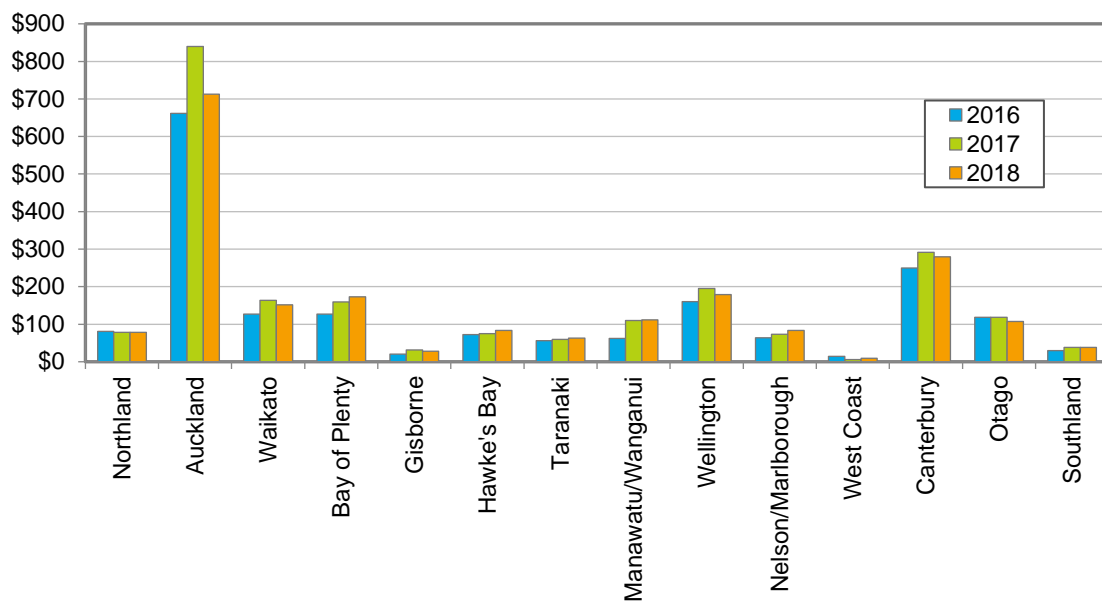


Figure 4: Total social cost of fatal and injury crashes on urban roads, by region (\$ million, at June 2019 prices)



<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 2 and 3 provide the estimates of average social costs per crash and per injury, including breakdowns by cost component. Table 4 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 2: Average social cost per crash by cost component

Cost components	Severity		
	Fatal	Serious	Minor
	June 2019 prices (\$)		
Loss of life/permanent disability	5,320,300	520,800	21,800
Loss of output (temporary disability)	700	1,700	300
Medical –			
Hospital/medical	8,700	11,000	200
Emergency/pre-hospital	4,300	1,600	800
Follow-on	2,100	5,400	100
Legal and court	25,500	3,500	1,100
Vehicle damage	12,400	7,800	6,300
<b>Total</b>	<b>5,374,100</b>	<b>551,700</b>	<b>30,800</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 injury, by cost component

Cost components	Injury type		
	Fatal	Serious	Minor
	June 2019 prices (\$)		
Loss of life/permanent disability	4,527,300	452,700	18,100
Loss of output (temporary disability)	0	1,400	300
Medical –			
Hospital/medical	3,900	9,600	100
Emergency/pre-hospital	3,100	1,200	700
Follow-on	0	4,700	100
Legal and court	21,100	2,800	900
Vehicle damage	6,600	5,200	5,200
<b>Total</b>	<b>4,562,000</b>	<b>477,600</b>	<b>25,500</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 4: Average social cost per non-injury crash

Per non-injury crash	June 2019 prices (\$)		
	All areas	Open roads	Urban roads
Non-injury crash – vehicle damage	3,200	3,500	3,100

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

## 2.2 Average social cost per incident, by severity

Tables 5 to 7 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 7. Otherwise, use the estimates from Tables 5 and 6, depending on data availability and the purpose of the analysis.

