Calculating estimates of drowning morbidity and mortality adjusted for exposure to risk

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Background

• Injury incidence rate - estimate of injury risk
• Common estimate – per 100,000 population assumes equal exposure to a hazard
• Lack of appropriate denominators that reflect exposure to a hazard
  – e.g. number of people exposed; time exposed
• Particularly a problem for drowning estimates
  – e.g. childhood drowning in backyard pools
**Injury risk estimates**

- **Population-based** – per 100,000 population
  - e.g. drowning in Australia 1.2 per 100,000 population

- **Population-risk** – per 100,000 population exposed to the hazard
  - e.g. sport injury per number of population who play sport

- **Person-time risk** – amount of time person is potentially exposed to hazard
  - e.g. occupational injury per million hours worked

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**Aims**

- Estimate & compare the rate of unintentional drowning mortality & hospitalised morbidity of individuals engaged in swimming in NSW
  - population-based; population-risk; person-time risk

- Compare population-based and person-time risk estimates for drowning and road traffic mortality in NSW
Method - drowning

• Number of drowning and near-drowning events in NSW
  – Drowning mortality – ABS mortality data
  – Hospitalised drowning morbidity – NSW Admitted Patient Data Collection

• Case criteria:
  – 16 years of age or older
  – Resident of NSW & incident occurred in Australia
  – External cause: unintentional drowning & submersion, excluding bathtubs (ICD-10-AM: W67-W74 or Y21)

• Timeframe: 1 January to 31 December 2005

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Method - drowning

• NSW Population Health Survey, 2005
  – Two-stage sampling process – stratified by 8 AHSs
    • Randomly selected households
    • Randomly selected respondent within household
  – CATI interviews: February to December 2005
    – 13,701 respondents 16 years and over (57.7% RR)
**Method - drowning**

- NSW Population Health Survey, 2005
  - Respondents asked:
    - Been in or on the water at a swimming pool, beach, lake, river, creek, stream or dam in last 4 weeks, including fishing?
    - Swimming, fishing or rock fishing in last 4 weeks?
    - Swimming in last 4 weeks?
    - Hours spent swimming in last 4 weeks?

**Method - drowning**

- Denominators:
  - **Population-based** – per 100,000 population (ABS population estimates, 2005)
  - **Population-risk** – per 100,000 population exposed to water (NSW Population Health Survey, 2005)
    - Been in or on water
    - Swimming, fishing or rock fishing
    - Swimming
  - **Person-time risk** – per 1,000 hours spent swimming in last 4 weeks (NSW Population Health Survey, 2005)
**Method – road traffic mortality**

- Road traffic mortality – RTA mortality data, 2005
- Denominators
  - **Population-based**: per 100,000 population (ABS population estimates, 2005)
  - **Person-time risk** per 1,000 hours:
    - NSW Transport Data Centre – Household Travel Survey – Estimated average hours for car driver & passenger trip durations in Sydney GMA
    - ABS Survey of Motor Vehicle Use - Estimated road travel time using the total distance travelled per year in NSW and RTA estimates of average speed travelled on major roads

**Results – drowning mortality**

<table>
<thead>
<tr>
<th></th>
<th>Population-based</th>
<th>Population-risk</th>
<th>Person-time risk</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>rate per 100,000 population</td>
<td>rate per 100,000 population in/on water</td>
<td>rate per 100,000 population swimming, fishing</td>
</tr>
<tr>
<td><strong>Males</strong></td>
<td>1.5 (1.4-1.7)</td>
<td>4.2 (3.0-5.7)</td>
<td>14.0 (10.0-19.1)</td>
</tr>
<tr>
<td></td>
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<tr>
<td><strong>Females</strong></td>
<td>0.2 (0.2-0.3)</td>
<td>0.8 (0.3-1.7)</td>
<td>3.6 (1.5-7.5)</td>
</tr>
</tbody>
</table>

(x²=88.47, df=4, p<0.0001)

Source: ABS mortality data file and NSW Population Health Survey 2005 (HOIST), Centre for Epidemiology and Research, NSW Department of Health.
### Results – hospitalised drowning morbidity

<table>
<thead>
<tr>
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<th>Population-risk</th>
<th>Person-time risk</th>
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<tbody>
<tr>
<td></td>
<td>rate per 100,000 population</td>
<td>rate per 100,000 population in/on water</td>
<td>rate per 100,000 population swimming, fishing</td>
</tr>
<tr>
<td><strong>Males</strong></td>
<td>2.1 (1.9-2.3)</td>
<td>5.6 (4.2-7.3)</td>
<td>18.9 (14.2-24.7)</td>
</tr>
<tr>
<td><strong>Females</strong></td>
<td>0.6 (0.5-0.7)</td>
<td>1.9 (1.1-3.1)</td>
<td>8.3 (4.7-13.4)</td>
</tr>
</tbody>
</table>

(χ²=79.62, df=4, p<0.0001)

Source: NSW Admitted Patient Data Collection and NSW Population Health Survey 2005 (HOIST), Centre for Epidemiology and Research, NSW Department of Health.

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### Results – road traffic mortality

<table>
<thead>
<tr>
<th></th>
<th>Population-based</th>
<th>Person-time risk</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>All road traffic mortality rate per 100,000 population</td>
<td>Vehicle occupant mortality rate per 100,000 population</td>
</tr>
<tr>
<td><strong>All NSW</strong></td>
<td>7.5</td>
<td>6.1</td>
</tr>
<tr>
<td><strong>Sydney GMA</strong></td>
<td>3.5</td>
<td>N/A</td>
</tr>
</tbody>
</table>

*Rate per 1,000 hours – 0.0002 at 30 kph and 0.0004 at 50 kph

Source: RTA mortality data 2005 and RTA speed surveys; ABS survey of vehicle use 2005-06; and Household Travel Survey 2005, NSW Transport Data Centre.
Limitations

• Unspecified external causes
  – 19.6% deaths & 9.3% hospitalisations (16+ years)

• Exposure estimates
  – Self-reported – recall and information bias (NSW Population Health Survey & Travel Surveys)
  – Drowning exposure – no data collected in January
  – Road exposure – person-time exposure estimates calculated using vehicle distance travelled & estimated speeds

• 95% confidence intervals
  – Wide for some rate calculations, due to low case counts

Conclusions

• Highlights importance of using appropriate denominators

• Injury risk often under-estimated using population-based exposure

• Risk of swimmer drowning using population-risk exposure up to 10 times population-based exposure

• Vehicle occupant mortality – population-based exposures over-estimate risk
Conclusions

• Need to establish appropriate denominators of the population-at-risk:
  – perceived importance of issue
  – establish prevention & intervention priorities
  – inform policy development
  – assist resource allocation needs

• Showing the actual risk of drowning highlights the need to reassess drowning prevention efforts

Acknowledgments

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