

5-1-2015

## Tracking Fatal Drownings in Public Swimming Pools: A Retrospective Multiscale Investigation Within France

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### Recommended Citation

Vignac, Elie; Lebihain, Pascal; and Soulé, Bastien (2015) "Tracking Fatal Drownings in Public Swimming Pools: A Retrospective Multiscale Investigation Within France," *International Journal of Aquatic Research and Education*: Vol. 9 : No. 2 , Article 9.

DOI: 10.25035/ijare.09.02.09

Available at: <https://scholarworks.bgsu.edu/ijare/vol9/iss2/9>

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# Tracking Fatal Drownings in Public Swimming Pools: A Retrospective Multiscale Investigation Within France

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Regarding risks associated with activities of daily living, recreational activities tend to be major sources of domestic risks in France. We focused on fatal drownings in public swimming pools, intending to quantify them. We conducted an exhaustive overview of information sources that counted the number of fatal drownings in French public swimming pools. Our results underscored the fact that in spite of using numerous databases, it was impossible to accurately quantify the total number of fatal drownings. Gaps in data collection originated as a result of five main methodological issues that are discussed in detail in this article. Shortcomings regarding fatal drowning data gathering and processing enabled us to provide recommendations to key French stakeholders. In particular, our findings emphasize the critical necessity to establish a permanent national repository and database of fatal drownings in public swimming pools by gathering of data at the local level by aquatic and public health staff.

*Keywords:* public swimming pools, accidents, fatal drownings, water safety, injury prevention, emergency services

In France, 9% of people participating in sports activities had experienced a sport-related accident in the previous 12 months (Elfeki Mhiri & Lefevre, 2012). The study of sports accidents remain incomplete in many respects (Soulé, 2009; Ricard, Rigou, & Thélot, 2008). This problem is far from trivial, since the number of men and women who participate in some sort of broad sport context continues to grow as a result of policies aimed at combating sedentary lifestyles (Lefevre & Thierry, 2011).

One particular kind of serious sport injury related to aquatic activities is drowning. Quantifying fatal drownings might be seen as a simple accounting exercise.

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In his research on safety management in public swimming pools, Lebihain (2000) noticed that the data available in France allowed for only a rough estimation, ranging from a low approximation of 15 deaths a year to up to 80 deaths a year on the high end (Association Nationale pour la Prévention des Accidents en Piscine [ANPAP, *National Association for the Pool Accident Prevention*], 2000). The same conclusion has been drawn in other national contexts (Idris, Hoelle, & Papa, 2002; Ferretti, De Angelis, Donati, & Torre, 2014).

In France, currently we do not have sufficiently precise and comprehensive data to make a valid and reliable diagnosis on the prevalence of fatal drownings. Almost 15 years after Lebihain's pessimistic conclusion, the question remains open, as shown by the number of parliamentary questions receiving no satisfactory answer (Belhache, 2010). The goal of this study is to clarify the situation by tracking the fatal drownings occurring in a sample of French public swimming pools. The existence of fatal pool drownings seriously challenges the chain of supervision that is supposed to neutralize risk of drownings in these facilities (Soulé & Vignac, 2012). Knowledge about the number of accidents such as drownings occurring in a sports activity is the basis for preventing them (Bahr & Krosshaug, 2005). Based on an analysis of secondary sources, this study aims to provide a more accurate and reliable estimation of fatal drownings occurring in French public swimming pools.

## Review of Literature

There are a host of meanings associated with the term "drowning," not all of which are compatible. The absence of a standardized definition (Idris, Hoelle, & Papa, 2002) makes it impossible to collect data on drowning in a uniform manner both at local, national, and international levels. Furthermore, comparative studies as to the number of drownings and the reasons leading to their occurrence are very difficult to complete (Smith, 2006).

To encourage the development of scientific studies based on a common nomenclature, an international multidisciplinary working group was set up in 2003 with the intent to: (a) define drowning, (b) set up a uniform register for accident reporting, and (c) improve epidemiological knowledge to propose appropriate prevention measures and better treatment of victims. Taking up the proposal of this working group (which became known as the Utstein Style group), the World Health Organization (WHO) adopted the following definition of drowning: "Drowning is the process of experiencing respiratory impairment from submersion/immersion in liquid" (van Beeck, Branche, Szpilman, Modell, & Bierens, 2005). According to this definition which is the current standard used in peer-reviewed journals (Sempsrott, J., Slattery, D., Penalosa, B., Schmidt, A., Crittles, T., 2011), "fatal drowning" is the term ascribed to a person who has died by drowning (Bierens, Knape, & Gelissen, 2002; Seghers, 2002; Dorp, Knape, & Bierens, 2003). Hence, anyone who has not died of accidental submersion/immersion in a liquid should be described as a "nonfatal drowning."