**Table 5: Average social cost per crash by severity**

Crash severity	June 2019 prices (\$)		
	All	Open roads	Urban Roads
Fatal	5,374,000	5,543,000	4,935,000
Serious	1,005,000	1,072,000	943,000
Minor	110,000	115,000	106,000
Serious and minor	296,000	350,000	258,000
Fatal and serious	1,559,000	1,871,000	1,231,000
Fatal, serious and minor	444,000	613,000	324,000

**Table 6: Average social cost per injury by severity**

Injury severity	June 2019 prices (\$)		
	All	Open roads	Urban roads
Fatal	4,562,000	4,562,000	4,562,000
Serious	850,000	846,000	854,000
Minor	87,000	86,000	88,000
Serious and minor	234,000	260,000	214,000
Fatal and serious	1,296,000	1,450,000	1,109,000
Fatal, serious and minor	346,000	443,000	267,000

**Table 7: Average social cost per injury, excluding associated vehicle damage costs, by severity**

Injury severity	June 2019 prices (\$)		
	All	Open roads	Urban roads
Fatal	4,555,000	4,555,000	4,555,000
Serious	841,000	837,000	845,000
Minor	69,000	67,000	71,000
Serious and minor	218,000	243,000	199,000
Fatal and serious	1,287,000	1,440,000	1,100,000
Fatal, serious and minor	330,000	426,000	251,000

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

Table 8 provides estimates of the average social cost per reported crash by vehicle movement, using crash data from 2013 to 2018. 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 8: Average social cost per reported injury crash by vehicle movement

Vehicle movement classification	June 2019 prices (\$)		
	All	Open roads	Urban roads
Overtaking or lane change	485,000	641,000	281,000
Head-on, not overtaking	1,168,000	1,583,000	521,000
Lost control, straight roads	435,000	463,000	394,000
Cornering	482,000	501,000	439,000
Collision with obstruction	303,000	450,000	258,000
Rear-end collision	202,000	247,000	166,000
Turning versus same direction	340,000	527,000	248,000
Crossing, no turns	343,000	804,000	273,000
Crossing, vehicle turning	345,000	657,000	254,000
Vehicles merging	248,000	416,000	218,000
Right turn against	332,000	681,000	274,000
Vehicle manoeuvring	311,000	676,000	246,000
Pedestrian crossing road	439,000	1,692,000	394,000
Pedestrian other	599,000	1,562,000	476,000
Miscellaneous	720,000	792,000	655,000

## 2.4 Average social cost by local government region

Due to differences in physical locations, sizes of regions, road safety infrastructure, response, hospital 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. These result in different average costs per injury and crash for each region. These estimates are useful for the evaluation of regional programmes or policies for or between specific regions.

Table 9: 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
<b>All areas</b>	<b>June 2019 prices (\$)</b>					
Northland	5,402,000	1,244,000	112,000	393,000	2,056,000	678,000
Auckland	5,125,000	921,000	109,000	247,000	1,265,000	320,000
Waikato	5,719,000	687,000	110,000	240,000	1,565,000	487,000
Bay of Plenty	5,098,000	1,434,000	106,000	376,000	2,093,000	578,000
Gisborne	5,331,000	1,244,000	108,000	379,000	1,817,000	564,000
Hawke's Bay	5,084,000	1,384,000	108,000	391,000	1,881,000	547,000
Taranaki	6,364,000	1,423,000	111,000	451,000	1,995,000	646,000
Manawatu-Wanganui	5,591,000	859,000	114,000	277,000	1,619,000	491,000
Wellington	4,930,000	707,000	105,000	230,000	989,000	299,000
Nelson-Marlborough	5,487,000	1,200,000	107,000	350,000	1,703,000	497,000
West Coast	4,698,000	785,000	110,000	301,000	1,422,000	532,000
Canterbury	5,340,000	1,070,000	110,000	330,000	1,644,000	503,000
Otago	5,014,000	1,163,000	113,000	346,000	1,534,000	453,000
Southland	5,914,000	1,272,000	116,000	406,000	1,941,000	629,000
<b>New Zealand</b>	<b>5,374,000</b>	<b>1,005,000</b>	<b>110,000</b>	<b>296,000</b>	<b>1,559,000</b>	<b>444,000</b>



