A Few Home Truths
Low Speed Roll-Overs in Queensland

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A Few Home Truths
Low Speed Roll-Overs in Queensland

In Australia
≈ 9 fatalities per year
2nd leading cause of injury death in children aged 1 - 4

In Queensland
≈ 2 ½ deaths per year
≈ 3 incidents per week
1 fatality for every 62 non-fatal injuries
## Childhood Pedestrian Deaths

### Australia

<table>
<thead>
<tr>
<th>Location</th>
<th>0-4 years</th>
<th>5-14 years</th>
<th>0-14 years</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Traffic</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Built-up areas</td>
<td>54</td>
<td>77</td>
<td>131</td>
</tr>
<tr>
<td>- Other traffic locations</td>
<td>8</td>
<td>36</td>
<td>44</td>
</tr>
<tr>
<td><strong>Non-traffic</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Home</td>
<td>60</td>
<td>6</td>
<td>66</td>
</tr>
<tr>
<td>- Farm</td>
<td>6</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>- Other non-traffic locations</td>
<td>4</td>
<td>19</td>
<td>23</td>
</tr>
<tr>
<td><strong>Total Deaths</strong></td>
<td>132</td>
<td>138</td>
<td>270</td>
</tr>
<tr>
<td>Deaths per 100,000 per year</td>
<td>1.0</td>
<td>0.5</td>
<td>0.7</td>
</tr>
</tbody>
</table>

Child Pedestrian Safety: driveway deaths & low-speed vehicle run overs, Australia 2001-10
Australian Government: Department of Infrastructure & Transport
Childhood Serious Pedestrian Injuries
Australia

<table>
<thead>
<tr>
<th>Location</th>
<th>0-4 years</th>
<th>5-14 years</th>
<th>0-14 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Street or Highway</td>
<td>613</td>
<td>2568</td>
<td>3181</td>
</tr>
<tr>
<td>Home</td>
<td>511</td>
<td>265</td>
<td>776</td>
</tr>
<tr>
<td>Farm</td>
<td>14</td>
<td>35</td>
<td>49</td>
</tr>
<tr>
<td>School</td>
<td>9</td>
<td>34</td>
<td>43</td>
</tr>
<tr>
<td>Other specified place of occurrence</td>
<td>99</td>
<td>233</td>
<td>332</td>
</tr>
<tr>
<td>Unspecified place of occurrence</td>
<td>289</td>
<td>546</td>
<td>835</td>
</tr>
</tbody>
</table>

| Total Seriously Injured               | 132       | 138        | 270        |
| Seriously injured per 100,000 per year| 1.0       | 0.5        | 0.7        |

Child Pedestrian Safety: driveway deaths & low-speed vehicle run overs, Australia 2001-10
Australian Government: Department of Infrastructure & Transport
Low speed roll-overs in Australia

7 ½ deaths per year
82 (Jul 2000 – Dec 2010)

3/4 aged < 36 months

3/4 driver known to the child

3/4 non traffic settings
(1/3 home driveway)

The most common vehicle was 4WD

Socially disadvantaged areas over-represented
Acknowledgements

Queensland Injury Prevention Council
Acknowledgements

Low speed Vehicle run over incidents in Queensland children (0-15 years), 11 year review (Jan 1999 – Dec 2009), and development of a prospective data monitoring system

Prof Roy Kimble
A/Prof Kerrianne Watt
Belinda Wallis
A/Prof Jim Nixon
Prof Danny Case
Tona Gillen
Heidi Winter
Bronyn Griffin

Queensland Children’s Medical Research Institute
Royal Children’s Hospital, Brisbane
Incidence

**3 Incidents per week**
1611 incidents over the 10 year period (17 per 100,000 children ≤ 15 yo)
peak incidence at 12-23 months
Severity

1 Death
3.5 ≥2 hospitalizations
32 1 hospitalization
22 ED presentation only
5 Ambulance only

56% required hospitalization
62 non fatal incidents for every death
Gender

2 males for every female

Males
21.0 per 100,000

Females
12.6 per 100,000
Fatalities vs Age

Small children more at risk of fatal injuries
In 58% of fatal injuries a parent was driving the car.
Time of Day
Fatal Injuries

