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

Rebecca Mitchell^{1,2}, Ann Williamson², Jake Olivier^{1,3}

¹NSW Injury Risk Management Research Centre, UNSW

²Transport and Road Safety (TARS) Research,
School of Aviation, UNSW

³School of Mathematics & Statistics, UNSW



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 population¹
- **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

¹Source: AIHW: Henley G and Harrison JE (2009). Injury deaths, Australia 2004–05. Injury research and statistics series no 51. (Cat. no. INJCAT 127). Adelaide: AIHW.



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



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

	Population-based	Population-risk			Person-time risk
	rate per 100,000 population	rate per 100,000 population in/on water	rate per 100,000 population swimming, fishing	rate per 100,000 population swimming	rate per 1,000 hrs swimming
Males	1.5 (1.4-1.7)	4.2 (3.0-5.7)	14.0 (10.0-19.1)	19.2 (13.7-26.1)	9.0 (6.4-12.3)
Females	0.2 (0.2-0.3)	0.8 (0.3-1.7)	3.6 (1.5-7.5)	4.5 (1.8-9.2)	1.4 (0.6-2.9)

($\chi^2=88.47$, $df=4$, $p<0.0001$)

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

	Population-based	Population-risk			Person-time risk
	rate per 100,000 population	rate per 100,000 population in/on water	rate per 100,000 population swimming, fishing	rate per 100,000 population swimming	rate per 1,000 hrs swimming
Males	2.1 (1.9-2.3)	5.6 (4.2-7.3)	18.9 (14.2-24.7)	25.9 (19.5-33.8)	12.2 (9.1-15.9)
Females	0.6 (0.5-0.7)	1.9 (1.1-3.1)	8.3 (4.7-13.4)	10.2 (5.8-16.5)	3.2 (1.8-5.2)

($\chi^2=79.62$, $df=4$, $p<0.0001$)

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



Results – road traffic mortality

	Population-based		Person-time risk
	All road traffic mortality rate per 100,000 population	Vehicle occupant mortality rate per 100,000 population	Vehicle occupant mortality rate per 1,000 hours
All NSW	7.5	6.1	0.0002 to 0.0004*
Sydney GMA	3.5	N/A	0.00012

*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



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