HELMET SAFETY: CYCLE, SKATE, SKI

ACIP
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OUTLINE

- What works in Injury Prevention
- Collaborative effort for Injury Prevention around helmets in NS
- Helmets for wheeled activities
- Review of legislations in NS
- Skating
- Skiing
- Future implications of research
- Strategic planning around helmets in NS
What Works in Injury Prevention?

<table>
<thead>
<tr>
<th>Injury Prevention Strategies</th>
<th>Health Promotion Strategies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Education</td>
<td>Developing personal skills</td>
</tr>
<tr>
<td>Enforcement</td>
<td>Healthy public policy</td>
</tr>
<tr>
<td>Engineering</td>
<td>Supportive environments</td>
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<td></td>
<td>Strengthening community action</td>
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<td>Reorienting health and other services</td>
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- These concepts in Injury prevention and health promotion share much in common.
- A combination of these strategies is essential to preventing injuries.
- These strategies must always consider and address root causes and reduce disparities in health status.
- The safe behaviour must be the easy choice.
- Changing the behaviour of children and youth requires us to change the adult environment in which they live.
Wheeled Activities

History

- Bike helmets (1997)
- Other wheels (2002)
- Closure of loopholes (2007)

Why does NS have legislation?

- Political environment and strong stakeholder support was key

- Little to no political opposition

- Minority governments and political cooperation
WHEELED ACTIVITIES

Next Steps

- Continue and expand a combined enforcement and education approach
Helmet Use and Legislation

• The effect of police enforcement on helmet use in an urban and a rural community in Nova Scotia.
INTRODUCTION

- Bicycling-related injuries in Canada per year
  - mean of 4,476 hospital admissions
  - 36 in-hospital deaths

  Canadian Institute for Health Information (2004)

- In 2001-02, cycling injuries were estimated to result in direct and indirect costs of almost $175 million

  Canadian Institute for Health Information (2004)
Helmets are designed to help:

- Slow the head down gradually
- Spread the impact over a larger area
- Prevent direct impact to the skull during an injury
- Bike helmets have been demonstrated to reduce the risk of brain injury for all age groups by 88% (Thompson, 2001)
INTRODUCTION

- Helmet-use legislation has led to increased rates of helmet wearers

INTRODUCTION

Helmet Use Rates for Halifax

<table>
<thead>
<tr>
<th>Year</th>
<th>Rate (%)</th>
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<tbody>
<tr>
<td>1995</td>
<td>35.9</td>
</tr>
<tr>
<td>1996</td>
<td>37.7</td>
</tr>
<tr>
<td>1997</td>
<td>75.3</td>
</tr>
<tr>
<td>1998</td>
<td>85.5</td>
</tr>
<tr>
<td>1999</td>
<td>83.8</td>
</tr>
</tbody>
</table>

LeBlanc et al. (2002)
Decreases in bicycle-related injuries and deaths have been attributed, in part, to helmet legislation.

The proportion of head injuries in Halifax, Nova Scotia were reduced in half from 3.6% to 1.6% after legislation was enacted. (LeBlanc et al., 2002)
**Introduction**

- **Enforcement**
- **Legislation**
- **Enforcement in Halifax**
- **Legislation**
- **Regular education**

- Quicker and more effective ↑ helmet use
- ↑ helmet use for up to 2 years post-legislation

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*Gilchrist et al. (2000)*  
*LeBlanc (2002)*
Purpose

Phase 1 (2006)

• To examine helmet use rates in metropolitan Halifax (pop. 373,000) and in the Town of Pictou (pop. 3800) and determine the amount of education and enforcement taking place

• Compare helmet use rates, education, and enforcement between Halifax and Pictou

Phase 2 (2008)

• Implement any recommendations determined in Phase 1 and replicate the study
METHODS – PHASE 1

Halifax

• Observational data were collected from the north, south, east and west quadrants of the Halifax Peninsula (July through September, 2006)

Pictou

• Throughout the entire Town of Pictou
• Included a variety of neighborhoods with different property values
Methods – Phase 1

Enforcement and education

• Information obtained from the Halifax Regional Police Department and the Pictou detachment of the RCMP