- 6am to 9am: 25%
- 9am to 12 noon: 25%
- 3pm to 6pm: 37%
- 6pm to 9pm: 13%

Late afternoon is the most common time for fatal injuries.
Type of car

**Fatal**
- Four Wheel Drive: 31%
- Utility: 23%
- Car: 15%
- Truck: 12%
- Other: 19%

**Non Fatal**
- Four Wheel Drive: 6%
- Utility: 1.4%
- Car: 84%
- Truck: 1.6%
- Other: 7.5%

**4WD over-represented in fatalities**
Rurality

Fatal
- Major City: 23%
- Inner Regional: 12%
- Outer Regional: 16%
- Rural: 16%

Non Fatal
- Major City: 57%
- Inner Regional: 16%
- Outer Regional: 20%
- Rural: 5%

Rural communities over-represented in fatalities
Social Advantage

Fatal

- High social advantage: 23%
- Lower social advantage: 77%

Non Fatal

- High social advantage: 48%
- Lower social advantage: 52%

Socially Disadvantaged over-represented in fatalities
Indigenous children over-represented in fatalities

- Indigenous children: 21.8 per 100,000
- Non - Indigenous children: 14.1 per 100,000
DON’T GO IF YOU DON’T KNOW!

Supervise: When moving vehicles, know where your kids are, hold them close or put them in the car with you. Never leave children unattended in cars.

Separate: Use fences and self-closing gates to keep garages and driveways separate from play areas. Always keep external doors locked.

See: Walk around your car and keep children in mind when using your reversing mirrors, sensors and cameras.
What to do?

Child Factors

Most fatalities occur in children ≤ 4 yo

- Too small to be visible
- Old enough to be mobile
- Developmentally unable to perceive danger
- More likely to sustain serious injuries
- Unable to reliably follow instruction even when supervised
- Playing in the car
What to do?

Adult Factors

Awareness raising of adult drivers

- Inherent risks of small children around cars
- Never leave children unattended near cars

Reportedly between 25-50% of parents had sighted the child believing they were “safe” prior to moving the car

- Simply knowing where the child is, is not sufficient
- Supervisors should hold the child's hand when in the vicinity of cars (it is not sufficient to merely watch the child)

Given that all social stratum are victims of this injury, targeted programs will not be effective; a general population approach is required
The Advertising Campaign

https://www.youtube.com/watch?feature=player_detailpage&v=wxHAwlvdOOc
What to do?

Vehicle Design

4WD & light commercial vehicles over-represented in fatalities

- NRMA “rearward visibility index” is no worse in 4WD than other vehicles
- It is hypothesized that the height and weight of 4WD and light commercial vehicles means they are more likely to cause severe injury
- All cars have a blind spot; reversing cameras or parking sensors are proposed as a possible design solution
- However, no studies have directly quantified the impact of reversing cameras or parking sensors
What to do?

Environmental Design

Most Low Speed Run-Overs occur in a home driveway

• Driveway redesign is a premier opportunity to reduce this type of injury
  • Separation of driveway from house and the yard or play areas
  • Doorway should not open directly into driveways
  • Fencing should be of similar design to pool fencing (self closing, self latching, high set handles)
• Further research is critical to strengthen the evidence base for guidelines / standards for new houses & ultimately all houses
Any Questions?

DON'T GO IF YOU DON'T KNOW

KEEPING DRIVEWAYS

www.kidsafeqld.com.au
Acknowledgements

Low speed Vehicle run over incidents in Queensland children (0-15 years), 11 year review (Jan 1999 – Dec 2009), and development of a prospective data monitoring system

Prof Roy Kimble
A/Prof Kerriannne Watt
Belinda Wallis
A/Prof Jim Nixon
Prof Danny Case
Tonya Gillen
Heidi Winter
Bronwyn Griffin

Queensland Children’s Medical Research Institute
Royal Children’s Hospital, Brisbane
Low-speed vehicle run over fatalities in Australian children aged 0-5 years

Anne Paul Anthikkat
Andrew Page
Buth Barker

References

Journal of Paediatrics And Child Health 2013

Anthikkat A.P., Page A., Barker R., Low speed vehicle run over fatalities in Australian Children aged 0-5 years, J of Paediatrics and Child Health, 2013,
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Anne Paul Anthikkat  
Andrew Page  
Buth Barker

Risk Factors Associated with Injury and Mortality from Paediatric Low Speed Vehicle Incidents: A Systematic Review

International Journal of Paediatrics  
2013
Characteristics of low-speed vehicle run-over events in children: a 11-year review

Browyn R Griffin, Kerrianne Watt, Linda E Shields, Roy M Kimble

Injury Prevention
Jan 21, 2014

ABSTRACT
Objectives The purpose of this study was to investigate the characteristics associated with fatal and non-fatal low-speed vehicle run-over (LSVRO) events in relation to person, incident and injury characteristics, in order to identify appropriate points for intervention and injury prevention.

