**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:

\[
F_{cm} = \frac{(m_c + m_h)v_f^2}{2d_{ce}} + (m_c + m_h)g \sin \theta
\]

where

\[
v_f = \sqrt{\frac{m_c v_m^2}{m_c + m_h} + 2gd_{ce}}
\]

**HBI THEORETICAL MODEL - SPEARING**

Effect of angle of impact and anthropology

- Initial velocity = 2.23 m/s
CHIRPP - Canadian Hospitals Injury Reporting and Prevention Program

DATA SAMPLER

EPIDEMIOLOGY OF BICYCLE HANDLEBAR INJURIES (HBI)

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

AGE DISTRIBUTION

MECHANISM OF INJURY

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

- 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

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/