• Interviews of bicyclists – convenience sampling

Results – Helmet use

Halifax - 571 cyclists
Pictou - 251 cyclists

Proportion of helmeted cyclists for 2006

Halifax = 82%
Pictou = 69%
<table>
<thead>
<tr>
<th></th>
<th>Halifax</th>
<th>Pictou</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>80%</td>
<td>64%</td>
</tr>
<tr>
<td>Female</td>
<td>89%</td>
<td>80%</td>
</tr>
</tbody>
</table>

\[ p \text{ value} = .009 \quad \text{and} \quad p \text{ value} = .008 \]

There were lower rates of helmet use among males in Pictou than among males in Halifax \( p \text{ value} = 0.0001 \)
Results – Helmet use

Halifax

Adolescent = 59%
Child = 75%
Adult = 88%

$p$ value = 0.012

Pictou

Adolescent = 32%
Child = 70%
Adult = 79%

$p$ value = 0.059
<table>
<thead>
<tr>
<th>Halifax</th>
<th>Pictou</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enforcement began on Sept. 1, 1997 and has continued through to 2006</td>
<td>No enforcement from the passing of the law in December, 1997 through to June, 2006</td>
</tr>
<tr>
<td>From 2000 to 2006 total of 1001 summary offence tickets issued</td>
<td>From June, 2006 through September, 2006, minimal enforcement - 5 bicycles impounded</td>
</tr>
</tbody>
</table>
Results - Education

Regular education has been carried out by police and community members in both Halifax and Pictou since the passing of the law in 1996.

- Routine visits to schools
- Education during patrol
- Bike rodeos
  (an event usually held by police where a bike and helmet inspection are done as well as an obstacle course using safety signals)
Conclusions Phase 1

- Helmet use rates of urban and rural adolescents are lower than rates found among children and adults.
Conclusions – Phase 1

**Halifax**

- Regular, ongoing education
- Enforcement

**Pictou**

- Regular, ongoing education
- Little enforcement

Continued high compliance rates

Significantly lower compliance rates
Phase 2

- The RCMP in Pictou as well as the policing forces in surrounding towns were apprehensive about issuing summary offense tickets (SOTs).

- Little enforcement – difficult to compare helmet use between regions.

- Need a way to convince the police in Pictou and the surrounding towns to issue SOTs:
  - diversion/educational program (Noggin Knowledge)
  - rewards program
  - school-based education
  - 5 Pictou district schools visits- Police/ Dr. Boutlier Neurosurgery/ThinkFirst Program with VIP
  - Eastlink TV panel discussion on helmets and brain injury prevention
  - Helmets for children of economic need.
Police provided a diversion activity (Noggin Knowledge) instead of giving a ticket.

Educational session designed to teach individuals the risks associated with not wearing a helmet encourage them to comply with helmet safety laws and other rules of the road.

For those wearing helmets- rewards were given out (i.e. pencils, glow in dark bracelets).

Helmets for needy family.
OPERATION HEADWAY/NOGGIN’ KNOWLEDGE

- Partnering for Injury Prevention
  - Key players
    - Lynne Fenerty and Dr. Simon Walling – Neuro-Trauma/Injury Prevention Program, CDHA
      - Helmet Safety Action Committee Partners
        - Nova Scotia Department of Health Promotion and Protection
        - QEII/IWK Division of Neurosurgery
        - Think First/Aviva Insurance Company of Canada
        - IWK Child Safety Link
        - Brain Injury Association of Nova Scotia
        - Emergency Health Services Nova Scotia
        - Canadian Paraplegic Association
    - Dr. Nicole Boutilier – Head of ER /Acting Chief of Staff, PCHA
    - Eileen MacIsaac - Director of Public Relations, PCHA
    - Representatives from the 5 police departments
    - Sherry Huybers and Dr. John LeBlanc – Dalhousie University
Phase 2 Results - Enforcement

**Halifax**

- 2006 - 301 SOTs issued
- 2007 - 355 SOTs issued
- 2008 - 177 SOTs issued up to the end of September 2008

**Pictou**

- 2006 – minimal enforcement
- 2007 – minimal enforcement
- 2008 – 7 SOTs issued plus a substantial number of warnings
Results – Phase 2
Helmet Use

<table>
<thead>
<tr>
<th>Location</th>
<th>2006</th>
<th>2008</th>
</tr>
</thead>
<tbody>
<tr>
<td>Halifax</td>
<td>82%</td>
<td>92%</td>
</tr>
<tr>
<td>Pictou</td>
<td>69%</td>
<td>77%</td>
</tr>
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</table>
Conclusions

- The significant increase in helmet use in Pictou (from 69% to 77%) indicates that enforcement *may* contribute to higher rates of helmet use (for children).