Table 9 continued

Average social cost per reported crash June 2019 prices (\$)						
Region	Crash severity					
	Fatal	Serious	Minor	Serious and minor	Fatal and serious	Fatal, serious and minor
<b>Open roads</b>						
Northland	5,526,000	1,259,000	118,000	427,000	2,211,000	795,000
Auckland	5,306,000	982,000	114,000	254,000	1,509,000	365,000
Waikato	5,849,000	704,000	115,000	260,000	1,765,000	595,000
Bay of Plenty	5,334,000	1,529,000	112,000	477,000	2,372,000	809,000
Gisborne	5,749,000	1,323,000	108,000	449,000	1,998,000	704,000
Hawke's Bay	5,188,000	1,463,000	113,000	497,000	2,140,000	777,000
Taranaki	6,351,000	1,450,000	118,000	534,000	2,155,000	824,000
Manawatu-Wanganui	5,691,000	875,000	123,000	329,000	1,823,000	667,000
Wellington	4,915,000	772,000	110,000	276,000	1,311,000	443,000
Nelson-Marlborough	5,782,000	1,220,000	113,000	385,000	1,911,000	612,000
West Coast	4,704,000	783,000	112,000	313,000	1,523,000	599,000
Canterbury	5,555,000	1,159,000	116,000	434,000	1,997,000	778,000
Otago	5,083,000	1,227,000	118,000	402,000	1,772,000	590,000
Southland	5,923,000	1,356,000	118,000	486,000	2,204,000	830,000
<b>New Zealand</b>	<b>5,543,000</b>	<b>1,072,000</b>	<b>115,000</b>	<b>350,000</b>	<b>1,871,000</b>	<b>613,000</b>
<b>Urban roads</b>						
Northland	4,717,000	1,206,000	104,000	332,000	1,612,000	447,000
Auckland	4,996,000	899,000	107,000	244,000	1,170,000	302,000
Waikato	5,053,000	651,000	105,000	208,000	1,081,000	306,000
Bay of Plenty	4,621,000	1,334,000	103,000	307,000	1,761,000	412,000
Gisborne	4,579,000	1,136,000	109,000	311,000	1,556,000	424,000
Hawke's Bay	4,578,000	1,276,000	105,000	304,000	1,472,000	349,000
Taranaki	6,408,000	1,385,000	105,000	372,000	1,744,000	468,000
Manawatu-Wanganui	5,178,000	832,000	107,000	225,000	1,229,000	305,000
Wellington	4,955,000	679,000	102,000	215,000	839,000	250,000
Nelson-Marlborough	4,734,000	1,177,000	102,000	317,000	1,442,000	387,000
West Coast	4,564,000	793,000	108,000	270,000	957,000	315,000
Canterbury	4,843,000	995,000	107,000	275,000	1,302,000	349,000
Otago	4,693,000	1,090,000	110,000	298,000	1,230,000	332,000
Southland	5,771,000	1,083,000	114,000	294,000	1,234,000	327,000
<b>New Zealand</b>	<b>4,935,000</b>	<b>943,000</b>	<b>106,000</b>	<b>258,000</b>	<b>1,231,000</b>	<b>324,000</b>

