The societal cost of unintentional childhood injuries in Aotearoa

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ABSTRACT

AIMS: To estimate the burden and inequity of unintentional childhood injury for children in Aotearoa.

METHODS: We used administrative data from the Accident Compensation Corporation (ACC) and the Ministry of Health to estimate the direct, indirect and intangible costs of unintentional injuries in children aged under 15 and the inequity of the impact of childhood injury on discretionary household income. We used an incidence approach and attributed all costs arising from injuries to the year in which those injuries were sustained.

RESULTS: 257,000 children experienced unintentional injury in 2014, resulting in direct and indirect costs of almost $400 million. The burden of lost health and premature death was the equivalent of almost 200 full lives at perfect health. Pacific children had the highest incidence rates. Māori had the lowest rates of ACC claims but the highest rate of emergency department attendance. Children living with the highest levels of socioeconomic deprivation had the highest rate of hospital admission following injury. The proportional loss in discretionary income arising from an injury was higher for Māori and Pacific compared to non-Māori, non-Pacific households.

CONCLUSION: The burden of unintentional childhood injury is greater than previously reported and has a substantial and iniquitous societal impact. There should be a focus on addressing inequities in incidence and access to care in order to reduce inequities in health and financial impact.

Approximately 66 children (0–14 years) die from unintentional injuries each year, and unintentional injury is the leading cause of death in 1- to 14-year-olds. An additional 7,700 hospitalisations occur as a result of these injuries. Tamariki Māori are 3.4 times more likely to die from unintentional injuries than European children. The frequency, severity, potential for death and disability, inequities and costs of unintentional injury make it a significant childhood health problem.[1]

Despite the significance of unintentional childhood injuries in Aotearoa, little is known about their immediate and long-term costs, which include the direct costs (eg, medical treatment and rehabilitation) and indirect costs (eg, productivity losses and intangible human costs of resulting disability and avoidable deaths). Current injury-prevention policy development and spending is heavily influenced by existing economic data, which are largely derived from the Accident Compensation Corporation (ACC). These measured costs are largely compensation for the lost earnings of injured adults. Thus child injury prevention is interpreted as costing much less.

Although the need to reduce health inequities is widely acknowledged, particularly for Māori,[2] little is known about the economic costs associated with the disproportionate burden of unintentional injuries experienced by tamariki Māori.

This study seeks to quantify the economic costs of unintentional child injuries for all tamariki in Aotearoa aged 0–14 years, including the direct and indirect costs of these injuries, and to identify inequities that exist between unintentional injury rates for tamariki Māori and non-Māori children in Aotearoa.

Methods

This analysis was incidence based and aimed to estimate the societal costs of all unintentional injuries that occur in one year for children aged 0–14 years. Given the need for a sufficient period of post-injury follow-up time, we chose 2014 as our base year for injury incidence, allowing for up to five and a half years of post-injury data from ACC and the Ministry of Health (MoH).

The first part of our study used ACC claims data for unintentional childhood injuries in 2014 to establish the incidence. The second part of our study quantifies the burden of costs across a range of categories based on the incidence data. We estimated the societal cost burden in three forms:

- Direct costs: those relating to the medical treatment and rehabilitation of unintentional childhood injuries.
- Indirect costs: the lost potential productivity in the workplace resulting from absences due to unintentional childhood injuries (ie, these costs relate to caregivers).
- Intangible costs: these cannot readily be monetised (eg, the pain, stress, physical limitations or loss of life as a result of unintentional childhood injuries). We measured these in disability-adjusted life years (DALYs).

Incidence data for unintentional childhood injuries were based upon individual level claims data for 2014 provided by ACC. We provide details of the data cleansing process in the supplementary materials to this paper.

We used prioritised ethnicity codes. Children who do not have either Māori or Pacific as a recorded ethnicity are grouped in the non-Māori, non-Pacific (NMNP) group.

We used prices from the midpoint of the time period of the analysis (2017) for inpatient, day patient and non-admitted secondary care events. We applied an additional 20% to these calculated costs to represent the deadweight cost that taxation imposes on the economy.[3]

We adopted a human capital approach for estimating the indirect costs of lost productivity, using wages to estimate the productivity loss. Household incomes were based on 2017 median equivalised income before housing costs from Perry.[4] We assumed an average two-adult, two-children household for our analysis, which equates to a multiplier of 2.1. We choose this household type as our 'standard' household as it is the most common type among those where children are present.[5] This is the case across all ethnicities, although Māori and Pacific women are more likely to have three or more children, and Māori and Pacific children are more likely to live in a sole parent household.[5,6]

As a conservative estimate for lost productivity and lost income, we assumed that each unique date on which an inpatient, day patient, non-admitted secondary care (including outpatient and emergency department) and/or ACC event occurred was equal to one lost day of productivity and income. This presupposes that a caregiver would need to take time off work for these attendances. While it is unlikely that all attendance days occurred on working days, this was likely more than offset by additional time off work for caregivers caring for injured children.