The main goal of this study was to explore the current means of reporting drowning accidents in France. It included a close examination of the procedures used to quantify fatal drownings in public swimming pools in France. We chose the WHO definition of drowning which was based on the conclusions of the Utstein Style group to address the question of drowning without ambiguity and to avoid confusing terminology.

## Method

Eight unique sources capable of providing information on the number of fatal drownings in French public swimming pools were identified and explored over a 10 year period using three geographic scales: (a) the country of France as a whole, (b) the *département* of Calvados (France being administratively divided in 101 *départements*), and (c) the “agglomeration community” of Caen la mer (metropolitan government structure grouping a *commune*—here, Caen and its suburbs). In the framework of a doctoral thesis on drowning risk management in the public swimming pools of Caen la mer, the *département* of Calvados actually became a “laboratory” for testing the relevance of different French information sources on fatal drownings. Such a territorial focus limits the extent of the investigation which was necessary for implementing an in-depth study as proposed. Most available indicators (in particular the most reliable ones) were indeed produced at *département* and *commune* levels. Even if the objective was a national accounting, the multiscale approach became a methodological necessity since local sources provided the basis for a “test” of the accuracy and reliability of the national data. Soulé (2002) had already demonstrated the value of such an approach for estimating the number of accidents occurring in French ski resorts.

In-depth understanding of the accident reporting mechanisms was facilitated by carrying out nine interviews, lasting on average one hour each. The nine interviews comprised two interviews at Service Départemental d’Incendie et de Secours 14 (SDIS, *fire and rescue services department*) (with a sergeant in charge of operational statistics); three interviews at Caen Centre Hospitalier Universitaire (CHU, *Caen Teaching Hospital*) with an emergency doctor and forensic doctor in charge of Logiciel de gestion des urgences (UrQual, *emergency management software*) deployment; two interviews (emergency doctor, general practitioner, dispatching operators) and an observation of the Service d’Aide Médicale Urgente 14 (i.e., SAMU, *urgent medical aid service*) operation; and one interview at Direction Départementale de la Cohésion Sociale 14 (DDCS, *Department Directorate for Social Cohesion*) with a youth and sports inspector.

Combining a documentary investigation methodology with such interviews enabled us to have a comprehensive and detailed overview of existing information in France. Table 1 summarizes (a) the different sources likely to provide data regarding drowning accidents in French public swimming pools; (b) the definition of drowning adopted; and (c) the methods used to gather data.

## Analysis of Sources

Within this section, we have identified two types of information sources. The first type mentions sources which actually produce data regarding the number of fatal drownings in public swimming pools (regardless the level of detail). The second type is dedicated to sources that are supposed to produce and/or gather data relate to those drownings, but which eventually proved to be inaccurate and unreliable, mostly because of methodological issues.

**Table 1 Overview of the Nine Primary Sources Investigated**

Source	Actors Involved	Definition of Drowning	Method
InVS	Various emergency services: SAMU, fire and rescue service, SNSM, police, gendarmerie, CROSS, rescue associations	WHO definition	For each drowning accident, emergency services requested to complete and transmit the form provided by the InVS
CépiDc	Doctors, Agence régionale de Santé (ARS, <i>Regional Health Agency</i> ), Institut National de la Santé et de la Recherche Médicale (INSERM, <i>National Institutes of Health and Medical Research</i> )	Drowning that has led to death or started the morbid process	Death certificate completed by doctor, passed on to the ARS and then INSERM for statistical processing by CépiDc
Press (print media)	Print journalists	Search uses wide variety of terms associated with drowning	Interviews with victims, family/friends, facility operators, rescuers
SAMU/SMUR	Emergency doctors	Cases of death or threat of death in any liquid medium	Reports on call-outs completed on the scene and then archived (not computerized)
CHU	Doctors, interns	Hospitalization following a drowning (medical approach to drowning)	Patient's medical data entered into UrQual database
SDIS	Fire and rescue service (crew managers), officer in charge of statistics	Assistance to person in danger of death in water	Crew manager must enter details of call-out through computerized interface within 72 hr
DDCS	Operators of aquatic facilities, Youth and Sports Inspector	Accident entailing serious risks for victim's health (fatal accident; accident with risks of fatal consequences; accident whose sequelae raise fear of total or partial invalidity)	Operator must inform DDCS and Prefecture of a serious accident on a special form
Caen la mer	Swimming instructors-lifeguards, rescuers, facility managers, legal department	Victim requiring intervention from a lifeguard in water and rescue services	For each accident, the lifeguard completes a form transmitted to the legal department for archiving

