

**Supplementary table 1.** Published studies investigating drowning-related morbidity, mortality and risk factors in India

#	Study	Study period	Place	Age group	Sample size	Study design and methods	Outcome measure	Relevant results	Comments on study quality (based on STROBE Statement)
1	Bose A et al., 2006	1998-2004	Vellore, India	All ages	426	Retrospective analysis of data from an injury surveillance system	Analysis of mortality data from an injury surveillance system	Unintentional drowning caused 87 (20%) deaths over the study period.	(+) Data reviewed from a 7-year period. (+) Data from the surveillance system is regarded as high quality and is routinely validated
2	Debata et al., 2014	2010-2011	Northern India	1-19 years	434	Retrospective analysis of autopsy records	Analysis of post-mortem data for all injury types	Two cases of drowning deaths were reported, both within the 1-5 years age group.	(+) Mortality data presented by age and sex (-) Data collected from one site (-) Although a retrospective study, records were only reviewed from a 1 year period
3	Isaac et al., 2007	?	Tamil Nadu, India	?	5 discussions with 6-8 people per group	Focus group discussions in community settings	Discussions held with health aides, extension workers, balwadi teachers, PTCHWs and land owners/village leaders	Most groups felt that drowning was not a major cause of death in children in their area. The common sites where the groups considered that children drown in the study area were: cement pots storing water in the back yards of their homes; large buckets of water; open irrigation wells; irrigation tanks; abandoned quarries filled with rain water; small drainage pits and tanks collecting rain water.	(+) Diverse range of study participants (-) Little information provided about qualitative research methods used – either for data collection or for analysis (-) Participant selection process not defined (-) Unclear whether data saturation was reached
4	Jagnoor J et al, 2011	2001 - 2005	India	0-5 years	777	Verbal autopsy	VA conducted through in-person household interviews with family members/ caretakers	Drowning caused more than 26,000 deaths in children aged less than 5 years across India in 2005. A peak in drowning deaths occurred within the 1-2 year age group. Deaths were 3 times higher in rural areas than urban areas and were more common among boys than girls. Most deaths occurred in the Northeast region, where drowning accounted for 82% of all unintentional injury deaths in children.	(+) Data subset analysed was part of a larger, nationally-representative, well-regarded study (Million Death Study) (-) Data was collected by interviewing family members/caretakers of the deceased – potential for response bias (-) VA are known to misclassify some causes deaths, particularly in neonates and older age groups

5	Jagnoor et al., 2012	2001–2003	India	All ages	2,003	Verbal autopsy	VA conducted through in-person household interviews with family members/ caretakers	Drowning was the cause of 73,000 deaths, accounting for 11% of all injury-related deaths in India. This made it the third leading cause of unintentional injury mortality in the country. Rates were higher in males (8.2) than in females (4.6). The study showed drowning mortality to be grossly under-reported by the National Crime Registration Bureau (NCRB): Drowning rate from study: 6.4 Rate from WHO/GBD: 6.3 Rate from NCRB: 2.1	(+) Data subset analysed was part of a larger, nationally-representative, well-regarded study (Million Death Study) (-) Data was collected by interviewing family members/caretakers of the deceased – potential for response bias (-) VA are known to misclassify some causes deaths, particularly in neonates and older age groups
6	Kalaiselvan et al, 2011	Oct-Nov 2009	Pondicherry, India	All ages	1,613 household's surveyed	Population-based cross-sectional study	Retrospective injury data collected in-person using a structured interview guide	14 drowning injuries were reported in total, corresponding to 0.2% of all injuries. Drowning was investigated by age group: 4 (0.2%) drowning cases were for people aged under 18, 8 (0.1%) among people aged 18-60 years and 2 (0.3%) for people aged 60+ years. 4 females and 10 males drowned.	(+) Social mapping was used to identify study villages (+) Standardised and tested data collection tools were used (+) High participation rate (97%) (-) Retrospective reports from a one year period – potential for recall bias
7	Kanchan et al., 2007	1993-2003	Manipal, India	All ages	58	Retrospective analysis of medical records	Analysis of medical record data from one site, specifically for drowning	85% of drowning cases were males, 0-20 year olds accounted for 59% of cases, 69% of cases occurred in fresh water. 55% of cases experienced respiratory problems, 21% experienced neurological problems and 15% had no complications. 12% of cases died in hospital, with a survival period ranging from 2-18 days.	(+) Provides morbidity data (+) Provides data on health outcomes following drowning (-) Small a number of cases despite long review period (-) Data collected from one hospital site only (-) Old data
8	Kanchan T et al, 2009.	1994-2007	Manipal, India	0-10 years	75	Retrospective analysis of autopsy and police records	Analysis of autopsy records and police records for all injury deaths	Drowning accounted for 11% of fatal child injury cases. Drowning mortality was more common among boys than girls (3:1), the average age of drowning mortality was 5.4 years. Drowning fatalities were concentrated among toddlers (indoor settings) and school age children (outdoor settings).	(+) Detailed data provided on the mechanism and circumstance of each injury death (-) Small sample size from a long study period: the 75 deaths analysed corresponded to only 3% of total autopsy cases over the study period

