Don't slip up: Design, maintenance and pedestrian accidents

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Outline

- Purpose
  - Environmental determinants of road and roadside slips, trips and falls
- The cost of these accidents
- Method
  - Household surveys
  - ACC claims
- Key findings
  - Infrastructure
  - Individual factors
  - Distraction

Scope of the problem – Accident cost

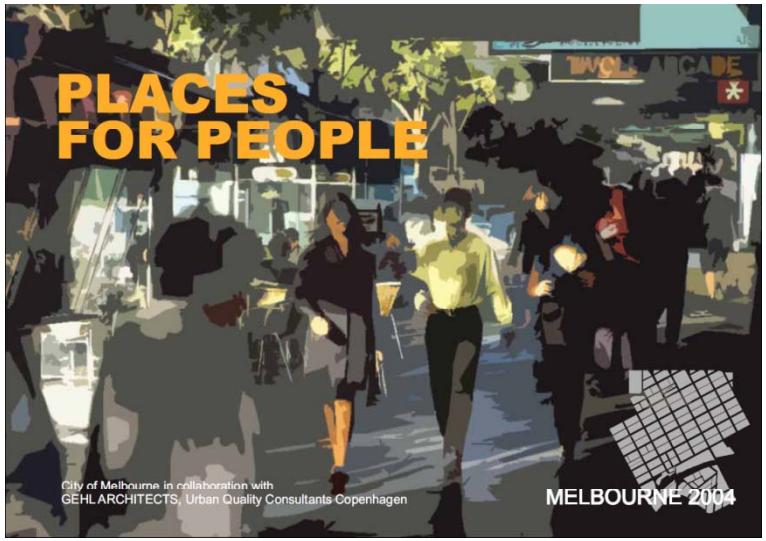
- 90% of New Zealand's over 20000 pedestrian injury insurance claims do not involve a moving motor vehicle
- New Zealand has around 700 pedestrians admitted to hospital per year due to slips, trips and stumbles on the road and roadside - similar to the 738 pedestrians admitted for motor-vehicle injuries in 2008.
- In Australia, in 2003-2004 there were 4587 hospitalisations due to "falls" classified as "on street or highway". This is 72% greater than the 2666 pedestrian hospitalisations associated with motor vehicles.

$1.7 billion = Total annual economic cost of falls in NZ

(O'Dea & Wren, 2010)

Economic cost of pedestrian confidence

- "A good city is like a good party – people stay for much longer than really necessary, because they are enjoying themselves" (Jan Gehl, 1994)
- Melbourne city case study
  - Increased seating in outdoor spaces by 177%
  - Improved footpaths (especially width)
  - Cafes/Restaurants/Bars increased (from 95 in 1993 to 356 in 2004)
  - Pedestrian traffic up 39% weekday and 98% on week nights
- A core component of this is that the public has confidence in its ability to walk safely on the street network.



Knowledge gap:
Surrounding the causes of slips, trips and falls

- Most research on falls is done in the workplace
- Road safety research is focussed on pedestrian and motor vehicle interactions
- There is a need to identify under what circumstances roadside pedestrian injury occurs, and to instigate effective counter measures.
- There is thus a lack of knowledge about the circumstances and mechanisms of pedestrian injuries, particularly how they relate to infrastructure.

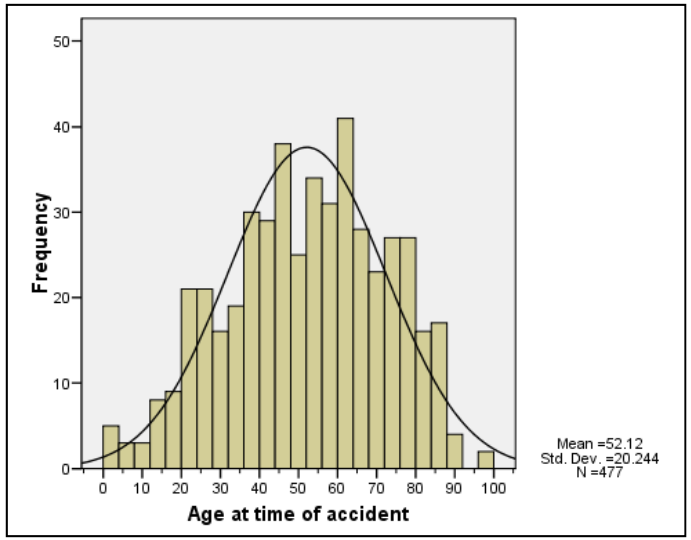
Method: Pedestrian accident sample

- A structured home interview survey of Wellington pedestrians injured on roads or footpaths and other roadside areas
- The sample frame provided through ACC claims for pedestrian for injuries
- Key exclusions to the sample:
  - Pedestrian injuries that did not occur on or near a road (e.g. on a walking track, park or golf course)
  - Where motor vehicles were involved
  - Rare events like a mugging or sudden physical disability (e.g. muscle cramp)causing a fall