- Increase in education and positive policing in Pictou may have played a role as well in improved helmet use.

- The continued increase in helmet use in Halifax (currently 92%) indicates that ongoing enforcement and education is effective (for all age groups).
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  - Pictou County Health Authority

- **John LeBlanc, MD, MSc**
  - Departments of Pediatrics, Psychiatry, Community Health and Epidemiology, Dalhousie University
Implementation of a mandatory helmet rule
OVERVIEW

- Rationale
- Background information
- Methods
- Results
- Conclusion
- Acknowledgments
- Questions
Rationale

- Collaborative research project with Dalhousie University to examine the effects of introducing mandatory helmet use for skating
SKATING HELMETS

- Helmet policy paper (2007)

- Excellent example of collaboration (community, researcher, recreation and injury stakeholders, and government)

- Developing evidence to inform public policy and create supportive environments
SKATING HELMETS

Next Steps

• Continue to expand and build case

• Work with rinks and communities who are ready

• Explore other options to leverage helmet policy development

• Legislation? Not yet
WINTER SPORTS AND HELMETS

- Winter sports combine speed with a hard, slippery surface – potential for injury

- Rates of injury in ice skating are significant
ICE SKATING INJURIES – RESEARCH

- Ice skating produces 3 times more head injuries than either roller or inline skating.
- The rate of concussion due to ice skating:
  - 5 times higher than from roller skating
  - 7 times higher than from inline skating (Knox, 2006)
- Video analysis - harder to break your fall on ice with your arms – more likely to hit your head (Knox, 2006)
ICE SKATING AND INJURY

- In Ontario alone in 2004-05:
  - 5012 emergency room visits
  - 283 hospitalizations due to falls while skating
    21% of these were head and neck injuries

Extrapolating:
- In Canada:
  - 3072 emergency room visits

Source: Ontario Injury Prevention Resource Centre
IWK CHIRPP DATA – SKATING

- 68% occurred in rinks
- 75% occurred during recreational activity
Long-term risk of epilepsy after traumatic brain injury in children and young adults: a population-based cohort study

Jakob Christensen, Marianne G Pedersen, Carsten B Pedersen, Per Sidenius, Jørn Olsen, Mogens Vestergaard

Summary
Background The risk of epilepsy shortly after traumatic brain injury is high, but how long this high risk lasts is unknown. We aimed to assess the risk of epilepsy up to 10 years or longer after traumatic brain injury, taking into account sex, age, severity, and family history.

Methods We identified 1 605 216 people born in Denmark (1977–2002) from the Civil Registration System. We obtained information on traumatic brain injury and epilepsy from the National Hospital Register and estimated relative risks (RR) with Poisson analyses.

Risk of epilepsy was increased after a mild brain injury (RR 2.22, 95% CI 2.07–2.38) (7.40, 6.16–8.89), and skull fracture (2.17, 1.73–2.71). The risk was increased more than 10 years after mild brain injury (1.51, 1.24–1.85), severe brain injury (4.29, 2.04–9.00), and skull fracture (2.06, 1.37–3.11). RR increased with age at mild and severe injury and was especially high among people older than 15 years of age with mild (3.51, 2.90–4.26) and severe (12.24, 8.52–17.57) injury. The risk was slightly higher in women (2.49, 2.25–2.76) than in men (2.01, 1.83–2.22). Patients with a family history of epilepsy had a notably high risk of epilepsy after mild (5.75, 4.56–7.27) and severe brain injury (10.09, 4.20–24.26).