To calculate the median daily income/productivity loss, we based household income on 1.5 incomes (ie, one full-time and one half-time income), in accordance with the living wage calculations and 260 paid working days a year.[7]

Measurement of health loss due to injuries had to account for both the loss in health due to premature mortality for fatal injuries and the loss in health-related quality of life due to disability for non-fatal injuries. We measured the health losses due to unintentional injury in disability-adjusted life years (DALYs). Details of our DALY estimation are included in the supplementary materials to this paper.

We explored how an injury may impact household discretionary income for the first year following an injury for different groups. Although the monetised value of time off work may be lower for those on lower incomes, this loss may represent a relatively higher burden compared to those on higher incomes. For this impact approach to inequity, we used the median income by ethnicity reported by Perry.[4] For the breakdown by deprivation, we assigned the midpoint of the quintile: for instance, we assigned the 90th percentile figure to quintile 1 (least deprived) the

10th percentile figure to quintile 5 (most deprived). As a benchmark for our equity impact analysis, we used the 2017 living wage 2017 ($20.20 per hour).

Our ethnicity equity analysis broke the previous NMNP ethnicity group into 'European' and 'All Other'. Multiple response ethnicity was prioritised in order of Māori, Pacific people, All Other and then European.

We used a discount rate of 3.5% per annum for all costs, consistent with standard practice for economic analysis at PHARMAC.[8]

Ethics approval was obtained from the Auckland Health Research Ethics Committee and the ACC Ethics Panel.

Results

Incidence and costs

During the 2014 calendar year, more than one in four children aged 0–14 (257,000 of 911,000, or 28%) suffered at least one injury. There were almost 345,000 ACC claims for unintentional childhood injuries. Approximately 40% of these were due to falls, and almost 30% due to sports-related injuries (Table 1).

The loss in health of 5,400 DALYs (Table 2) is equivalent to almost 200 full lives in perfect health. The cost of the injuries to the health sector and ACC equates to over $200 million. Unintentional childhood injuries also resulted in productivity losses of almost $170 million. Applying a full-time annual salary for the ages 18–64 for the fatal injuries in 2014 equates to a further productivity loss of $29 million.

Contribution to DALYs lost by injury cause is similar to incidence (Table 2), with the exception of falls, transport incidents and drowning. Transport incidents and drowning contribute to burden in a higher proportion than their incidence due to the relatively high proportion of fatal injuries, whereas falls contribute less, primarily due to lower average severity (disability weight).

Māori were found to have the had lowest rates of recorded injury, in total and across most causes (Table 3).

The health and ACC cost per injury for Māori is higher than for Pacific people and NMNP (24% and 30% higher, respectively) (Table 4). This offsets the lower ACC claim rate such that the overall health and ACC cost rate is more in line with the average.

In comparison to total incidence, the hospital admission rate for Māori following an unintentional injury exceeds the rate for NMNP, and the Māori emergency department (ED) attendance rate is the highest across the three ethnicities (Table 5).

Deprivation is based on the New Zealand Index of Deprivation 2013 (NZDep2013) decile groupings, grouped into quintiles (Table 6). Children in quintile 1 have the highest rates of injury across almost all causes, especially sports-related injuries. Except for quintile 5, total (all-cause) injury rates fall as deprivation increases. This trend is primarily driven by fewer sports-related injuries. Both transport incidents and injuries from fire, heat and hot substances tend to increase with deprivation. The rate of injury from animate mechanical forces is relatively flat for quintiles 1 to 4 but is around 50% higher for quintile 5.

Children in quintile 1 have the highest rates across all the four measures of Table 7. Although the health and ACC cost rates per 1,000 children are similar, the cost per injury is higher for quintile 5 than any of the other quintiles.

Equity of injury impacts

Higher incomes combined with higher attendance days for Europeans are reflected in higher absolute loss in household income following an injury. However, due to the higher income, the percentage loss in discretionary income is the lowest. Māori households have the highest percentage loss of discretionary income.