9	Kumar et al., 2013	2000-2010	All India – coastline	All ages	?	Retrospective analysis of media reports and a range of police data	Review and follow-up of media reports and drowning data from police reports	78% of coastal drownings were due to rip currents, 5% were suicides, 5% were boat accidents, 10% were accidents within the harbor and 2% were unknown. Rip currents caused drowning deaths of 350 people in Andhra Pradesh and 293 in Visakhapatnam over the study period. The east coast of India averaged 30–40 drownings, and west coast of India averaged 5–10 drownings per year during the study period.	(+) Long study period (+) Multiple data sources reviewed (+) Clearly defined inclusion criteria for drowning cases and method of drowning (+) Study limitations and potential sources of bias clearly outlined (-) Data sources used are known to be unreliable
10	Mirkazemi et al., 2009	2007-2008	Pune, India	All ages	2100 households surveyed	Population-based cross-sectional study	Semi-structured interviews with household heads	Unprotected water surfaces close to living areas were reported by 33% of HHs. 21% of HHs associated drowning risk with a lack of lifeguard or safety devices at swimming places, and 25% associated risk to swimming without being trained to swim. There was no association between socioeconomic status and presence of unprotected water surfaces close to living areas. 4% of the upper socioeconomic strata had not received formal swim training, compared to 42% of the lower socioeconomic strata.	(+) Large sample size (+) Households were randomly selected through multistage, stratified, cluster random sampling (+) Risk factors for drowning were investigated, not just burden
11	Padubidri et al., 2013	Jan 2009 – Dec 2011	Mangalore, India	12-49 years	328	Retrospective analysis of medico-legal autopsies	Analysis of autopsy data for women to determine cause and manner of death	Drowning accounted for 18 (5%) deaths in the study cohort.	(-) Data collected from one site (-) Few deaths related to drowning in the cohort (-) Methods of identifying drowning-related suicide not outlined

12	Sapna et al., 2008	2007	Kerala, India	12-60 years	254	Hospital based cross-sectional survey, clinical data from medical records	Participants from an outpatient epilepsy clinic completed a survey on injuries experienced as a result of an epilepsy attack	One near-drowning event was reported by epilepsy patients surveyed. Despite this, the paper states: "drowning is probably the most common type of fatal accident in patients with epilepsy" and highlights drowning mortality is most common amongst children with epilepsy.	<p>(+) Clear inclusion/exclusion criteria outlined</p> <p>(+) Participants recruited over a 6 month period</p> <p>(+) Two data sources reviewed: survey responses and data from medical records</p> <p>(-) Data collected from one site</p> <p>(-) Only one drowning case reported</p>
13	Sharma et al., 2009	2004-2005	Jamnagar, India	All ages	1,496	Population-based cross-sectional study	Self-reported, retrospective injury data collected in-person using a structured questionnaire	12% of the study population reported experiencing an injury in the past year. 1 drowning case was reported out of 178 injury cases. It was for a girl aged between 0-4 years.	<p>(+) In-depth data provided on sampling methods</p> <p>(-) Data collected from one location only</p> <p>(-) 1 year look-back period introduces potential for recall bias</p> <p>(-) Minimal data provided on data collection tool</p>
14	Shetty et al., 2007	1994–2005	Taluk, South India	All ages	984	Retrospective analysis of medical records	Analysis of medical record data from 4 different sources, specifically for drowning	78% of drowning deaths were males and 22% were females. Overall, drowning rates decreased over the study period, yet there was a sharp increase in male drowning deaths from 2002-2005. The majority of drowning deaths occurred in the 21-30 year age group (26%). The majority of cases occurred in wells/ponds (44%), followed by rivers (30%).	<p>(+) Long study period</p> <p>(+) Multiple data sources reviewed</p> <p>(+) Detailed information surrounding the context of drowning events is provided</p> <p>(-) Medical records reviewed for only one town – generalisability of results?</p>
15	Singh et al., 2011	1999-2001	Moradabad, India	25-64 years	2,222	Verbal autopsy and review of medical records	VA conducted through in-person household interviews with family members and local health workers. Clinical data reviewed	Drowning accounted for 2% of all deaths.	<p>(+) Large sample</p> <p>(+) Both VA results and data from medical records analysed</p> <p>(+) Standardised WHO tool used for VA</p> <p>(-) Medical records only reviewed by one physician</p>

16	Stalin et al., 2015	2013	Tamil Nadu, India	All ages	3,947	Population- based cross- sectional study	Self-reported, retrospective injury data collected in- person using a structured questionnaire	There no cases of drowning during the study period.	(-) No details provided on sampling methods (-) Self-reported retrospective data collected - potential for recall bias (+) Large study population
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