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How well does a national newspaper reporting system profile drowning?

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In Finland, the Finnish Association for Swimming Instruction and Life Saving (SUH) and Statistics Finland (SF) both provide nationwide data on unintentional drowning. The SUH database relies on rapid reporting from a newspaper clipping service and additional local police information, whereas the SF database relies on the later release of the death certificate information, which is based on extensive medico-legal investigation. The aim of the study was to explore the main differences between the SUH and SF databases for drowning and to evaluate the capacity of the former to characterize drowning events in Finland from 1998 to 2000. Computerized files of death certificates tabulated by SF were linked with the SUH database by deterministic methods. SF and SUH databases allowed the identification of 704 and 567 unintentional drownings, respectively, giving an unintentional drowning rate of 4.5 and 3.6/100 000 per year. Of the 704 drownings described by SF, 418 (59.4%) were also found in the SUH database. The SUH database markedly underreported drowning fatalities in certain settings, such as bath, ditch and swimming pool drownings; fall- and land-traffic-related drownings; and drownings occurring in South Finland. The narrative text of SUH drownings contributed limited information to characterize the drowning events. It was concluded that the newspaper-based SUH data provide more timely data on individual drownings but are not representative of all drownings. Conversely, the SF vital statistics data are more accurate but may take up to 2 years to become available. Both SUH and SF data provide little detailed information on drowning events. A multidisciplinary national surveillance system for drowning is necessary to provide more accurate and timely drowning data, analyse risk factors and design follow-up studies for developing and monitoring prevention strategies.

Keywords: Drowning; Immersion; Surveillance; Alcohol; Forensic autopsy; Finland

1. Introduction

In Finland (population 5.2 million) the unintentional drowning rate is the highest among the Nordic countries and more than 50% higher than the average for EU countries (Lunetta *et al.* 2002, 2004, World Health Organization 2003). The high Finnish autopsy rate for violent and unintentional deaths (Penttilä *et al.* 1999),

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together with a multiple-step system of coding causes of death before final tabulation at Statistics Finland (SF) (Statistics Finland 2000, Lunetta *et al*. 2002), provides a reliable basis for retrospective studies on unintentional drowning (Browne 2004, Lunetta *et al*. 2004). However, there is a delay of up to 2 years before data are available for analysis. The Finnish Association for Swimming Instruction and Life Saving (SUH) is an educational organization established in 1956, which aims to improve the swimming skills of Finns and to reduce drowning fatalities (The Finnish Association for Swimming Instruction and Life Saving 2004). Since 1992, the SUH has maintained an ongoing database on unintentional drowning, which relies mainly on information collected by a commercial news-clipping service and some police reports to provide timely information on drowning events. This study seeks to examine the representativeness of the data from the active 'real-time' surveillance system (SUH) and its ability to represent the true status of drowning in Finland as documented by vital statistics data (SF).

2. Material and methods

2.1. *Statistics Finland*

Computerized files of death certificates tabulated by SF, 1998 to 2000, were selected for analysis by use of the international classification of disease (ICD 10th version) nature of injury (N) and external cause of death (E) codes for unintentional drowning (T75, V90, W65–74) (World Health Organization 1992). The variables available included victim's personal data (name, sex, age, community of residence, civil status, nationality), drowning circumstantial data (site, community, province and region, date) and data concerning the type of post-mortem investigation and final certification (cause of death by N and E codes and manner of death). Mortality rates per 100 000 inhabitants were calculated using population data, furnished by SF. Human subjects' approval was granted by Statistics Finland (TK-53-1778-01).

2.2. *SUH statistics*

Drowning data from 1 January 1998 to 31 December 2000, tabulated and furnished by the SUH, were compared with SF data. The SUH database on drowning is based on information gathered by a commercial news-clipping service from local and national newspapers, supplemented by police reports if available. SUH personnel extract and pool the following basic information from newspaper articles: victim's gender, age and community of residence, location, areas and date of submersion, time of day, water temperature, use of a personal flotation device and transportation mode for cases occurring on ice. A narrative free text may also be added to each case, based on available information. No victim's names or personal identification numbers are collected. The SUH excludes prior to tabulation, all drownings defined by newspapers as suicide or homicide and all land-traffic-related drowning, with the exception of those involving drivers or occupants of vehicles moving on ice.

2.3. *Data linkage*

The linkage of SUH and SF databases was performed on an Excel data-sheet using deterministic methods. Drowning fatalities from the two databases were manually matched by sorting the variables list, with the main criteria being the date and location of drowning, victim's sex, age and community of residence.