Median incomes for Pacific people are already below the living wage, highlighting broader societal inequities. We therefore do not report the percentage change, as this cannot be directly compared, but note that the deficit is increased.

When analysed by deprivation, the highest absolute loss following an injury is for households in quintile 1. However, the relative loss for this group is the lowest. Quintile 4 and 5 incomes are already below the living wage before an injury. These groups, like Pacific people households (discussed above), are likely to be impacted the most from lost income arising from caring for an injured child.

Table 1: Injuries by cause.

Injury cause	Non-fatal injuries	Fatal injuries	Total
Falls	137,524	3	137,527
Sports	98,079	2	98,081
Animate mechanical forces[1]	42,070	2	42,072
Other	31,213	3	31,216
Inanimate mechanical forces[1]	26,505	3	26,508
Transport incident	3,871	16	3,887
Fire, heat and hot substances	3,105	1	3,106
Inhaled/swallowed object	2,501	0	2,501
Drowning	29	4	33
Total	344,897	34	344,931

[1] 'Animate mechanical forces' refer to injuries that are caused by living things able to move on their own accord. This includes injuries like dog and insect bites, as well as being struck by another person. 'Inanimate mechanical forces' refers to injuries that are caused by moving non-living things, such as moving machinery or explosions.

Table 2: Societal costs by injury cause.

Injury cause	Incidence	DALYs	Health and ACC cost	Caregiver productivity loss
Falls	137,527	1,623	$81.53M	$61.64M
Sports	98,081	1,580	$56.22M	$64.08M
Animate mechanical forces	42,072	621	$16.09M	$14.54M
Other	31,216	422	$15.42M	$12.70M
Inanimate mechanical forces	26,508	333	$12.97M	$10.10M
Transport incident	3,887	606	$10.36M	$3.41M
Fire, heat and hot substances	3,106	64	$4.37M	$2.24M
Inhaled/swallowed object	2,501	33	$5.03M	$0.87M
Drowning	33	118	$0.07M	$0.01M
Total	344,931	5,400	$202.05M	$169.60M

Table 3: Injuries by cause and ethnicity.

Injury cause	Māori	Pacific people	NMNP	Total
Counts				
Falls	29,612	14,440	93,475	137,527
Sports	19,098	8,809	70,174	98,081
Animate mechanical forces	11,326	7,042	23,704	42,072
Other	7,652	3,390	20,174	31,216
Inanimate mechanical forces	6,115	3,351	17,042	26,508
Transport incident	988	386	2,513	3,887
Fire, heat and hot substances	959	455	1,692	3,106
Inhaled/swallowed object	686	209	1,606	2,501
Drowning	12	3.0	18	33
Total	76,448	38,085	230,398	344,931
Rate per 1,000				
Falls	**126	**164	159	151
Sports	**81	**100	120	108
Animate mechanical forces	**48	**80	40	46
Other	**32	**38	34	34
Inanimate mechanical forces	**26	**38	29	29
Transport incident	4.2	4.4	4.3	4.3
Fire, heat and hot substances	**4.1	**5.2	2.9	3.4
Inhaled/swallowed object	2.9	*2.4	2.7	2.7
Drowning	0.05	0.03	0.03	0.04
Total	**324	**431	392	379

** Rate ratio is significant at the 99% level compared to NMNP.
* Rate ratio is significant at the 95% level compared to NMNP.

Table 4: Societal costs by ethnicity.

Ethnicity	Incidence	DALYs	Health and ACC cost	Productivity loss
Counts				
Māori	76,448	1,459	$54.22M	$34.77M
Pacific people	38,085	429	$21.73M	$16.51M
NMNP	230,398	3,511	$126.11M	$118.32M
Total	344,931	5,400	$202.05M	$169.60M
Rate per 1,000				
Māori	**324	6.2	**$230K	**$147K
Pacific people	**431	**4.9	**$246K	**$187K
NMNP	392	6.0	$215K	$202K
Total	379	5.9	$222K	$186K

** Rate ratio is significant at the 99% level compared to NMNP.
* Rate ratio is significant at the 95% level compared to NMNP.

Table 5: Summary of attendance rates by ethnicity—rates per 1,000.

Attendance rate	Māori	Pacific people	NMNP
Injury	324	431	392
Inpatient or day patient	18	22	15
ED attendance	67	50	59
Outpatient/non-hospital	242	362	321

Key
Highest
Middle
Lowest

All rate ratios for Māori:NMNP and Pacific people:NMNP for the rates shown in Table 5 are significant at the 99% level.