Methods Data on all known LSVRO events in Queensland, Australia, over 11 calendar years (1999–2009) were extracted from five different databases representing the continuum of care (prehospital to hospital and trauma units). Descriptive and multivariate analyses were used to analyse the sample characteristics in relation to demographics, health service usage, outcomes, incident characteristics, and injury characteristics.

Results Of the 164 LSVRO incidents, 98.4% (96/100) were non-fatal, and 1.6% were fatal (n=3). Over half the children required admission to hospital (56%, n=92), with mean length of stay was 2.4 days. Younger children (5–6 years) were more frequently involved, and experienced more serious injuries with worse outcomes. Rates of injury (location of injury, type, severity and age group) were most common the vehicle drivers in fatal incidents. While older children, such as three- and four-year-olds, were most frequently involved in LSVRO events resulting in fatalities, older children were more frequently involved in non-fatal events.

Conclusions This is the first study to identify the rate and severity of injury in children involved in LSVRO events in children (0–15 years) on a state-wide basis. Characteristics of LSVRO events varied with age, and age-specific interventions are required. Children living outside major cities, and indigenous children were over-represented in these data. Further research is required to identify the burden of injury in these groups.

INTRODUCTION
Low-speed vehicle run-over (LSVRO) incidents occur when a pedestrian, usually a child, is injured or killed by a slow moving vehicle (moving forward or in reverse) in traffic and non-traffic areas at less than 30 km/h. They were first documented in 1964 and have been reported in more than 80 countries, in various countries, including Australia, the UK, USA, Brazil, Austria, and New Zealand. LSVROs are a significant cause of transport pedestrian fatalities in young children, and are the second most frequent cause of death due to unintentional injury among children aged 1–4 years in Australia. More recent studies have highlighted this problem as more complex than simple ‘running into’ or ‘driving over’ injury. To date, most studies have described fatal events where data are typically collected through coroner’s reports, hospital data, police reports and child death reviews. Separately from fatal events (where data are typically collected through one or two hospitals), non-fatal events (where data are usually collected through several hospitals) and trauma registries) have been less documented. While non-fatal events have been described, this has been done separately for both hospital admissions and ambulance-attended cases—only rarely are all relevant databases integrated. One previous Australian study included data on fatal and non-fatal events, but non-fatal data were extracted from hospital admissions in one major children’s hospital, and there is no data collected on a state-wide basis, so the two populations were not directly comparable. Emergency Department (ED) and hospital admissions data were accessed in a study which used data from the Canadian Hospitals Injury Reporting and Prevention Program (CHIRP), but these data are not generalisable because not all Canadian EDs and hospitals participate in the injury surveillance program. These studies from Auckland, New Zealand, included fatal and non-fatal events, however, the study was restricted to events within Auckland (the largest city in New Zealand) only, so results were not generalisable to non-metropolitan regions. Additionally, studies have limited their focus to LSVROs that involved a reversing vehicle, and were limited to that location-specific (e.g., driveway). This mechanism of injury has not been described in detail at a population level, and the methodological limitations of previous work on LSVROs has resulted in a lack of adequate information about the circumstances surrounding fatal and non-fatal incidents. A recent systematic review on LSVRO events found that the incidence of non-fatal LSVROs varied from 7.09 to 14.79/100,000, and from 0.63 to 3.27/100,000 for fatal events. Previous studies have highlighted that LSVROs are a particular problem among young children aged 0–4 years, with children aged 0–4 years. A recent population-based study of fatal and non-fatal LSVRO events over an 11-year period in Queensland, Australia, indicated that the incidence of LSVROs identified the highest for young children may be the highest (14.6/100,000) in the world. However, this study used sophisticated methodology to identify all known LSVROs identified across the continuum of care (from prehospital to hospital).
References

Browyn R Griffin
Kerrianne Watt
Belinda Wallis
Linda E Shields
Roy M Kimble

Paediatric low speed vehicle run-over fatalities in Queensland

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Feb 22, 2011, 17:10

ABSTRACT

Introduction Child pedestrian fatalities associated with motor vehicle reversing or moving at low speed are difficult to identify in surveillance data. This study aims to determine the incidence of fatalities associated with what is thought to be an under-reported and preventable fatal injury mechanism.