Interpretation The longlasting high risk of epilepsy after brain injury might provide a window for prevention of post-traumatic epilepsy.
INJURIES FROM FALLING ON ICE AT RINK
INJURIES FROM FALLING ON ICE AT RINK
INJURIES FROM FALLING ON ICE AT RINK
HEAD INJURIES AND SKATING

- Significant problem
- Examine impact of regulation
Mandatory helmet use was implemented at Dalhousie Memorial Arena January 1, 2010

Division of Neurosurgery, QEII has undertaken a research project to monitor the impact of helmet regulation on skating at Dalhousie University.
Purpose

To study helmet use, and to study the effects of the regulation on skating practices after implementation
Methods

Phase 1
- Pre-Implementation Observational Study (October-December 2009)

Phase 2
- Education and Awareness

Phase 3
- Post-Implementation observations (January-March 2010)
REGULATION OF HELMETS FOR SKATING

Phase 1

• Pre-Implementation Results
SKATING DEMOGRAPHICS – AGE DISTRIBUTION (PRE-IMPLEMENTATION)

- 0-3 yrs: 2%
- 4-12 yrs: 37%
- 13-19 yrs: 16%
- 20-60 yrs: 41%
- 60+ yrs: 4%
GENDER DISTRIBUTION OF SKATERS

48% Males
52% Females
Fraction of skaters wearing helmets

- 54% wearing helmets
- 46% not wearing helmets
HELMET USE - BY AGE

Age of skaters (years)

% of skaters wearing helmets

0-3 yrs  |  4-12 yrs  |  13-19 yrs  |  20-60 yrs  |  60+ yrs

100%   |  90%       |  20%        |  5%         |  10%
Helmets use by gender

% of skaters wearing helmets

Males

Females
Helmet use – by gender and age

Age of skaters (years)

Number of skaters

- Males - Helmets
- Males - No Helmets
- Females - Helmets
- Females - No Helmets
FALLS – BY AGE
PROPER HELMET USE

- CSA-approved (fastened): 1.1%
- Non-CSA helmet: 5.5%
- No helmet: 53.0%
- Helmet unfastened: 40.4%
Regulation of Helmets for Skating

Phase 3

• Post-Implementation Results
**Helmet Use – Post-Implementation**

- Only 2 of 358 observations – no helmet
- 2 instances of non-CSA approved helmet
- 5.6% of observations involved incorrect helmet use
Impact of regulation on participation in skating

- 361 participants observed in pre-implementation period
- 358 participants observed during same number of observation-hours post-implementation
Demographics – Pre- and Post-Implementation

Pre-implementation

- 60+ yrs: 4%
- 0-3 yrs: 2%
- 20-60 yrs: 41%
- 13-19 yrs: 16%
- 4-12 yrs: 37%

Post-implementation

- 60+ yrs: 5%
- 0-3 yrs: 0%
- 4-12 yrs: 44%
- 20-60 yrs: 44%
- 13-19 yrs: 7%
Gender Distribution Pre- and Post-Implementation

Pre-Implementation
- Males: 48%
- Females: 52%

Post-Implementation
- Males: 39%
- Females: 61%
Conclusions

• Rates of helmet use have risen from 40.4% correct usage to 93.3%, with 99.4% of skaters using helmets post-implementation of regulations
• Rates of overall participation in skating have not been significantly affected
• Rates of teen skating are lower; however, skaters from all age groups continue to participate
• Changes in gender distribution of skaters were noted
Acknowledgements

- Research Team
  - Dr. David Clarke
  - Lynne Fenerty
  - Ginette Thibault-Halman
  - Jessica Heaton
  - Lisa Sangster
  - Kathie Wheadon-Hoare

- Contributions
  - Dr. Simon Walling
  - Roy Dempsey
  - Julian Young
Observational Study of Helmet Use on Ski Hills in Nova Scotia

Skiing and Snowboarding
Ski and Snowboard Helmets

- Natasha Richardson (public and political support)
- Opportunity to establish baseline data
- Develop relationships industry
- Conduct the formative behavioural research
Overview

• Research Question/Rationale

• Background and Literature

• Study Design

• Sample Selection & Ethical consideration

• Data Collection

• Data Analysis
Ski Snowboard Study in NS

- Phase 1 – OBSERVATION STUDY
  - January –February 2010

- Phase 2 – QUALITATIVE STUDY
  - February 2010
  - Educational displays and presentations
  - Intercept interviews
TBI in skiing

TBI accounts for 50%-88% of fatalities at various ski resorts

(Levy et al. J Trauma 2002)
Purpose

1. Examine helmet use as on ski hills in Nova Scotia
   1. Quantitative – who is wearing helmets?
   2. Qualitative – reasons for wearing helmet or not