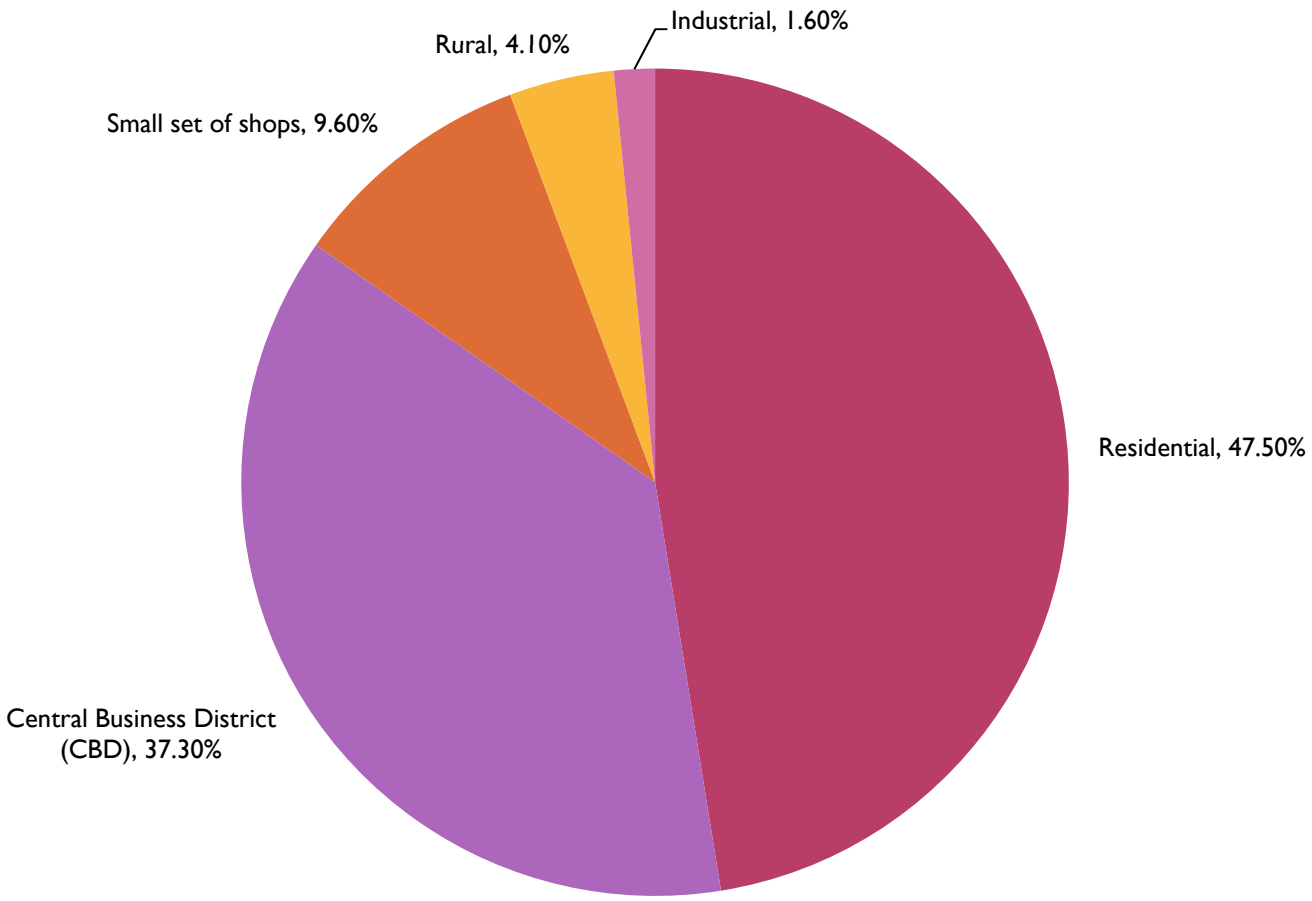
* The Accident Compensation Corporation (ACC) is New Zealand's publicly owned no-fault personal injury insurance provider