Methods The term low speed vehicle run-over fatalities describes incidents where vehicles run over a child at low speed. Data were obtained for children aged 0—15 years in the Australian state of Queensland from January 2004—December 2008.

Results There were 15 deaths (7 females and 8 males) during 2004—2008 (1.80/100,000). Ten were under 5 years of age (6.33/100,000) and 5 aged 5—14 years (1.47/100,000). There were 53 low-speed deaths recorded among 10—15-year-olds. Most (31/53) of the incidents occurred in private properties, and only two occurred on a road. Worn half of the fatalities were caused by a four wheel drive (4WD) vehicle, large family sedans were involved in three fatalities, and heavy vehicles were involved in three deaths. In 11 of the fatalities, parents were the drivers of the vehicle involved (methods in brackets): (i) in one, the vehicle involved was reversing before it came in contact with the child; fatalities occurred in each of the SoA domains for Arial (DIRA) levels.

Conclusions The unique data provided by the child death review team has highlighted that LSVF fatalities are a significant problem in Queensland. The Commission for Children and Young People and Child Guardians (CCYPC) child death review teams, which recommend an investigation into ways to reduce LSVF fatalities and injuries to children through research, education, and consultation, and for mandatory requirements for dwellings. Between 3 January 2004 and 31 December 2008, CCFPC recorded a total of 252 child deaths as a result of transport incidents in Queensland. Of these, 19 were due to LSVF incidents.

Identifying LSVF incidents

For LSVF events, International Classification of Diseases (ICD) coding identifies only the location, not the speed of the vehicle, nor does ‘non-traffic’ incidents from ‘traffic’ incidents give a true indication of LSVF status, and may not detect LSVF incidents involving injury in non-road events. To help improve identification of LSVFs, the CCYPC, primarily classify deaths according to their circumstances. Sometimes, in Road Reports of Death to a Coroner, LSVFs can be identified where the ICD code does not accurately reflect the circumstance of death. Identifying LSVF incidents using ICD-9 codes, specifically E344.2, which separated incidents into ‘traffic’ and ‘non-traffic’. For 35% of police and coroner’s reports resulted in re-coding of ‘traffic’ to ‘non-traffic’. A schematic representation of the codes for ICD-9 (specifically E344.2/E344.3) to identify factors associated with low speed non-traffic death circumstances in Queensland. They, too, had to use supplementary state coroner data to identify LSVF fatalities.
Incidence of paediatric fatal and non fatal low speed vehicle run over events in Queensland, Australia: eleven year analysis

Bronwyn R Griffin, Kerrianne Watt, Belinda A Wallis, Linda E Shields, Roy M Kimble

MBC Public Health
2014, 14:245

References

Bronwyn R Griffin, Kerrianne Watt, Linda E Shields, Roy M Kimble

Abstract

Objectives: The purpose of this study was to investigate the characteristics associated with fatal and non-fatal low-speed vehicle run-over (LSVRO) events in relation to person, incident and injury characteristics, in order to identify appropriate points for intervention and injury prevention.

Methods: Data on all known LSVRO events in Queensland, Australia, over 11 calendar years (1999–2009) were extracted from five different databases representing the continuum of care (prehospital to fatal) and manually linked. Descriptive and multivariate analyses were used to analyse the sample characteristics in relation to demographics, health service use, outcomes, incident characteristics, and injury characteristics.

Results: Of the 1641 LSVRO incidents, 98.4% (n=1592) were non-fatal, and 1.6% were fatal (n=25). One half of the children required admission to hospital (51%, n=812), mean length of stay was 2.4 days. Younger children aged 0–4 years were more frequently injured, and experienced more serious injuries with worse outcomes. Factors of injury (injury type and severity), injury characteristics (e.g., time of injury, vehicle type, driver of vehicle, incident location), and demographic characteristics (such as socioeconomic status, indigenous status, remoteness) varied according to age group. Almost half (48.8%, n=787) of the events occurred outside major cities, and approximately 16% of events involved indigenous children. Parents were more commonly the vehicles drivers in fatal incidents. While larger vehicles such as 4 wheel drive (1WD) were more frequently involved in LSVRO events resulting in fatalities, cars were most frequently involved in non-fatal events.