3. Results

During the 3-year study period, the vital statistics (SF) database included 704 unintentional drownings (annual rate: 4.5/100 000; male-to-female ratio: 6.4:1), of which 11 occurred abroad. The epidemiological profile of unintentional drowning as derived from SF has been described in detail in a recent study (Lunetta 2004). During the same period, 567 unintentional drownings from the SUH database were identified (3.6/100 000; 9.3:1), i.e. 137 (19.5%) fewer than those available from SF. In the SUH database 30 unintentional drownings were identical to cases later tabulated by SF as suicides (n = 13) or undetermined (n = 17) drowning. These false–positive cases were not considered further in this study.

In comparing SF and SUH databases, three groups of unintentional drownings were detected: those identified by both the SF and SUH databases (n = 418); cases identified only by SF (n = 286); and those cases identified only by the SUH (n = 119), giving a total of 823 unintentional drownings (figure 1). Thus, of the 704 cases described by SF, 418 (59.4%) were also found in the SUH database, whereas the remaining 286 (40.6%) cases were unreported. The 119 cases identified only by SUH could not be traced in the SF database of drowning. The SUH unmatched cases were not further considered in this study. However, preliminary examination of these cases did not reveal any patterns as to why the official investigation system (SF) had not classified them as unintentional drowning.

To further characterize the typology of cases missing from the SUH, we compared the SF drowning cases, with those matching from the SUH database (tables 1 to 5). Given the extensive medico-legal system of investigation of cause of death, the high autopsy rate and the extensive quality control checks of the certificate of death, the SF data have most likely a higher accuracy and were considered in this study as the golden standard.

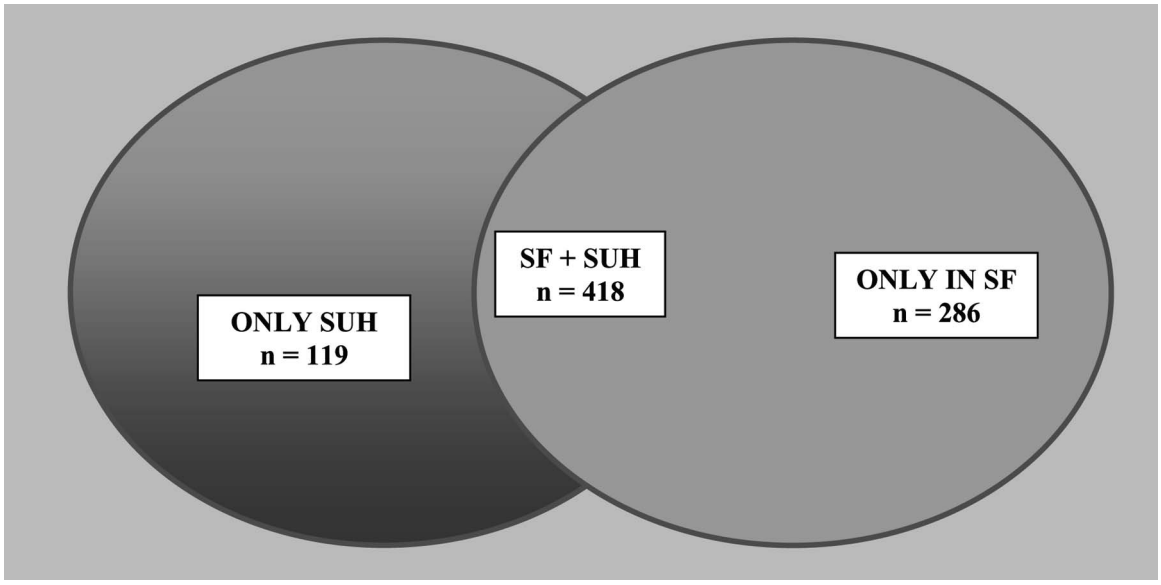

Figure 1. Unintentional drowning identified by Finnish Association for Swimming Instruction and Life Saving (SUH) and by Statistics Finland (SF) databases. Manual linkage of these databases by deterministic methods allowed identification of 418 matching cases.

Table 1. Statistics Finland (SF) drownings and Finnish Association for Swimming Instruction and Life Saving (SUH) drownings matched with SF, by site. SF data are missing in 44 cases.