## Sources Providing Data Regarding Fatal Drownings in French Public Swimming Pools

**Drownings Survey of the Institut de Veille Sanitaire (InVS, French Institute for Public Health Surveillance).** This survey is the national reference for statistical data on fatal drownings in France. Data from five administrations of this survey were available, starting in 2003 (see Table 2). The survey provided data on the number of drownings, distinguishing the types of bathing and three geographical levels: (a) national, (b) region ( $n = 27$  in France), and (c) department. The survey counted drowning incidents that were followed by death or hospitalization. The main limitation that should be mentioned is contextual, since the InVS focuses on drownings occurring during the four summer months (June to September). This method is biased for assessing the number of drownings in public swimming pools which may occur year-round.

**Centre d'épidémiologie sur les causes médicales de Décès (CépiDc, Center for Epidemiology on the Causes of Death).** For every death, French law requires that a death certificate be completed by a doctor, giving information on its medical causes (detail of the “morbid process,” i.e., the pathology—Decree no. 2006–938 of 27 July 2006, Order of 24 December 1996). The Registry of the *Town Hall* then transmits part of the certificate to the Agence Régionale de Santé, which does not process the data but simply collects the documents to pass them on to the Institut National de la Santé Et de la Recherche Médicale. Data are then coded according to the *International Statistical Classification of Diseases (ICD 10)* by the CépiDc, whose task is to then produce statistics on the causes of death in France and ensure the distribution of the data.

The 21 chapters of ICD-10 contain 16,000 codes which make it possible to quantify, by simple statistical extractions, the number of deaths by drowning in public swimming pools (<http://www.cepidc.inserm.fr/inserm/html/index2.htm>). In the ICD-10, under the heading, “External Causes of Accidental Injury,” it is possible with the aid of the subvariable code, “place of occurrence” (e.g., places such as tennis court, riding school, gymnasium, skating rink, stadium, baseball pitch, cricket pitch, golf course, hockey pitch, or squash court), to identify and isolate drowning deaths that occurred in a public swimming pool.

The results of the search revealed that since 2003 only 15 cases of drowning in public swimming pools (of which one occurred in Calvados in 2009) had been registered by CépiDc (see Table 3). This figure is astonishingly low in light of the most optimistic estimations mentioned previously in this article.

Many cases seem to not be recorded by ICD-10 or to be coded using other reference terms such as Ferretti et al. (2014) had shown wherein 80% of drowning deaths ( $n = 887$ ) were coded under code ICD W74 “unspecified drowning.” In this regard, Smith and Langley (1998) have pointed out that in some cases drowning is

**Table 2 Annual Fatal Drownings in French Public Swimming Pools Per Year According to InVS**

Year of Survey	2003	2004	2006	2009	2012
Fatal drownings	5	8	5	6	8

**Table 3 Annual Results of CépiDc Search “Number of Deaths by Drowning in Public Swimming Pools” by ICD-10 Codes**

	2003	2004	2005	2006	2007	2008	2009	2010	2011
W74.3	2	0	0	0	2	1	2	2	0
W67.3	1	1	0	1	1	0	1	1	0
TOTAL	3	1	0	1	3	1	3	3	0

coded as an underlying cause rather than the main cause, and that when misclassifications occur, these errors are very difficult to discover later. Other specialists (Szpilman et al., 2012; Smith 2006; Moran 2010) make the same observation, underscoring the existence of significant errors in coding such as when fatal drownings in swimming pools are coded as “unspecified drownings.” The explanations given by the SAMU doctor who was interviewed seems to confirm this concept:

When a doctor completes this certificate, it’s always done in haste and in an emotionally-charged situation, so [completion] of the certificate (i.e., lower medical part) is very often bungled. Moreover, in their training, doctors are not taught how to complete death certificates.

He also stated,

For the cause of death in a swimming pool [referring to an accident that had happened in our research area, in the town of Hérouville Saint-Clair], I’m sure I wrote as cause of death (in the “morbid process”): 1, cardiorespiratory arrest, 2, drowning, and that’s it! I certainly didn’t add 3: in swimming pool.