Table 6: Injuries by cause and NZDep2013 quintile.

Injury cause	Q1	Q2	Q3	Q4	Q5	Total
Rate per 1,000[1]						
Falls	169	**153	**146	**139	**142	151
Sports	142	**112	**105	**93	**84	108
Animate mechanical forces	40	40	39	**42	**61	46
Other	35	**33	**33	*33	**36	34
Inanimate mechanical forces	29	**28	*28	**27	**32	29
Transport incident	4.0	4.2	4.3	4.0	*4.4	4.3
Fire, heat and hot substances	2.7	*3.1	2.7	**3.5	**4.5	3.4
Inhaled/swallowed object	2.7	2.5	2.9	2.9	2.6	2.8
Drowning	0.03	0.03	0.03	0.03	0.05	0.04
Total	423	**375	**361	**344	**366	380

[1] The rates by quintile exclude injuries where NZDep2013 data for injuries are missing (1.6%). Therefore, quintile specific rates are slightly undercounted.
** Rate ratio is significant at the 99% level compared to Q1.
* Rate ratio is significant at the 95% level compared to Q1.

Table 7: Societal costs by deprivation quintile.

Quintile	Incidence	DALYs	Health and ACC cost	Productivity loss
Rate per 1,000[1]				
1—least deprived	423	6.5	$231K	$226K
2	**375	6.1	**$225K	**$193K
3	**361	**5.4	**$216K	**$180K
4	**344	**5.5	$199K	**$164K
5—most deprived	**366	**5.7	$228K	**$164K
Total	380	5.9	$222K	$186K

[1] The rates by quintile exclude injuries where NZDep2013 data for injuries are missing (1.6%). Therefore, quintile specific rates are slightly undercounted.
** Rate ratio is significant at the 99% level compared to Q1.
* Rate ratio is significant at the 95% level compared to Q1.

This breakdown shows fewer attendance days per injury by deprivation.

Discussion

Key results

Unintentional childhood injuries have a significant societal cost. Our methodology consistently used conservative assumptions, meaning that the results presented here should be interpreted as lower limits for the true level of burden imposed by unintentional childhood injury. Our main findings are of substantial cost and material inequalities in childhood trauma.

We investigated the impact of injury on households according to the distribution of discretionary income. Injuries could have a particularly significant impact on low-income households, which may result in borrowing or avoiding essential household expenditure, and if debt were used to cover the deficits, interest on any additional debt would exacerbate the impact. Similarly, forgoing essential expenditure, such as for food, medicine or heating, may worsen health outcomes.

Households are likely to first spend income on the goods and services that are of most importance and the highest value. That is, there are diminishing marginal benefits to increases in income. For lost income, this means that the 'value' of each dollar lost is greater for lower-income households. For households with negative discretionary income before any losses in income, it is likely that they will already be forgoing essential goods and services. A reduction in income for these households likely means forgoing even more vital essential goods and services.

Importance

The level of cost of injury we found is significant in a New Zealand context. Our finding of nearly $400 million in annual costs is substantial, particularly because it applies only to children aged under 15. The $200 million we found in direct costs was approximately 12% of ACC's entire annual expenditure of $1.7 billion on health services.[9]

The disparities we found across ethnic groups can be explained, at least to some extent, by existing research on access to primary healthcare.[2] Poorer access to primary care for Māori, Pacific people and people with higher levels of deprivation, which has already been documented in the established literature, is likely to be at least one important factor behind these key findings:

- Māori had the lowest rates of ACC claims for injuries, but the highest ED attendance rate and, given the collected data, are 50% more likely to be admitted to hospital following an injury than NMNP. This signals a possible gap between Māori and non-Māori use of and access to

Table 8: Reduced income due to injuries by ethnicity.

	Māori	Pacific people	All Other	European
Median annual household income	$69,930	$58,170	$76,440	$87,150
less Living wage	$63,024	$63,024	$63,024	$63,024
Remaining discretionary income	$6,906	-$4,854	$13,416	$24,126
less Lost caregiver income[1]	$374 (2.1)	$301 (2.0)	$439 (2.2)	$540 (2.4)
Discretionary income after one injury	$6,532	-$5,155	$12,977	$23,586
Percentage change in discretionary income	-5.7%		-3.4%	-2.3%

[1] Numbers in brackets reflect the average number of attendance days in the first year following injury.

primary healthcare following lower acuity unintentional injuries.