Table 10: 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
<b>All areas</b>	<b>June 2019 prices (\$)</b>					
Northland	4,562,000	990,000	86,000	297,000	1,617,000	499,000
Auckland	4,562,000	810,000	88,000	200,000	1,099,000	256,000
Waikato	4,562,000	574,000	85,000	190,000	1,231,000	369,000
Bay of Plenty	4,562,000	1,210,000	87,000	300,000	1,770,000	455,000
Gisborne	4,562,000	977,000	87,000	298,000	1,432,000	440,000
Hawke's Bay	4,562,000	1,145,000	87,000	307,000	1,558,000	425,000
Taranaki	4,562,000	1,231,000	88,000	348,000	1,677,000	492,000
Manawatu-	4,562,000	727,000	86,000	212,000	1,332,000	366,000
Wellington	4,562,000	625,000	87,000	193,000	869,000	249,000
Nelson-Marlborough	4,562,000	1,009,000	88,000	286,000	1,396,000	396,000
West Coast	4,562,000	646,000	83,000	229,000	1,180,000	399,000
Canterbury	4,562,000	913,000	87,000	260,000	1,383,000	389,000
Otago	4,562,000	942,000	86,000	259,000	1,241,000	336,000
Southland	4,562,000	983,000	85,000	291,000	1,477,000	442,000
<b>New Zealand</b>	<b>4,562,000</b>	<b>850,000</b>	<b>87,000</b>	<b>234,000</b>	<b>1,296,000</b>	<b>346,000</b>
<b>Open roads</b>						
Northland	4,562,000	978,000	87,000	311,000	1,691,000	561,000
Auckland	4,562,000	798,000	89,000	199,000	1,203,000	279,000
Waikato	4,562,000	571,000	85,000	199,000	1,332,000	428,000
Bay of Plenty	4,562,000	1,188,000	86,000	344,000	1,859,000	575,000
Gisborne	4,562,000	969,000	88,000	345,000	1,463,000	533,000
Hawke's Bay	4,562,000	1,126,000	87,000	363,000	1,660,000	559,000
Taranaki	4,562,000	1,236,000	88,000	382,000	1,787,000	585,000
Manawatu-	4,562,000	719,000	84,000	233,000	1,439,000	454,000
Wellington	4,562,000	622,000	85,000	212,000	1,054,000	336,000
Nelson-Marlborough	4,562,000	984,000	88,000	300,000	1,482,000	457,000
West Coast	4,562,000	643,000	83,000	235,000	1,260,000	443,000
Canterbury	4,562,000	902,000	85,000	313,000	1,536,000	547,000
Otago	4,562,000	930,000	86,000	282,000	1,348,000	407,000
Southland	4,562,000	986,000	84,000	328,000	1,600,000	553,000
<b>New Zealand</b>	<b>4,562,000</b>	<b>846,000</b>	<b>86,000</b>	<b>260,000</b>	<b>1,450,000</b>	<b>443,000</b>

Table 10 continued

Urban roads Region	Average social cost per reported injury					
	Injury severity					
	Fatal	Serious	Minor	Serious and minor	Fatal and serious	Fatal, serious and minor
June 2019 prices (\$)						
Northland	4,562,000	1,023,000	86,000	268,000	1,377,000	359,000
Auckland	4,562,000	815,000	87,000	201,000	1,054,000	247,000
Waikato	4,562,000	581,000	87,000	175,000	947,000	254,000
Bay of Plenty	4,562,000	1,238,000	89,000	263,000	1,645,000	352,000
Gisborne	4,562,000	990,000	87,000	250,000	1,379,000	342,000
Hawke's Bay	4,562,000	1,176,000	88,000	253,000	1,364,000	291,000
Taranaki	4,562,000	1,224,000	89,000	311,000	1,499,000	385,000
Manawatu-Wanganui	4,562,000	744,000	88,000	186,000	1,101,000	253,000
Wellington	4,562,000	626,000	88,000	185,000	770,000	215,000
Nelson-Marlborough	4,562,000	1,042,000	88,000	272,000	1,275,000	330,000
West Coast	4,562,000	661,000	86,000	213,000	806,000	249,000
Canterbury	4,562,000	926,000	88,000	227,000	1,204,000	286,000
Otago	4,562,000	960,000	88,000	237,000	1,085,000	264,000
Southland	4,562,000	976,000	88,000	231,000	1,079,000	251,000
<b>New Zealand</b>	<b>4,562,000</b>	<b>854,000</b>	<b>88,000</b>	<b>214,000</b>	<b>1,109,000</b>	<b>267,000</b>