In fact, because they often are unaware of the complex ICD-10 taxonomy, doctors often seem to complete this document inadequately. Other studies have identified large international variations within data on drowning produced in this way (Smith & Brenner, 1995; Langlois et al., 1995; Smith, 1996). The question is whether the variations are due to real differences in the numbers of drownings or to a methodological problem linked to the coding of a complex taxonomy. Mackie (2006) explained that the ICD-10 is not a sufficient mechanism for coding death statistics. It is necessary to triangulate the data with other reliable sources (e.g., newspaper accounts, reports from rescue services, coroner reports) for more detailed and confirmatory information. Such an effort has in fact been undertaken by the International Collaborative Effort on Injury Statistics which carries out studies beyond the ICD to collect data needed for investigating the causes of fatal drowning. Coding differences are actually an important factor in the underestimation of the accident phenomenon in several countries (Smith, 2006).

**Press analysis.** We carried out a daily survey of media coverage of drownings in public swimming pools on a national scale starting in early 2013. By comparing the information from different vectors (e.g., RSS feeds, Google, and Twitter alerts) we were informed in real time of any fatal drowning in public swimming pools, in accordance with the recommendations of Ferretti et al. (2014) who advocated that the press and the Internet are valuable sources of gathering data on fatal drownings.



By this means, throughout 2013, we discovered five fatal drownings in public swimming pools somewhere in France.

Second, we made a retrospective analysis of newspaper accounts over 10 years, targeting public swimming pools drowning events. We primarily used the information database, *Factiva*, in which we searched using specific terms, in conjunction with Boolean operators OR, NOT, AND. Keywords entered into the database search engine included: *noyade(s)*, *noyé(s)*; *center aquatique*, *complexe nautique*; *stade nautique*; *parc aquatique*; *piscine publique (communale, communautaire, municipale)* (i.e., in English: drowning(s), drowned; aquatic center/complex/stadium/park; commune/community/municipal pool). Produced by Dow Jones and Reuters, *Factiva* offers full-length articles from several thousand international titles including newspapers, magazines, and transcripts of TV programs. In particular, it covers titles from the French press such as *Le Monde*, *Liberation*, *L'Express*, *Le Figaro*, *Le Point*, or *Les Echos*, as well as local daily newspapers.

From the start date of first January 2003, *Factiva* returned 790 articles for the whole country. This broad sweep should have allowed little information to slip through. The reading of these 790 articles led to the identification of 14 cases of fatal drowning in a public swimming pool. The potential redundancy of information for the same case is the main source of error in these estimations. Among the 26 cases of nonfatal drowning returned by *Factiva*, 10 presented a vital prognosis given at the time of the intervention by the emergency services. It is mostly impossible through using *Factiva* as a media source to know whether such accidents ended up being fatal or not.

Through *Factiva*, we obtained demographic information including: (a) the sex and age of the drowning victim, (b) his/her condition at the time of the event, (c) the place of hospitalization, (d) the means of transportation used, and (e) the type of facility (conventional pool, play pool, municipal pool, or public swimming pool [PSP] managed by a private company). By contrast, it can be assumed that the national press is only moderately interested in drownings in public swimming pools, which are “minor” items often of more interest to the local press. For a more complete overview, we would have needed an equivalent of *Factiva* that allows exploration of the local press.

## Inability of Local Sources to Provide Fatal Drowning Information in Public Swimming Pools

Sources mentioned below had initially been identified as a means of getting information regarding the quantification of fatal drownings in PSPs. For many reasons, they turned out to be inadequate to our purpose. In spite of their uselessness for our study, we have detailed the different factors leading to this negative conclusion to appreciate the origins of dysfunctions and obstacles. Hopefully, this analysis may allow us to propose alternatives that may improve future quantification efforts.

**SAMU/SMUR 14.** There is a SAMU in every French department. The SAMU of Calvados makes an average of 5,000 “primary interventions” a year. At the scene of an accident, “secondary intervention” is the medical transportation of a patient from one hospital to another. For each of the primary and secondary interventions, a paper report is completed. The archive is not computerized, making an



examination of each paper file impractical (i.e., some 50,000 for the considered period) to identify the interventions that followed a fatal drowning in a public swimming pool. By chance, the secretary of SAMU 14 had kept the account that she had passed to the InVS in the context of its survey on drownings. These files only reported sea drownings except for one that happened in a private swimming pool.