- Pacific people had higher incidence rates, but apparently fewer long-term disabilities and therefore lower health impacts. This indicates that there may be gaps in longer-term follow-up treatment for Pacific children, who appeared to have fewer long-term injuries due to lack of events past one year of age.

The finding of lower health service presentation rates following injury for Māori could also be due to differential treatment by health providers when Māori present to the health sector, which would lead to fewer ACC claims. If fewer attendance days for more deprived households are, at least in part, due to lost income, then caregivers may be needing to make the difficult trade-off between their children's health and other life necessities. Factors such as effective and culturally appropriate patient–provider communication may impact on a patient's understanding of health processes.[10,11,12] Therefore, the quality of the healthcare received by Māori may be as important (if not more) than poorer access to healthcare.

There is a growing body of research into the cost of injury in New Zealand. However, due to different methodologies and timeframes, the absolute values are difficult to compare. For instance, few studies have estimated the costs of childhood injuries, let alone unintentional childhood injuries specifically. Other studies focus on hospital admissions and/or fatalities, which account for less than 5% of the total number of injuries in our analysis.

Research completed by Mills, Reid and Vaithianathan found similar disparities between Māori and non-Māori. They found that between 2003–2007 there was a Māori-to-non-Māori rate ratio of 0.68 of ACC claims. We found that the rate ratio for 2014 was 0.80, which may show a slight closing of the gap, although we note that our analysis was only for one year and considers only unintentional injuries.

Previous research into differences between levels of deprivation showed trends similar to those we found. Mistry et al found the same increasing rate of burn injuries by deprivation for all New Zealanders,[14] and Hosking found road traffic injuries increasing with deprivation for children.[15]

Conclusions

Our approach to analysing equity provides insight into areas that have not previously been quantified. Our analysis showed that Māori and Pacific people are much more impacted than All Other and European households. As expected, the most deprived

Table 9: Reduced income due to injuries by deprivation quintile.

	Quintile				
	1—least deprived	**2**	**3**	**4**	**5—most deprived**
Median annual household income	$166,950	$107,520	$80,220	$59,430	$41,160
less Living wage	$63,024	$63,024	$63,024	$63,024	$63,024
Remaining discretionary income	$103,926	$44,496	$17,196	-$3,594	-$21,864
less Lost caregiver income	$1,061 (2.5)	$659 (2.4)	$478 (2.3)	$339 (2.2)	$217 (2.1)
Discretionary income after one injury	$102,865	$43,837	$16,718	-$3,933	-$22,081
Percentage change in discretionary income	-1.0%	-1.5%	-2.8%		

[1] Numbers in brackets reflect the average number of attendance days in the first year following injury.

households are also more heavily impacted by an injury than the least deprived.

This impact is likely even more substantial than the analysis we have shown. Firstly, those on lower incomes or who identify as Māori or Pacific people may be more likely to be in casual employment.[16] These workers are less likely to be entitled to paid sick leave compared to those in permanent employment, from whom paid sick leave may help to alleviate the financial impact of time off work.

Secondly, the most deprived households are more likely to have other health issues, and Māori and Pacific people typically have poorer health outcomes than NMNP, even after the data are adjusted for deprivation. Therefore, even if paid sick leave were available to these groups, they would be more likely to have use their allocation for other health issues.

This analysis has contributed a new perspective to the burden of unintended childhood injury in Aotearoa. We adopted an incidence approach, which we anticipate will be useful in future cost–benefit analysis of injury prevention interventions. We also explored issues of inequitable impact and showed clearly that the impact of a childhood injury varies for different families, and that the ability to manage the costs arising from an injury varies systematically by ethnicity and deprivation.

These results present a starting point for a number of research questions that could expand upon our analysis, draw in different datasets, or develop our findings in the context of other literature. In particular, we see a number of questions and areas for future research that arise from our results:

- How do households with little or no discretionary income manage childhood injury?
- To what extent do issues of poor access to primary care impose a greater and inequitable injury burden on households, particularly for Māori?
- To what extent do issues of poor access to rehabilitation and longer-term care impose a greater and inequitable injury burden on households, particularly for Pacific people?
- What are the wider policy implications of the inequity of injury burden, particularly for Pacific people?
- Analysis of the household burden of injury, taking into account household size and income in a more granular manner, potentially using Integrated Data Infrastructure data on income and living circumstances.
- Analysis of Pacific outcomes by Total Response ethnicity, as well as Prioritised ethnicity, in order to explore the impact on Pacific communities further.