		SUH drownings matched with SF		
Site	SF drownings	n	%	Underreported in SUH database %
Lake	309	224	72.5	27.5
Sea	126	87	69.0	31.0
River	92	58	63.0	37.0
Ditch	37	2	5.4	94.6
Pond	34	25	73.5	26.5
Swimming pool	20	9	45.0	55.0
Bathtub	13	0	–	100.0
Other	73	8	11.0	89.0

Table 2. Statistics Finland (SF) drownings and Finnish Association for Swimming Instruction and Life Saving (SUH) drownings matched with SF, by activity. SF data missing in ten cases.

		SUH drownings matched with SF		
Activity	SF drownings	n	%	Underreported in SUH database %
Boating	210	154	73.3	26.7
Falling	184	72	29.1	70.9
Swimming	176	106	60.8	39.2
Ice-related*	87	81	90.8	9.2
Traffic†	22	0	–	100.0
Bathing	8	0	–	100.0
Diving	7	3	42.9	57.1

*Includes cases with a victim driving a vehicle over ice.
†SUH by statute does not tabulate drownings resulting from land-traffic accidents.

Table 3. Statistics Finland (SF) drownings and Finnish Association for Swimming Instruction and Life Saving (SUH) drownings matched with SF, by age-group.

		SUH drownings matched with SF		
Age	SF drownings	n	%	Underreported in SUH database %
< 1	0	0	–	–
1 to 4	16	4	25.0	75.0
5 to 14	21	17	81.0	19.0
15 to 24	45	32	71.1	28.9
25 to 44	140	90	64.3	35.7
45 to 64	339	202	59.6	40.4
⩾ 65	143	73	51.1	48.9

Table 4. Statistics Finland (SF) drownings and Finnish Association for Swimming Instruction and Life Saving (SUH) drownings matched with SF, by province of Finland (SF data missing in six cases).

		SUH drownings matched with SF		
Location	SF drownings	n	%	Underreported in SUH database %
South province*	259	112	43.2	56.8
West province	193	130	67.3	32.7
East province	126	97	77.0	23.0
Oulu province	63	40	63.5	36.5
Lapland	48	30	62.5	37.5
Åland	9	7	77.8	32.2

SF data missing in six cases.
*Includes the Helsinki area.

Table 5. Statistics Finland (SF) drownings and Finnish Association for Swimming Instruction and Life Saving (SUH) drownings matched with SF, by month.

		SUH drownings matched with SF		
Month	SF drownings	n	%	Underreported in SUH database %
Jan	25	10	40.0	60.0
Feb	17	11	64.7	35.3
Mar	10	7	70.0	30.0
Apr	50	32	64.0	26.0
May	59	35	59.3	40.7
Jun	116	79	68.1	31.9
Jul	139	83	59.7	40.4
Aug	78	44	56.4	43.6
Sep	60	36	60.0	40.0
Oct	58	33	56.9	43.1
Nov	46	25	54.3	45.7
Dec	46	23	50.0	50.0

The majority of the drowning cases unreported by SUH occurred in bathtubs, ditches and swimming pools (100, 94.6 and 55.0%, respectively) (table 1). The activities most frequently involved in cases missing from the SUH database were land-traffic crashes (100%), bathing (100%) and falling into water (70.9%) (table 2). The underreporting by age was highest among children under 4 years old (75% unreported) (table 3). Significant differences in reporting also occurred by province, with South Finland having the highest percentage of unreported cases: 56.8 vs. 39.8 in the rest of the country (table 4). As to monthly occurrence, the highest percentage of underreporting was in January (60) (table 5). The SUH database failed to report the victim's age in 49 cases and pre-drowning activities in

35 cases while in SF these were reported in 100 and 98.6% respectively. The information on victim's use of a personal flotation device was available in the SUH data in less than 30% of the boating-related drowning. The SUH database had the lowest underreporting for drowning occurring in ponds (26.5% unreported) (table 1), during ice-related activity (9.2%) (table 2), among 5- to 14-year-old victims (19.0%) (table 3), occurring in the East Province (23.0%) (table 4) and during April (26.0%) (table 5).

Analysis of the accuracy of age in SUH compared to SF found that 57% of cases were concordant, 30.8% within a difference of 1 year and the remaining 12.2% had a difference $\geqslant 2$ years. Date of drowning was concordant in 84.2% of the cases, in 13.6% the difference was of 1 day, and in the remaining 2.2% of the cases, the difference was $\geqslant 2$ days. Site and pre-drowning activities were concordant in 94.2% and 96.6% of drownings, respectively.

