Safety At Traffic Signals For Cyclists And Pedestrians

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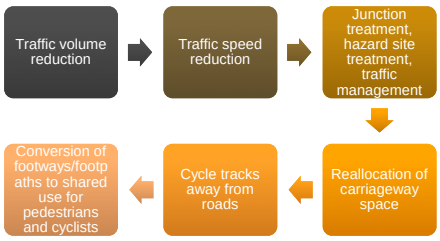
Overview

- Hierarchy of provision for bicycles
- Research undertaken
- Data collection
- Before and after study results
- Crash prediction models
- Key conclusions

Hierarchy of Bicycle Provision



How effective are these treatments?

Studies Undertaken

1

Effectiveness and Selection of Intersection Treatments for Cyclists, 2010

102 four-arm intersections (383 approaches)

Christchurch | Adelaide

Study outcomes
Before-after study
Crash prediction models for cycle crashes

2

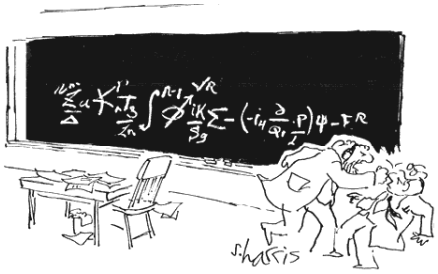
Crash Prediction Models for Signalised Intersections, 2011

238 three-arm and four-arm intersections (889 approaches)

Auckland | Wellington | Hamilton
Christchurch | Dunedin | Melbourne

Study outcomes:
Crash prediction models for motor vehicle and pedestrian crashes

What are Crash Prediction Models?



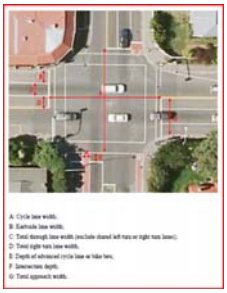
"You want proof? I'll give you proof!"

Data Collection

Traffic signals database

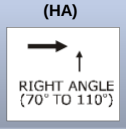
Crash data (CAS, VicRoads)	Counts: MV, cyclists, pedestrians	SCATS pedestrian phase data (Study 2)	SCATS signal phasing (Study 2)	Layout and geometry

Data Collection: Signal Layout and Geometry

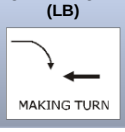


Key Crash Types: Cyclists

Crossing, both straight (HA)

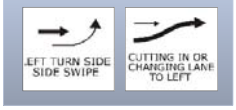


Right turn against (LB)



Same direction, rear end, sideswipe (A*FG*)

Left turn sideswipe (GB+AC)



All other crashes

Before and After Analysis

% change in crashes after installation of cycle facilities:

Christchurch 20%

Adelaide 37%

% reduction, by crash type	Christchurch	Adelaide
Crossing, both straight	74%	6%
Right Turn against	-3%	-1%
Same direction, rear end, sideswipe	-4%	16%
Left turn sideswipe	58%	-103%
All other cycle crashes	77%	-186%

% reduction, by lane arrangement	Christchurch	Adelaide
Sites with shared left turns	40%	-40%
Sites with exclusive left turns	3%	-36%
Sites with free left turns (FLTs)	-39%	-30%
Sites with coloured facilities	39%	N/A

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Cyclist Crash Models

- 20 models across 5 key crash categories.
- Model types:
  - All sites
  - Christchurch sites only
  - Presence/absence of cycle treatments
  - Design parameters (eg. cycle lane width)

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Cyclist Crash Models

Both clear positives…

- Coloured treatments.
- Adequate total width RS5
- Transition facilities RS9

…and conflicting results

- Cycle storage boxes. RS6
- Fewer right angle crashes at deeper intersections? RS8

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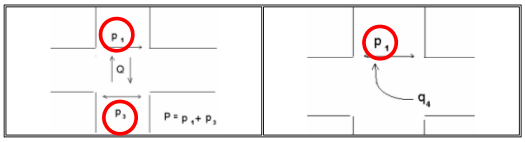
Pedestrian Crash Models

Right angle (NA and NB)

Right turning motor vehicle /pedestrian crossing (ND and NF).