## 2.5 Crash statistics and price indices

Table 11: Reported and estimated number of crashes and injuries from 2016-2018

All areas								
	Reported crashes	Reported injuries			Estimated crashes	Estimated injuries		
		Fatal	Serious	Minor		Fatal	Serious	Minor
Fatal	959	1,083	422	446	959	1,083	422	446
Serious	6,612	0	7,510	2,262	12,049	0	13,693	4,190
Minor	25,197	0	0	30,387	89,726	0	0	108,212
<b>Total</b>	<b>32,768</b>	<b>1,083</b>	<b>7,932</b>	<b>33,095</b>	<b>102,734</b>	<b>1,083</b>	<b>14,115</b>	<b>112,848</b>
Open roads								
	Reported crashes	Reported injuries			Estimated crashes	Estimated injuries		
		Fatal	Serious	Minor		Fatal	Serious	Minor
Fatal	693	804	345	348	693	804	345	348
Serious	3,185	0	3,802	1,448	5,861	0	7,003	2,698
Minor	9,796	0	0	12,203	34,885	0	0	43,456
<b>Total</b>	<b>13,674</b>	<b>804</b>	<b>4,147</b>	<b>13,999</b>	<b>41,439</b>	<b>804</b>	<b>7,348</b>	<b>46,502</b>
Urban roads								
	Reported crashes	Reported injuries			Estimated crashes	Estimated injuries		
		Fatal	Serious	Minor		Fatal	Serious	Minor
Fatal	266	279	77	98	266	279	77	98
Serious	3,427	0	3,708	814	6,188	0	6,690	1,492
Minor	15,401	0	0	18,184	54,841	0	0	64,756
<b>Total</b>	<b>19,094</b>	<b>279</b>	<b>3,785</b>	<b>19,096</b>	<b>61,295</b>	<b>279</b>	<b>6,767</b>	<b>66,346</b>

**Table 12: Price indices for updating unit costs**

Cost components	Indices/measures	Infoshare table references	Period	Indices/values	% change over the 12 months to June 2019
Loss of life and life quality	Average hourly earnings (ordinary time)	QEX001AA	June 2019	\$32.37	+4.4%
Loss of output			June 2018	\$31.00	
			June 2017	\$30.09	
Medical cost	Producers price input index – Health and community services	PPI020AA (Base: Dec 2010=1000)	June 2019 June 2018 June 2017	1128 1102 1081	+2.4%
Legal and court cost	Producers price input index – Legal services: Personal and Corporate	PPI027AA (Base: Dec 2010=1000)	June 2019 June 2018 June 2017	1184 1147 1126	+3.2%
Vehicle damage cost	Consumers price index – Vehicle servicing & repairs	CPI013AA (Base: June 2017 =1000)	June 2019 June 2018 June 2017	1041 1023 1000	+1.8%

Source: Infoshare, Statistics New Zealand.

## 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. Trade-offs covered in the survey involved asking how much respondents would pay to reduce road accident risks for themselves, their families, and other people. Specific questions included:

- Driving on a safer road with a toll
- Taking a course in road safety
- Adding safety features to a car
- Living in a neighbourhood that has a lower chance of being involved in a motor vehicle accident
- Funding road and pedestrian safety improvements via higher taxes
- Reducing fatal vs non-fatal risks

This information was 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 2019 prices is \$4.53 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 10.8 days and the average daily earnings per person (considering the age and gender profiles of 2016-2018 crash data) was \$126.80. These give an average loss of output of \$1,660 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 hospitals in Dunedin and Waikato to determine the average cost of 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.