4. Discussion

Two nationwide data sources for unintentional drowning exist in Finland: the SF, in which data are based on the release of a certificate of death; and SUH, in which rapidly updated records are mostly based on information gathered by a commercial news-clipping service. The accuracy of SF data on drowning are guaranteed by extensive medico-legal investigations (Penttilä *et al*. 1999, Statistics Finland 2000), including a high autopsy rate of up to 98% of all drownings during the last decade (Lunetta 2002, 2004), and by a multi-step system for checking the death certificate before final tabulation by SF (Statistics Finland 2000, Lunetta *et al*. 2002). The more accurate SF data are published annually but with a considerable delay since they concern deaths that occurred 2 years previously (Statistics Finland 2000, 2001, 2002) and provide limited detailed information on drowning events. However, researchers do have access to final data on each case several months after each death, when medico-legal reports and the certificate of cause of death are readied, checked, sent to SF and there again checked and tabulated. SUH promotes drowning prevention in partnership with the Finnish Maritime Administration, Ministry of the Interior, Ministry of Transport and Communication, Ministry of Social Affairs and Health, and the Finnish Centre for Health Promotion. Since 1992 their prevention activities have included providing reports and information to the media (television, radio, magazines), in addition to offering swimming courses and education in various settings (The Finnish Association for Swimming Instruction and Life Saving 2004). Because the SUH needs rapid and updated information on drowning, it set up a nationwide system to collect information from newspapers through a commercial news-clipping service, supplemented by information from local police authorities.

While newspapers can provide timely and often very graphic descriptions of drownings for use in promoting prevention messages, other studies have also found them to be an incomplete source of injury data (Rainey and Runyan 1992, Fine *et al*. 1998, Voight *et al*. 1998, Baullinger *et al*. 2001). In our study, comparison between the accurate but delayed SF database (considered the 'gold standard') and the SUH database found that the newspaper reports are not representative of all drownings. SF unintentional drowning rates were much higher than those resulting from SUH data, with the overall percentage of unintentional drowning unreported by SUH being 40.6. This percentage is somewhat lower than that reported in a US study, in which only 48% of the 984 victims of drowning were found through a 6-year screening of 225 Washington state newspapers (Baullinger *et al*. 2001). The sensitivity of the SUH database, however, varied markedly with victim's age, particular settings, activities and monthly and geographical distribution. Although SUH was reasonably good ($> 60\%$) at picking up drowning in most natural bodies of water (sea, river, lake, pond), drowning connected with boating, swimming and ice-related drowning, among 5- to 64-year-old victims, it greatly underrepresented many circumstances. It markedly underreported drowning fatalities in certain settings, such as bath, ditch and swimming pool drownings, fall- and land-traffic-related drownings and drownings occurring in South Finland. The underreporting was higher than 50% for bath, ditch and swimming-pool drownings, fall- and land-traffic-related drownings, drownings occurring in South Finland and among 1- to 4-year-old victims. Demographic data, such as victim's age and date of drowning, were rather often missing or inaccurate. This may be in part due to the variable level of detail in newspaper descriptions of drowning cases, which, for instance, may designate the date of drowning as the date of body retrieval and mention the victim's age before full police investigation and body identification are completed.

Several factors may explain why deaths in bathtubs, ditches and swimming pools are underestimated. For instance, a death in a ditch can be reported by a newspaper as a body found outdoors, e.g. along a road; whereas a death in a bathtub or private swimming pool may not become public unless it is a homicide. For the same reasons, childhood drownings, which mostly occur in domestic settings, may remain unreported. Such drownings are, however, important since deaths in bathtubs or swimming pools, although rarer in Finland than in other high-income countries (Lunetta *et al*. 2004), represent a primary target for prevention. Drowning in a ditch may also represent an overlooked opportunity for prevention and may result from inadequate fencing of hazardous areas. Similarly, while swimming, boating and ice-related activities are relatively well identified ($> 60\%$) by the SUH, other

circumstances, such as falling into water or bathing or diving injuries, are clearly overlooked. The fewer drowning cases reported in the more densely populated southern province of Finland – including the area of the capital, Helsinki – may be because big-city newspapers are less likely to report drownings, especially on a busy news day.