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Slide 11

RS5

for the left most traffic lane plus any cycle lane

Esp same direction crashes.
There is evidence that shared lanes increase crashes of this type + also for left turn sideswipe.
Rohit Singh, 27/03/2011

RS6

mitigate right angle but increase right turn against crashes.
However the addition of colour may make a storage box safer. Deeper boxes
Rohit Singh, 27/03/2011

RS8 Rohit Singh 27/03/2011
It maybe that cyclists are more careful when crossing major roads, than when they are cycling along major roads.
Rohit Singh, 27/03/2011

RS9

have a beneficial effect on left turn sideswipe crashes.
To ensure they succeed at preventing left turn sideswipe crashes, colour is most important and width less of an issue.
Rohit Singh, 27/03/2011

Pedestrian Crash Models

Crash Type		Model Parameters
Right angle	Longer cycle, all-red times: more crashes	$F_{Cycle\ facilities}$ 0.51 $F_{Shared\ turns}$ 1.32 $F_{Split\ phasing}$ 0.74 $F_{Med\ island}$ 0.77
Right turning/ pedestrian crossing	Longer amber times: more crashes	$F_{Full\ RT\ Protection}$ 0.63 $F_{Residential}$ 0.57 $F_{Coordinated}$ 1.24 $F_{Med\ island}$ 0.99

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What are the models saying?

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Conclusions: Cycle Crashes

The overall effect of cycle lanes was neutral. Quality of provisions is important.

Cycle lanes built to high standards improve cyclist safety

Those built to lesser standards can reduce cyclist safety

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Conclusions: Cycle Crashes (contd.)

Crashes at sites with coloured cycle lanes (all within Christchurch) decreased by **39%**

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Conclusions: Cycle Crashes (contd.)

Sites with shared left-turn and through lanes

Higher initial crash rates, but benefit the most from coloured cycle lanes and advanced storage boxes

Sites with exclusive left turn lanes

much safer for cyclists, but benefit from coloured transition cycle lanes marked across the diverge area to the limit line.

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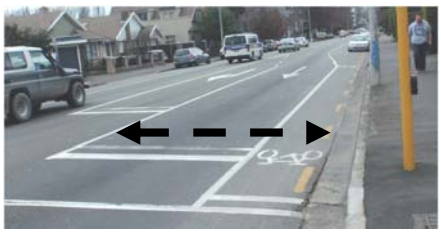
Conclusions: Cycle Crashes (contd.)

Adequate total width in the kerbside approach lane is more important than the presence or width of a cycle lane within this space.



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Conclusions: Pedestrian Crashes

Longer cycle times = more pedestrian crashes

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Conclusions: Pedestrian Crashes (contd.)

Split phasing and full right turn protection are **25-35%** safer for pedestrians as compared to filter right turns

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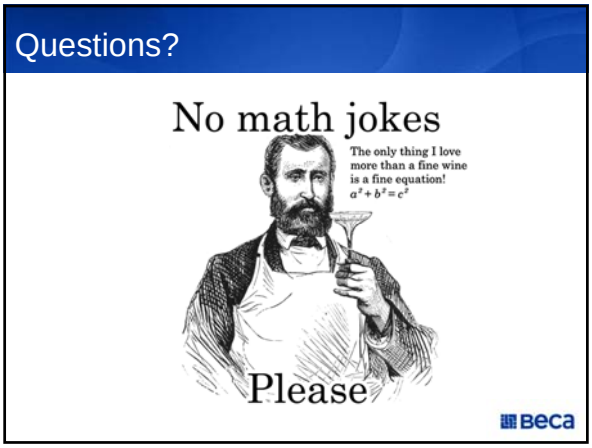
Questions?


No math jokes
The only thing I love more than a fine wine is a fine equation!
$a^2+b^2=c^2$
Please