Sample information

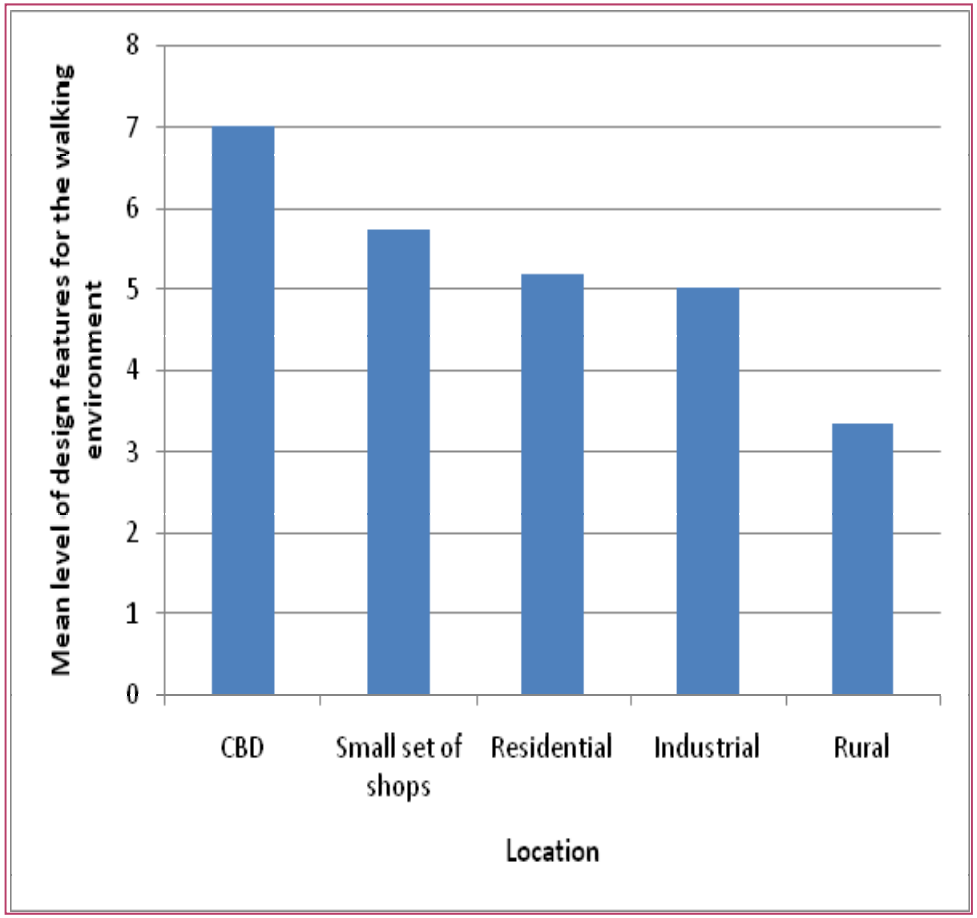
- 491 completed Computer Aided Personal Interviews (CAPI) – Response rate = 81%
- Survey participants ranged in age from toddlers, where a parent, present at the time of the accident, was interviewed, to elderly pedestrians (up to 97.5 years), with an average age of 52 years.
- As expected, the sample was age-biased. Percentage of sample 64+ was 29%, while the estimated population percentage 65+ was 13%.
- About 60% females