Thus, while newspaper clippings can provide more timely data on drowning and alert authorities to potential current hazards, their value for comprehensive drowning surveillance is limited. The potential and limits of newspaper clipping services for injury prevention, including drowning, have also been examined in other studies (Rainey and Runyan 1992, Fine *et al*. 1998, Voight *et al*. 1998, Baullinger *et al*. 2001). One author noted that such data can provide 'timely and vivid descriptions of submersion injuries that can be useful for illustrating modifiable risks and prevention messages', but added that their usefulness as a surveillance tool and source of injury data is limited (Baullinger *et al* 2001). Furthermore, as discussed in previous studies, traffic-related drowning is a special concern, because the widespread utilization by national statistics agencies of ICD E codes alone to describe unnatural deaths does not, in many countries, allow identification of drownings in this setting (Smith and Langley 1998, Lunetta *et al*. 2002). In Finland, SF tabulation of drowning through the N and E codes allows prompt identification of land traffic-related-drowning. Such drownings represented 3.2% of unintentional drownings in Finland and up to 10 to 11% of unintentional drownings in other countries with reliable data (Smith and Langley 1998, Lindholm and Steensberg 2000, Langley *et al*. 2001, Lunetta *et al*. 2004). Conversely, SUH specifically excludes land-traffic-related drowning, with the exception of those resulting from driving a vehicle on ice. These traffic drowning deaths represent a specific target for preventive countermeasures to be established in collaboration with the Ministry of Transport and Communication and should be included in drowning surveillance systems.

Identification of drowning of Finns abroad and of foreign victims in Finland is problematic. SF and SUH both collect records on drownings of Finns abroad. During the study period, the SF database contained 11 drownings abroad, three of which SUH also identified. On the other hand, because SF does not tabulate or publish deaths of non-residents (Statistics Finland 2000), the SUH is currently in Finland the only means for identification of drowning cases involving foreigners (four during the study period). Similar issues have been noted in other countries, as has the need to specifically target these cases for preventive countermeasures (Mackie 1999, Lindholm and Steensberg 2000).

Unintentional drownings identified by the SUH and not traced in the SF database of drowning were not analysed in detail. Some of these cases – after full medico-legal and police investigation – may involve a cause of death in water other than drowning (natural death, hypothermia, other injury death) or a drowning that is later classified as purposely inflicted (suicide, homicide) or that where intent remains undetermined. It is also possible that some unmatched cases may be related to reclassification by SF or, according to WHO rules of epilepsy-related drowning, as death due to epilepsy or to errors during pooling and tabulation of original data in the respective databases. Furthermore, in alleged drownings reported by newspapers, the victim may not even have died. Because SUH do not include unique identifiers, such as name or personal identity number, the possibility of a few duplications cannot be excluded. SUH personnel, however, thoroughly examine the rare cases in which two apparently unrelated drowning cases are reported in the same period, province and settings, and in victims of the same age. The unmatched SUH cases should, however, be further investigated in detail to reveal possible causes of underestimation of drowning cases by the SF database.

More work is needed to compare information relevant to drowning prevention between the free narrative of the death certificate and that for each individual fatality recorded by the SUH. However, examination, when available, of the brief text summary of the SUH drowning cases reveals the limited value of the SUH database for measuring specific risk factors for drowning, e.g. the low percentage of drownings with information on the victim's use of a personal flotation device.

5. Conclusion

The SUH database of drowning, based on newspaper reports, represents a rapid method of monitoring deaths occurring in aquatic settings and can provide timely information to the media of relevant information on specific current hazards, such as dangerously thin ice, and contributes to maintaining Finnish public awareness of hazards related to water activities. However, data collected by the commercial news-clipping service and tabulated by the SUH must be considered with caution and are of limited value on their own for comprehensive drowning surveillance, since they markedly underestimate overall drowning rates. Moreover, the SUH database differentially underreports or even completely fails to report drowning fatalities in particular settings. It also appears to contribute limited in-depth information on drowning events and because it lacks the ability to do follow-up investigations includes death in water due to causes and manners other than unintentional drowning.

Neither the extensive medico-legal system of investigation of causes of death, which results in the high quality but delayed availability of SF data, nor the rapid monitoring of drowning deaths by SUH are adequate alone to provide

comprehensive timely information for drowning prevention. Establishing a minimum set of information for the narrative section of the death certificate requires a more active interaction between rescue personnel, police investigators and forensic pathologists and could likely improve the quality of data collection and characterization of drowning events. Improving the quality of the newspaper reporting system, for instance, by expanding collaboration with local police authorities, would likely assist the SUH in improving its data. Ongoing linkage with SF data as soon as it becomes available would also provide an invaluable update to the value of SUH data, optimizing preventive messages conveyed to the public. There is a need to establish a national surveillance system for water-related fatalities, which combines the strengths of both systems, respectively timely and accurate data, with more detailed information concerning the drowning events and victims. Such a system, closely linked to public health programmes, in Finland could provide a more efficient tool for data collection, for analysis of risk factors and for the design of follow-up studies to develop and monitor prevention strategies.

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