2. Provide education and promotion for increased helmet use
Methods – Quantitative Observations

Data collectors were present in public areas of all three ski hills in Nova Scotia:

- Percent of skiers/snowboarders using helmets
- Correct helmet use

15 minute interval = 1 observation

Four or more observations

- days and nights
- week and weekend

Inter-rater reliability
### Methods – Quantitative Observations

#### Helmet Observations
- Age
- Sex
- Proper helmet
- Proper helmet fit
- Child (attend by guardian with or without helmet)

#### Falls Observations
- Helmet (yes/no)
- Frequency
- Age
- Sex
- Number of persons in collision
- Impact area
- Resume sport or sitting out
- First aid required
Number of Observations per Hill

<table>
<thead>
<tr>
<th>Hill</th>
<th>Number of Observations</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1300</td>
</tr>
<tr>
<td>2</td>
<td>700</td>
</tr>
<tr>
<td>3</td>
<td>1300</td>
</tr>
</tbody>
</table>
Demographics – Age
N = 3336

- 0-3 yrs: 0%
- 4-12 yrs: 12%
- 13-19 yrs: 29%
- 20-60 yrs: 57%
- 60+ yrs: 2%
Helmet Use - Age

<table>
<thead>
<tr>
<th>Age Group</th>
<th>% Helmet Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 to 12</td>
<td>100</td>
</tr>
<tr>
<td>13 to 19</td>
<td>80</td>
</tr>
<tr>
<td>20-60</td>
<td>60</td>
</tr>
<tr>
<td>Greater than 60</td>
<td>50</td>
</tr>
</tbody>
</table>
Demographics – Gender
N=3336

- Male: 67%
- Female: 33%
Falls and Helmet Use

- 292 falls
- 17% of falls - not wearing helmet
Falls - Area of Impact

- Full Body: 10%
- Behind: 51%
- Left: 6%
- Side: 7%
- Knees: 9%
- Hands: 2%
- Head: 7%
- Front: 8%
Falls – Age

- 0-3 yrs: 1%
- 4-12 yrs: 35%
- 13-19 yrs: 49%
- 20-60 yrs: 15%
- 60+ yrs: 0%
- 0-3 yrs: 1%
- 4-12 yrs: 35%
- 13-19 yrs: 49%
- 20-60 yrs: 15%
- 60+ yrs: 0%
Helmet Use on Different Hills in Nova Scotia

![Graph showing helmet use on different hills in Nova Scotia. The graph includes bars for hills 1, 2, and 3, with hill 3 having the highest percentage of helmet use.](image)
There were significant differences in the percentage of helmet use between hills.
100 + surveys completed per hill

Surveys were administered
- helmet use
- factors which influence decision to wear helmets
Self-Described Frequency of Helmet Use

- Always: 66%
- Never: 18%
- Occasionally: 6%
- Most of the time: 8%
- Other: 2%
Factors – Decision to Wear Helmet

- Protection: 60% of respondents
- Rules: 35% of respondents
- My Choice: 30% of respondents
- Family: 25% of respondents
- Knows injured: 20% of respondents
- Terrain/Conditions: 15% of respondents
- Warmth: 10% of respondents
- Been hurt before: 8% of respondents
- Comfort: 7% of respondents
- Friends: 6% of respondents
- Weather: 5% of respondents
- Other: 3% of respondents
- Costs: 2% of respondents
Education and Awareness

• Educational displays present during the helmet observation studies and during formal education sessions

• 2 education sessions per hill:
  • developed by Neurosurgeons

• Prizes such as free helmets were drawn at the end of the sessions

• Support provided for project by Health Promotion and Protection
Conclusions Ski/Snowboard Study

- Final analysis of data is pending

- Women more likely than men to wear helmets
- Differences between ski hills Hill 1, 2, 3
- Main reason cited for helmet use was protection
- Main barrier cited for helmet use – personal choice
Next steps

- Complete data analysis
- Share findings with ski hills and all stakeholders
- Determine next steps, based on research findings, in consultation with stakeholders
- Mandatory policy or legislation
Thank You for Your Time
Health Promotion and Protection
Dr. David Clarke & Dr. Simon Walling.
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ThinkFirst Canada
Volunteers