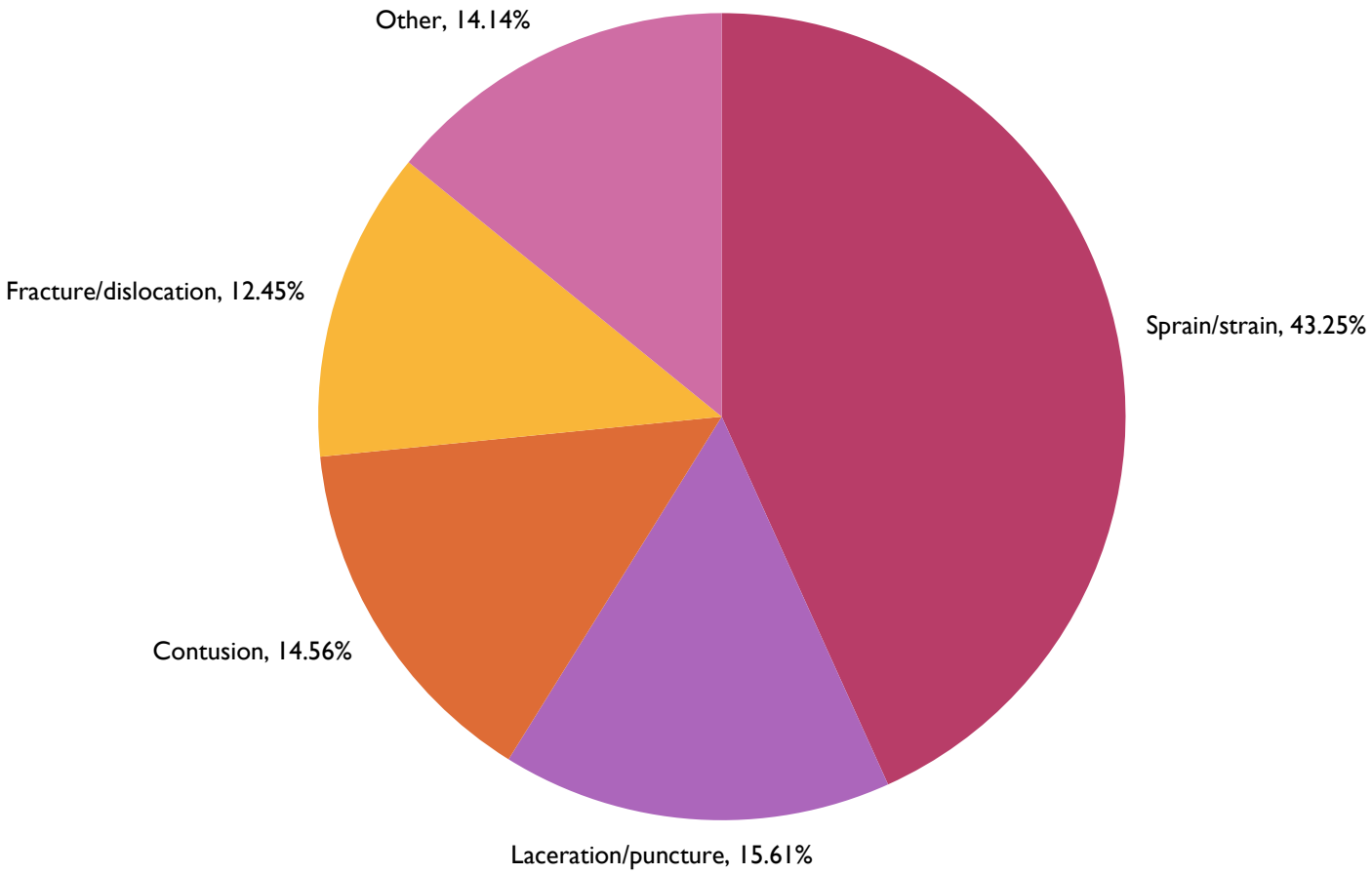
Results: Walking environment



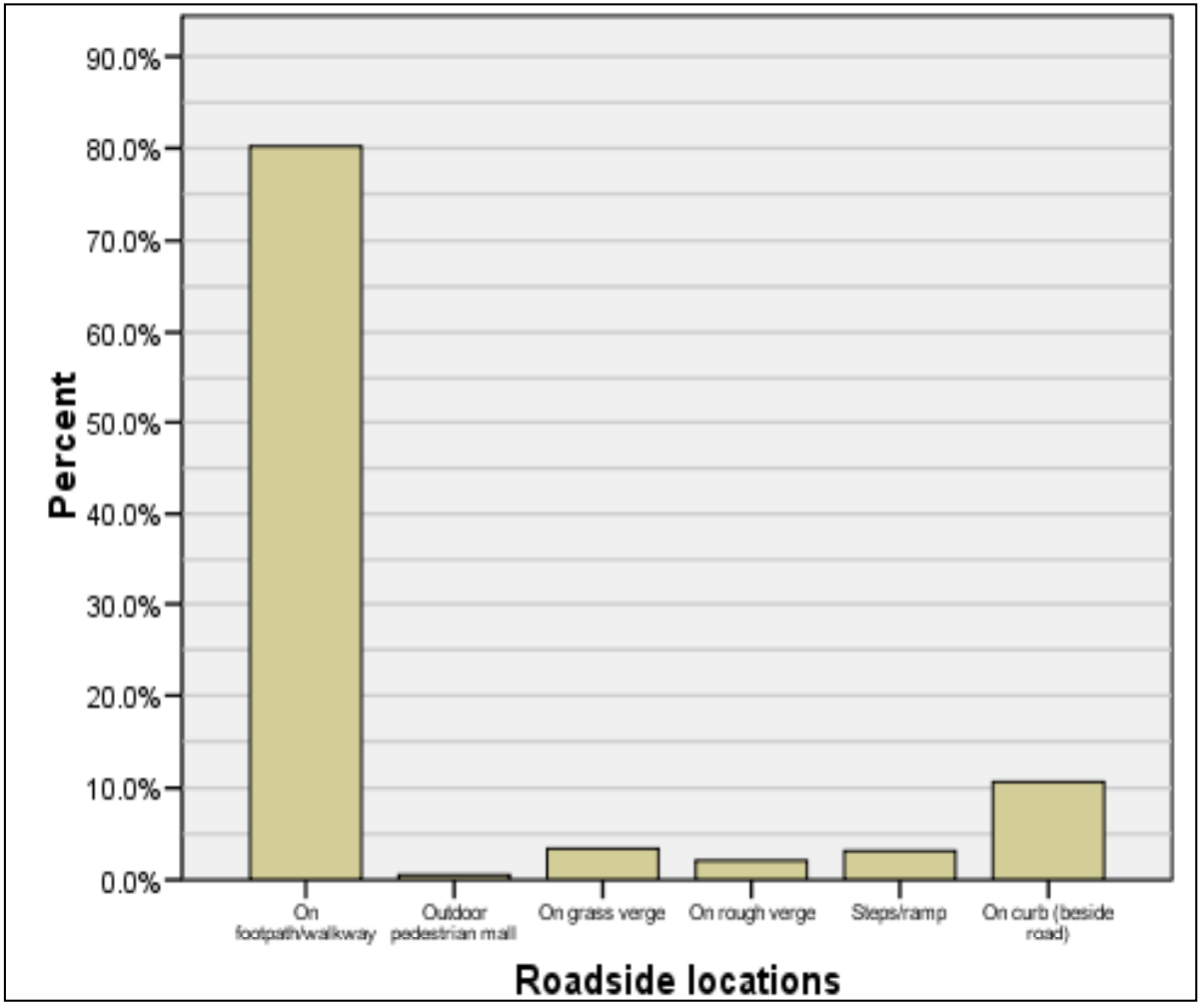
Level of design features for a pleasant walking environment(out of 10)