Conclusions: This is the first study, to the authors’ knowledge, to analyse the characteristics of fatal and non-fatal LSVRO events in children aged 0–15 years on a state-wide basis. Characteristics of LSVRO events varied with age, thus age-specific interventions are required. Children living outside major cities, and indigenous children, were over-represented in these data. Further research is required to identify the burden of injury in these groups.

Introduction

Low-speed vehicle run-over (LSVRO) incidents occur when a pedestrian, usually a child, is injured or killed by a slow moving vehicle (moving forward or in reverse) and non-traffic areas at less than 30 km/h. They were first documented in 1964 and sporadically reported since then in Australia, the UK, USA, Brazil, Austria, and New Zealand.1-8 LSVROs are a significant cause of transport pedestrian fatalities in young children, and are the second most frequent cause of death due to unintentional injury among children aged 1–4 years in Australia.9 More recent studies10-14 have highlighted this problem as more complex than simple ‘rampaging or ‘driveway’ injuries. To date, most studies have described fatal events where data are typically collected through coroner’s data, police reports and/or child death reviews.15-17 Separately from non-fatal events (where data are typically collected through one or two hospitals via admission data or trauma registry data),Where non-fatal events have been described, this has been done separately for either hospital admissions,18-20 or ambulance-attended cases—rarely are all relevant databases interrogated. One previous Australian study included data on fatal and non-fatal events,15 but non-fatal data were extracted from hospital admission in one major children’s hospital, and family data were collected on a state-wide basis, so the two populations were not directly comparable. Emergency department (ED) and hospital admissions data were accessed in a study which used data from the Canadian Injury Reporting and Prevention Programme (CIRPP),21; but the results are not generalisable because not all Canadian EDs and hospitals participate in the injury surveillance programmes. These studies from Auckland, New Zealand,16-17 included fatal and non-fatal incidents, however, the study area was restricted to events within Auckland (the largest city in New Zealand) only, so results were not generalisable to non-metropolitan regions. Additionally, studies have limited their focus to LSVROs that involved a reversing vehicle17, or were located specific to driveways.21 This mechanism of injury has not been described in detail at a population level, and the methodological limitations of previous work on LSVROs has resulted in a lack of adequate information about the circumstances surrounding fatal and non-fatal incidents.14-21 A recent systematic review on LSVRO events found that the incidence of non-fatal LSVROs varied from 7.09 to 34.79/100,000, and from 0.63 to 3.2/100,000 for fatal events.23 Previous studies have highlighted that LSVROs are a particular problem among young children aged 0-4 years, and 陕-4.13,5,15,17,18,21,23,24 A recent population-based study of fatal and non-fatal LSVRO events over an 11-year period in Victoria, Australia, indicated that the incidence in Queensland may be the highest (14.6/100,000) in the world.25 However, this study used sophisticated methodology26 to identify all known LSVROs identified across the continuum of care (from prehospital to
Low speed vehicle run-over incidents: Methodological issues in describing incidence and characteristics in Queensland children aged 0–15 years

Browyn Griffin, Kerrianne Watt, Linda Shields, Roy Kimble

Abstract
Low speed vehicle run-over (LSVRO) have been identified as a significant cause of transport pedestrian fatalities in young children. There are two main methodological challenges associated with investigating LSVRO incidents: (i) case ascertainment and (ii) disparate data sources. These challenges have resulted in a lack of adequate information about the true burden (fatal and non-fatal) of this injury event, and the circumstances surrounding the incident. The aim of this paper is to discuss each of these issues and their implications, as well as to describe the processes used by the authors to overcome these methodological issues, in order to accurately calculate the incidence and characteristics of LSVRO events. Despite the methodological improvements of this study in relation to case ascertainment and detail of data on incidents, data regarding circumstances leading to the event were not routinely or consistently recorded. A dedicated, prospective data collection would address most of these limitations. More detailed information is required to identify specific risk factors that are relevant to LSVRO events, using improved methodology and consensus and comprehensive classification of events, such as that used in this study.