The current findings have three significant points. The first is the sheer size of unintended childhood injury supports the view that childhood injury is a significant burden to New Zealanders. It is a particularly high burden for Māori and Pacific people. The second point is that the impact of a childhood injury may magnify pre-existing inequities in access to healthcare. The existing, well established inequity in access to primary care for key groups of New Zealanders is seen here in lower rates of presentation for less severe injuries. There is room for further research on the impact that inequity of access has on the outcome of injuries.

Lastly, the impact of a childhood injury magnifies wider, pre-existing socioeconomic inequities in Aotearoa. We have shown that households with low discretionary income sustain a higher proportionate impact from the costs of an injury. In the extreme cases of households with very low average incomes, where there is no discretionary income even before an injury occurs, there is significant potential for an injury to cause harm to the household, and for the impact to be significantly out of proportion to the impact upon a whānau with more resources. This finding applies in particular to Pacific people and those living in high socioeconomic deprivation.

Overall, there is significant scope for reducing the absolute burden of unintended childhood injury in Aotearoa. Work to address that burden has the potential to reduce inequalities, both in the immediate treatment of injury and, more widely, upon the inequitable impact that childhood injury has on households and whānau. Health promotion programmes that work with local communities to support injury prevention

for tamariki have the potential to reduce an important source of inequity in health outcome for children in Aotearoa.

Supplementary materials

Data cleansing

Incidence data for unintentional childhood injury was based upon claims data provided by the Accident Compensation Corporation (ACC) for 2014. All ACC payments relating to these claims to 28 September 2019 were provided. Data for inpatient, day patient, non-admitted secondary care events (such as outpatient and emergency department visits) and mortality events for the children identified by ACC were provided by the Ministry of Health (MoH). These data were matched by National Health Index (NHI) and ACC claim number. The MoH also provided a cohort dataset, which contained patient demographics. The data were cleaned in accordance with the following rules:

- Claims were removed where the injury cause was either 'Criminal Act' or 'Medical Treatment'.
- MoH demographic data were prioritised over the ACC provided data.
- Claims were removed where the age at accident was greater than 14.
- MoH inpatient and day patient data were filtered to include only events where an accident date was recorded within seven days before or after the accident year and month reported by ACC and at least one of a) an external cause code, b) a diagnostic code under the ICD-10 umbrella group 'Injury, poisoning and certain other consequences of external causes', or c) the 'accident_flag' was set to 'Y'.
- Outpatient and emergency department visits were filtered to include only events where the service date occurred between the accident year and month provided by ACC and the greater of a) two months from the accident year and month provided by ACC, or b) the time between the last service paid by ACC and the accident date added to the end of the month in which the accident occurred.
- Mortality Collection data were filtered to include only events where the underlying cause of death was recorded under the ICD-10 umbrella 'External causes of morbidity and mortality', 'Accident'.

DALY calculations

Calculation of the DALY requires a 'disability weight', calculated from the results tool of the World Health Organization's (WHO) 2017 Global Burden of Disease (GBD) study. We calculated the average disability weights by nature of injury for the age groups 0–14.

We applied the following rules when determining the duration of disability arising from an injury:

- if the injury was fatal, use remaining life-expectancy; else
- if the nature of injury was an amputation, use remaining life-expectancy; else
- determine the length of time from injury to the last relevant inpatient, day patient, non-admitted secondary care or ACC payment event:
- if less than seven days, use seven days; else
- if greater than or equal to 365 days, use remaining life-expectancy; else
- length of time from injury to the last relevant inpatient, day patient, non-admitted secondary care or ACC payment event.

For life expectancy, we used life table data from Stats NZ (2015). We used the aggregate life expectancy for New Zealand, and we did not differentiate life-expectancy between different demographic groups since this would have discriminated against those with lower life-expectancies. For instance, a fatal or life-long injury for a Māori child would have resulted in a lower societal cost than one for a non-Māori, non-Pacific child due to lower life-expectancy.

Injuries were categorised in order to align with the disability weight data, in accordance with James et al.

Competing interests:
Nil.
Acknowledgements:
We would like to acknowledge helpful comments and feedback from Associate Professor Elana Curtis of Te Kupenga Hauora at the University of Auckland.
This work was supported by a grant from the Starship Foundation.
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