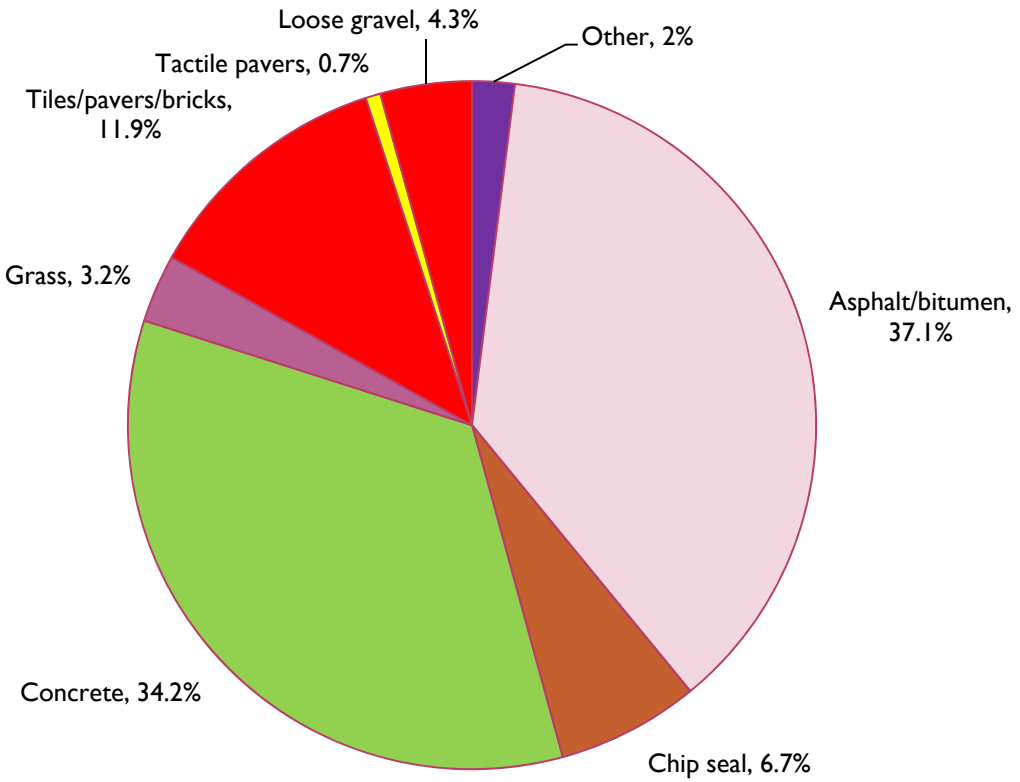
Type of injury



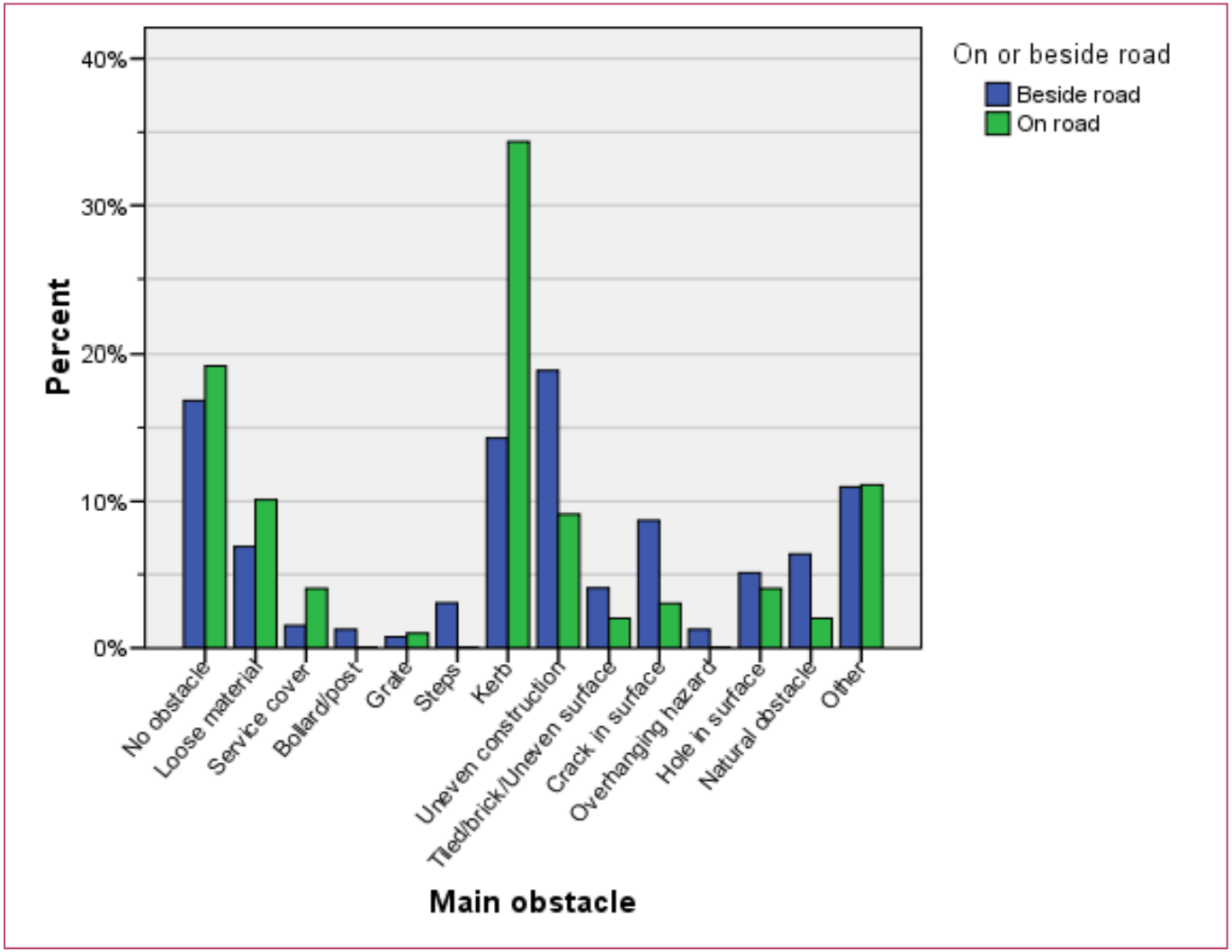
Location of accident



Surface pedestrians slipped, tripped or fell on



Obstacles


On or beside road
Beside road
On road
Percent
40%
30%
20%
10%
0%
No obstacle
Loose material
Service cover
Bollard/post
Grate
Steps
Kerb
Uneven construction
Tiled/brick/Uneven surface
Crack in surface
Overhanging hazard
Hole in surface
Natural obstacle
Other
Main obstacle

Maintenance or design?

