

DATA SAMPLER

BIOMECHANICS OF BICYCLE HANDLEBAR (HBI) SPEARING INJURIES IN CHILDREN



METHODS

- Theoretical mechanical model using Newton's equations to predict the potential magnitude of the compressive force
- Calculation of the mechanical stress imposed on the abdomen with covered versus uncovered handlebar ends

HBI-SPEARING MECHANISM

- The child, with the handlebar end embedded into the abdomen, fall to the ground as a system impacting with velocity, v_f where $v_f > v_0$
- Applying the dynamic equations of motion (energy method), we get the compressive force:

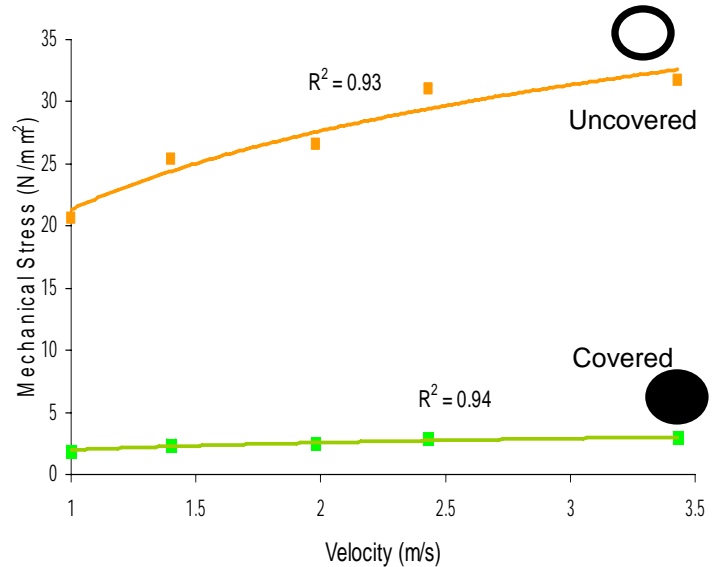
$$F_{hb} = \frac{\{(m_c + m_b)v_f^2 / 2d_{cg,y}\} + (m_c + m_b)g}{\sin \theta}$$

where

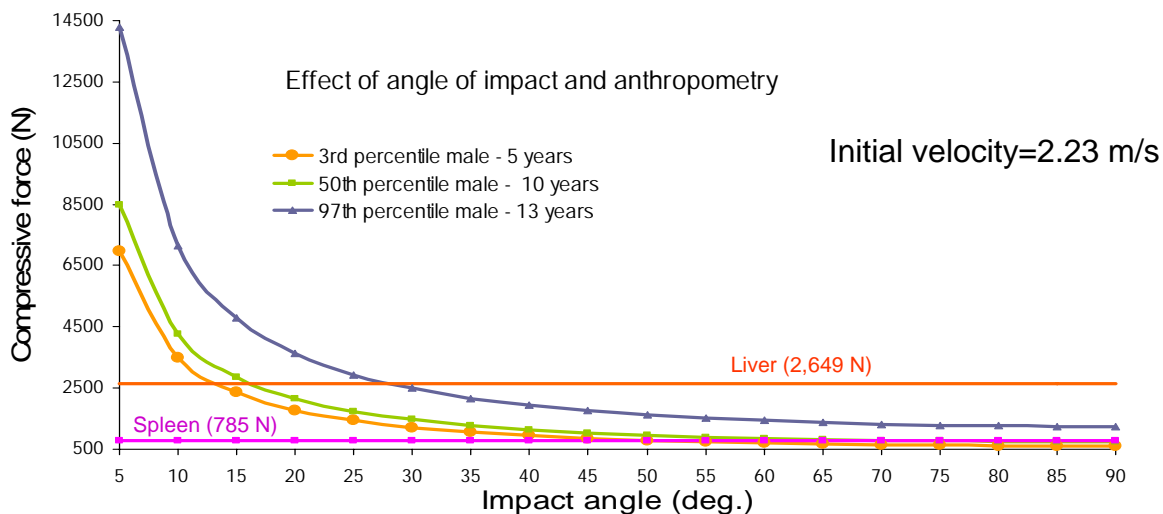
$$v_f = \sqrt{\frac{m_c v_{ox}^2}{(m_c + m_b)} + 2gd_{cg,y}}$$

HBI IMPACT THEORETICAL MECHANICAL STRESS

50th Percentile male, standard rubber grip



HBI THEORETICAL MODEL - SPEARING



For additional information on the CHIRPP program, please contact the Injury & Child Maltreatment Section, by phone at (613) 957-4689 by FAX at (613) 941-9927 or visit our website at <http://www.phac-aspc.gc.ca/injury-bles/>

