

# UNDERSTANDING THE EFFECTS OF MANDATORY BICYCLE HELMET LAWS ON HELMET USE, HEAD INJURIES AND RIDERSHIP: A SYSTEMATIC REVIEW

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## Introduction & Objectives

- Research has shown conflicting evidence of the impact of mandatory bicycle helmet laws
- Some claim it will reduce head injuries, others claim helmet laws diminish cycling and actually have a negative impact on cyclist safety and public health
- To date, no systematic reviews have examined studies that included both the intended and unintended consequences
- This review explicitly focuses on changes in helmet usage, deaths and/or serious head injuries, and changes to cycling rates



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## Methods

- **Research question:** “Are mandatory helmet laws associated with a reduction in deaths and/or serious head injuries and/or reductions in cycling rates?”
- Development and application of inclusion criteria
- Database search of PubMed and Google Scholar for “bicycle helmet” AND (law OR legislat\*) (3130 potential titles) & forward and backward citation tracking
- Extraction of key information for systematic review & meta-analysis
- Meta-analysis using average annualized changes in helmet usage, deaths and/or serious head injuries, cycling rates

## Other jurisdictions

Bicycle helmet requirement	Jurisdictions
All ages	Australia, New Zealand, Canada (BC, NB, NS, PEI), Finland (not enforced), Israel (not enforced)
Under 18	Canada (AB, ON), USA (CA, DE, NM)
Under 17	USA (MA, NJ)
Under 16	USA (AL, CT, FL, GA, HI, MD, MD, NH, NC, OR, RI, TN)
Under 15	Croatia, Czech Republic, Iceland, Slovenia, Sweden, USA (WV)
Under 14	USA (NY)
Under 12	USA (LA, PA)

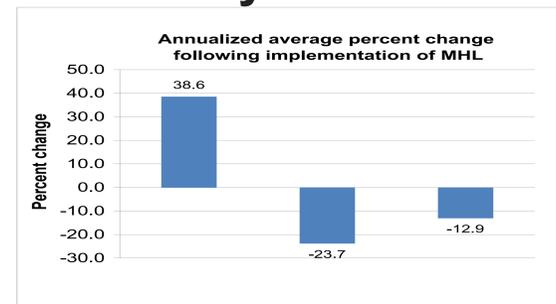
## Inclusion criteria

Included	Excluded
Focus on mandatory bicycle helmet laws	Focus on mechanical effectiveness of bicycle helmets
Before/after studies of mandatory bicycle helmet laws	Do not span the implementation of helmet laws
Account for deaths and/or serious head injury rates, cyclist exposure	Do not account for head injury/fatality rates, cyclist exposure
Data was not been used by another study in the analysis	Dataset was used by another study in the analysis
Peer-reviewed journal articles, university and government research reports	Meta-analyses and systematic reviews; non quality-controlled studies/opinion papers

## Summary of results

Title	Author	Journal	Study years	Geography	Research design	Research methods	Cycling exposure	ANNUALIZED helmet usage change	ANNUALIZED deaths and serious head injuries change	ANNUALIZED Cycling change
Safety in numbers in Australia: more walkers and bicyclists, safer walking and bicycling	Robinson DL	Health Promotion Journal of Australia (2005) 16: 47-51.	1988-1992	Australia (Victoria)	Quasi-experimental - non-equivalent groups	Descriptive	Observational counts	children: +26%; adults: +38%; all ages: +33%	all ages: deaths & serious head injuries (DSHI) -43%; all serious injuries: -39%	adults: -29%; children: -42%; all ages: -36%
The impact of compulsory cycle helmet legislation on cyclist head injuries in New South Wales, Australia	Walter, SR; Olivier, J; Churches, T; Grzebieta, R	Accident Analysis and Prevention	1990-1992	Australia (New South Wales)	Time trend analysis	Negative binomial regression	Controlled using head/arm and head/leg injury rates	children: +40%; adults: +50%; combined +45%	all ages: -25% in ratio of arm/head injuries	n/a
Mandatory bicycle helmet use following a decade of helmet promotion in Victoria, Australia--An evaluation	Cameron, MH; Vulcan, AP; Finch, CF; Newstead, SV	Accident Analysis and Prevention	1983-1992	Australia Greater Melbourne)	Quasi-experimental - non-equivalent groups	Logistic regression	Observational counts	all ages: +37%	all ages: -48% head injuries	children: -36%; adults: +44%; average +2.3%
Evaluation of New Zealand's bicycle helmet laws	Clarke CF	New Zealand Medical Journal, 2012;125(1349)	1989-2009	New Zealand	Before/after	Descriptive	Observational counts	n/a	all ages: -5% deaths	all ages: -4.4% hours cycled per person
Head injuries and bicycle helmet laws	Robinson DL	Accident Prevention & Analysis	1989-1993	Australia (New South Wales)	Observational	Descriptive	Observational counts	under 16 years: 45%; adults +59%	under 16 years: -14.5 head injuries	under 16 years: -22%
Intended and Unintended Consequences of Youth Bicycle Helmet Laws	Christopher S. Carpenter, Mark Stehr	Journal of Law and Economics, Vol. 54, No. 2 (May 2011)	1987-2006	Before/after in 21 MHL states; Between comparisons in MHL and remaining states	Quasi-experimental	Fixed effect models	Parent reports; youth risk behavior survey	0-15 year olds (mid-range): +33%	0-15 year olds: -19% fatalities	0-15 years: -4.5%

## Meta-analysis



Author(s)	ANNUALIZED Helmet usage change	ANNUALIZED deaths and/or serious head injuries change
Robinson (2005)	33	-43
Walter et al. (2013)	45	-25
Cameron et al. (1994)	37	-36
Clarke (2005)	n/a	-5
Robinson (1996)	45	-14.5
Carpenter et al. (2011)	33	-19
<b>Average</b>	<b>38.6</b>	<b>-23.7</b>



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## Conclusions

- Jurisdictions that implemented mandatory helmet laws observed a decrease in cyclist deaths and/or serious head injuries on average between 20 and 25%
- The 4 included studies that reported changes to helmet wearing rates observed an average increase between 35 and 40%.
- The 5 studies that reported on changes in cycling rates observed an average decrease of approximately 13%.
- It appears that mandatory helmet laws do discourage some people - particularly children - from riding bicycles.
- It was beyond this study's scope to compare the safety benefits of reduced head injuries with the public health costs of reduced physical activity. This is a promising area for future study.