- Poorly maintained surfaces are ranked as a more persistent cause of accidents than design issues
- Poor maintenance includes:
  - Uneven construction (e.g. cracks)
  - Temporary deterioration
- Design issues include:
  - Vertical changes (e.g. kerbs), particularly when stepping up (as opposed to down)
  - Slippery surfaces

Lighting

- 13% of accidents occurred where lighting is perceived to be poor
- These accidents were 53 times more likely to be in areas that were artificially lit (as opposed to lit by sunlight)
- Indicates that:
  - Current artificial lights setups are not always adequate
  - "Pointing" to obvious hazards where lighting is not cost effective

Pedestrian characteristics

Individual factors at the time of the accident (N = 491).

Individual factor	Strongly Disagree	Disagree	Not sure/ Neutral	Agree	Strongly Agree	Total Percent Agree
Appropriate footwear	0.8	3.5	2.0	61.9	31.8	93.7
Familiar with environment	1.2	8.6	3.1	38.7	48.5	87.2
Physically fit	0.0	5.1	7.9	68.4	18.5	87.0
Not looking at feet	1.4	17.5	9.0	58.0	14.1	72.1
In a hurry	6.5	58.2	5.9	19.6	9.8	29.3
Travelling too fast	6.1	67.6	8.4	16.5	1.4	17.9
Often injured when fall	9.4	69.2	6.7	13.6	1.0	14.7
Very fatigued	6.7	75.2	4.7	11.8	1.6	13.4
Often fall over	13.4	71.5	5.7	7.9	1.4	9.4
Carrying objects	13.6	77.4	2.2	5.1	1.6	6.7
Previous condition	16.1	76.4	3.7	3.3	0.6	3.9
Temporary illness	15.9	78.2	2.6	2.6	0.6	3.3

Distractions

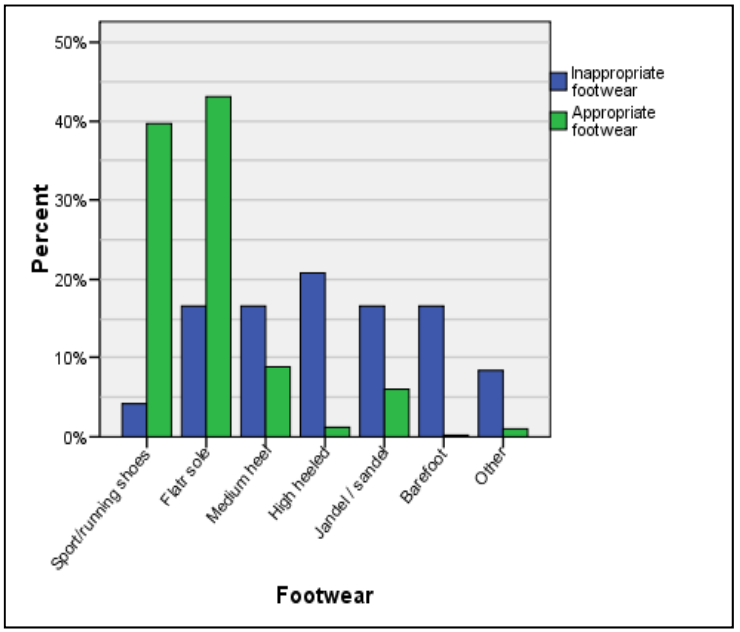
- Approximately 45% of participants agreed or strongly agreed they had some level of distraction at the time of their accident
- 38% of people were accompanying someone else

Distractions from other people	Total Percent Agree
Distracted by conversation	13.24%
Collision with person / animal caused accident	11.61%
Walking environment crowded with people	9.37%
Watching other people	3.46%

Activity	*N*	Percent
No activity	449	91.45%
Music player	18	3.67%
Walking dog	6	1.22%
Cell phone - Texting	3	0.61%
Cell phone - Talking	2	0.41%
Reading	1	0.20%
Drinking (non-alcoholic)	2	0.41%
Delivering pamphlets	2	0.41%
Other	8	1.63%
Total	491	100%