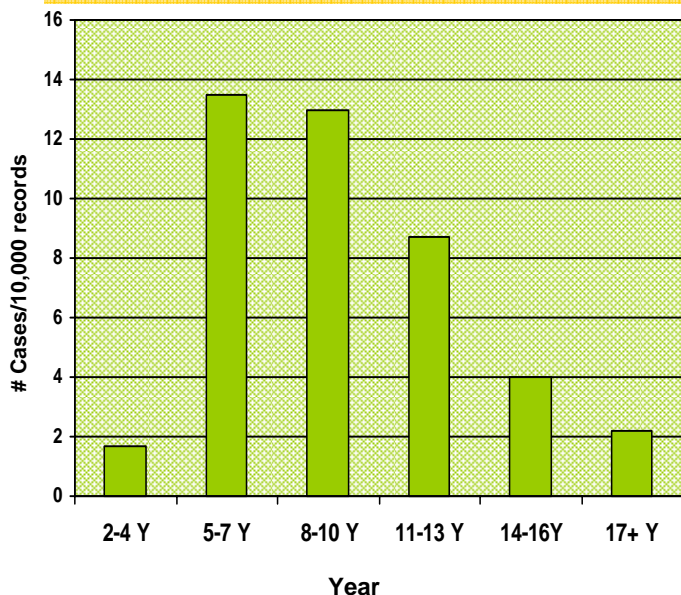


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EPIDEMIOLOGY OF BICYCLE HANDLEBAR INJURIES (HBI)

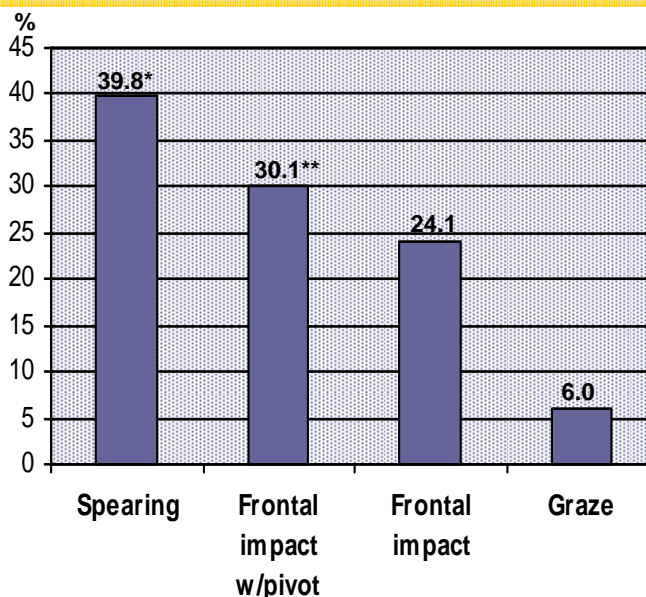
CHIRPP database, all ages, 1990-2000, 649 cases

AGE DISTRIBUTION



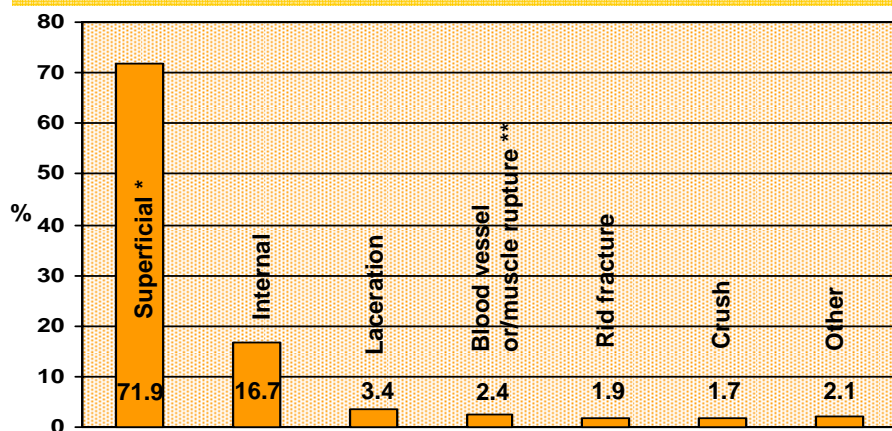
- 75% of those 2-13 years were wearing helmets
- N=649, 76.6% Male

MECHANISM OF INJURY



- * Free-fall onto handlebar end or bicycle-child fall to ground as a system.
- **This mechanism usually results in A-T injuries. Half (50%) of these cases involved 2 or more injuries compared to 18-22% for the spearing and frontal impact mechanisms

NATURE OF INJURY, ABOMINO-THORACIC INJURIES ONLY, n=538



* In the clinical literature there is often a diagnostic delay of up to 67%-86% of cases with internal injuries due to blunt trauma. It is possible that some of these cases later turned out to be more serious

** 3 cases of abdominal blood vessel injury and 10 cases of abdominal wall or chest muscle tear/rupture

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