References

Browyn Griffin, Kerrianne Watt, Linda Shields, Roy Kimble

Australasian Epidemiologist 2013, 20 (1):29
Systematic Literature Review of Incidence Rates of Low-Speed Vehicle Run-Over Incidents in Children

Worldviews on Evidence-Based Nursing
2013, 00:0, 1-9

Abstract
Low speed vehicle run-over (LSVRO) have been identified as a significant cause of transport pedestrian fatalities in young children. There are two main methodological challenges associated with investigating LSVRO incidents: 1) case ascertainment; and 2) disparate data sources. These challenges have resulted in a lack of adequate information about the true burden of this injury event, and the circumstances surrounding the incident. The aim of this paper is to discuss each of these issues and their implications, as well as to describe the process used by the authors to overcome these methodological issues, in order to accurately calculate the incidence and characteristics of LSVRO events. Despite the methodological improvements of this study, it is clear that more detailed information is required to identify specific risk factors that are relevant to LSVRO events, using improved methodology and consistent and comprehensive classification of events, such as that used in this study.

Keywords: LSVRO; transport pedestrian fatalities; child; low-speed vehicle; run-over; Queensland; Australia.

Introduction
Low speed vehicle run-over (LSVRO) have been identified as a significant cause of transport pedestrian fatalities in young children. After pooling data, LSVRO are the second largest cause of death from unintentional injury for children in Queensland aged 1–4 years. Low speed vehicle run-over events have been documented as a significant danger to young children since 1964, when Professor Kears-Gossin was first highlight this emerging injury type, and specifically referred to the danger of reversing cars in driveways. Very few appeared in the literature in the following years, until it was revisited again in 1990 by Bull, who recognised what he termed 'low-speed' events as a serious form of injury. Since this original research, LSVRO events have been studied specifically in the USA, Australia, the United Kingdom, New Zealand, and Australia.11,12

There are two main methodological challenges associated with investigating LSVRO incidents: 1) case ascertainment; and 2) disparate data sources. These challenges have resulted in a lack of adequate information about the true burden (fatal and non-fatal) of this injury event, as well as the circumstances surrounding the incident. The focus of the first part of this paper is to discuss each of these issues, and their implications, in detail. In the second half of the article, the process used by the authors to overcome these methodological issues, in order to obtain as accurate as possible of the incidence and characteristics of LSVRO events, are discussed. Additional benefits of the approach used by the authors will then be discussed.

1) Case ascertainment
The characteristics associated with low speed vehicle run-over events differ from other pedestrian casualties that occur on public roads as green spaces. The classification and definition of LSVRO events have varied considerably in the literature, perhaps because the concept of LSVRO lacks a clear definition. It has been variably represented by terms such as ‘bollard’, ‘driveway’, ‘run-over’, ‘low-speed run-over’, ‘back over’, ‘low-velocity’, ‘low-speed’, ‘driveway-related motor vehicle injury’, ‘non-traffic pedestrian’, ‘driveway crash’, ‘infant pedestrian’, ‘reversing injury’, ‘sidewalk run-over’, and ‘reversing motor vehicle injury’. This lack of consensus definition is more likely influenced by a number of factors. Firstly, knowledge of this mechanism of injury is in evolution. As programs have been made in research, the definition has been adjusted to describe the mechanism more accurately. The second contributing factor to the lack of clear

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Kerrianne Watt
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Practitioner’s Corner
Low speed vehicle run-over incidents: Methodological issues in describing incidence and characteristics in Queensland children aged 0–15 years

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Low-speed vehicle run-over (LSVRO) have been identified as a significant cause of transport pedestrian fatalities in young children. These are two main methodological challenges associated with investigating LSVRO incidents: case ascertainment and disparate data sources. These challenges have resulted in a lack of adequate information about the true burden (fatal and non-fatal) of this injury event, and the circumstances surrounding the incident. The aim of this paper is to discuss each of these issues and their implications, as well as to describe the process used by the authors to overcome these methodological issues, in order to accurately calculate the incidence and characteristics of LSVRO events. Despite the methodological improvements of this study in relation to case ascertainment and data on incidents, data regarding circumstances leading to this event were not routinely or consistently recorded. A dedicated, prospective data collection would address most of these limitations. More detailed information is required to identify specific risk factors that are relevant to LSVRO events, using improved methodology and consistent and comprehensive classification of events, such as that used in this study.

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