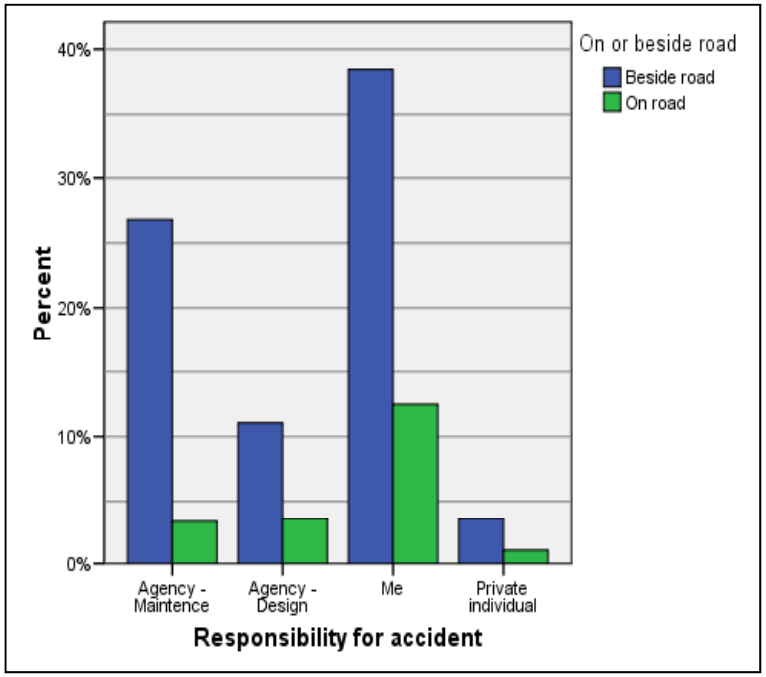
Footwear

- Less stable footwear, such as medium and high-heel shoes tend to be used in the CBD.
- High-heel wearers are more likely to report that they are travelling too fast for the walking surface when compared with those wearing flat-soled or running shoes.
- The combination of faster walking speeds with less stable footwear should be taken into account when designing high-pedestrian traffic CBDs



Responsibility and prevention

- Most pedestrians felt responsible for the accident and its prevention.
- 51% thought they had the best chance of preventing the accident and 38% thought they were it's main cause.
- Seventy-six people felt responsible for an accident while believing the main prevention mechanism related to maintenance, design or another person.
- May contribute to underreporting

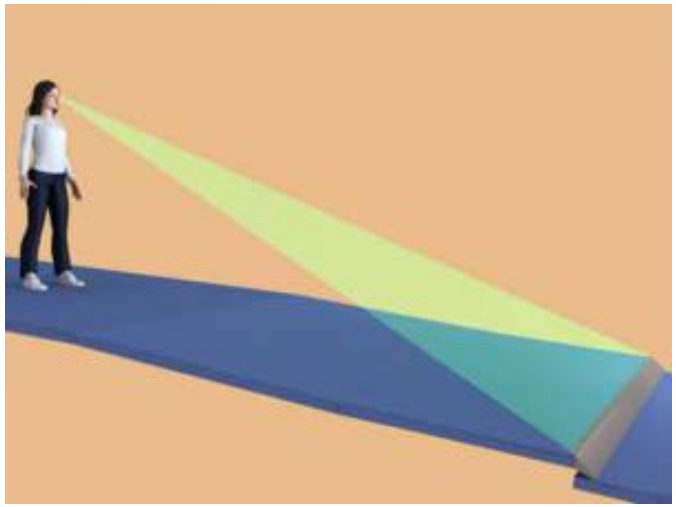


Complexity of pedestrian accidents

- The causes of a pedestrian slip, trip or fall are typically complex, and certainly not solely a function of the environment
- The survey indicates that people carry loads, may be fatigued, engage in other activities or hurry through their walking environment
- These factors can block their vision, distract them from their task and alter their gait
- Need to ensure the environments are forgiving to pedestrians

The role of predictability

- Pedestrians expect better environments
- Predictability problem: When there is a disparity between the perceived predictability of the environment and the actual continuity of the environment
- Self-explaining footpaths
  - "No surprises" environments
  - Intuitively encourage safe user behaviours



Key points

- Pedestrian accidents are complex
  - Possibility of better pedestrian education?
- Predictable, consistent, forgiving environments are key to user safety and comfort
- Where to now?
  - Develop better quantitative indicators to measure the benefits of infrastructure improvements
  - Commission a more comprehensive guide for pedestrian road safety audit and inspection

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