We fortunately realized that the InVS had not requested data from the SAMU of Calvados during the time period between 2002–2012 when we had done the national survey on drownings. Fatal drownings might consequently have occurred in this department without having been inventoried by the InVS. We hypothesize that other local sources of drowning statistics also may have been forgotten, reducing the accuracy of the InVS accounts.

It is interesting to underline that in SAMU call-out reports, no information is given as to the causes of the fatal drowning or its characteristics. Very often the victim is reported to have drowned simply because he/she was rescued from water or close to water. For those found dead, only the autopsy reports (such as those ordered by a judge in the event of a medico-legal situation) can provide further detail. The medico-legal department of the CHU is not allowed to provide such reports because they are the property of the Ministry of Justice and may under no circumstances be divulged except by authorization of the State Prosecutor which requires a very complicated process in France.

**Caen Teaching Hospital (CHU) and the UrQual database.** The UrQual computer database is used to record the medical parameters of patients admitted into hospital through the reception process and the treatment of emergency cases. The database has been designed to produce the documents necessary for their medical and administrative monitoring. Regarding drownings in public swimming pools, the UrQual database is interesting since drownings occurring in a public place followed by medical transportation are automatically directed to the emergency services of Caen CHU. UrQual has been in use at Caen CHU since January 1, 2006. Its records indicate 49 cases of both fatal and nonfatal drowning.

Drowning is coded in the thesaurus based on ICD-10 under the circumstantial qualifiers (FT751) “drowning and non-fatal submersion.” By reviewing this medical database, one is able to obtain information on the circumstances under which the drowning happened as well as the place and type of drowning. In addition to medical data, the statistical part of UrQual records the place and the means of transportation (e.g., fire and rescue service, SAMU, ambulance). To consult the 49 files registered, we used a relatively complex procedure of “noninterventional checking of data.” The Commission Nationale de l’Informatique et des Libertés (CNIL, *National Commission on Information Technology and Liberties*) authorization was necessary as well as the favorable opinion of the ethical committee if the information was intended for eventual publication. This procedure was not undertaken because in addition to the complexity of the retrieval process, the risk of approximation was quite high, especially since different configurations of the software were used for adult and pediatric emergencies.

A multitude of encoding categories (e.g., main diagnosis, reason for admission) through a thesaurus was still under construction and incomplete. The medical examiner in charge of the Medical-Legal Unit who also is responsible of UrQual development illustrated one example challenging the database: No trace of two

cases of drowning which he can distinctly recall could be found. To make sure as little data as possible were excluded, we performed multiple searches. For example, the symptoms (e.g., respiratory difficulty) are sometimes recorded as the reason for admission rather than the central causal mechanism (e.g., drowning). An epidemiological study based on the data produced by UrQual would require that users who are mainly doctors and interns have a thorough knowledge of the index which does not seem to be currently the case.

**Calvados Fire and Rescue Service (*Service départemental d'incendie et de secours, SDIS 14*).** The “services départementaux d'incendie et de secours” are fire and rescuers units that operate under the aegis of the Ministry of Interior. Units are located in each of the 101 French departments. The Calvados service manages call-outs and rescues at the level of this *département*. Its statistics processing software (called ARTEMIS) codes and archives call-out reports. The database has been in operation in Calvados since 2011 and during the period from 2011–2014 it has registered only two drownings in swimming pools (private ones in both cases, with no information provided as to the outcome of these accidents). It turns out that the code, “drowning,” essentially is used for those occurring in a natural environment, especially on the coast; drownings in public swimming pools usually are recorded through the codes “collapse in public place” or “unconscious person.” The fire and rescue service hardly ever uses the code, “drowning in swimming pool,” because when they arrive on the accident scene, the victim most often has either been removed from the water by the lifeguards and is therefore no longer in a drowning situation or is unconscious in which case they are then classified as an “unconscious person.” In principle, the wording of the caller determines the reported facts on the call-out sheet which generates the categorical numerical data.

In PSPs, if the lifeguard uses the words “drowning” or “near-drowning,” these terms will appear on the report. In addition, “when a lifeguard calls us out, it’s because there’s an emergency,” and there is a threat to life. It is the reported threat to life that is identified to the emergency processing center (i.e., the Centre de Traitement de l’Alerte, CTA, *Center of treatment of the fire and rescue services*). Circumstances that led to the life-threatening situation often remain in the background because knowing whether the person is conscious or not is the main question for the SDIS.

The critical nature of the emergency at the time of the call, combined with the presence of trained staff in swimming pools, makes it impossible to evaluate precisely the number of interventions by the fire and rescue service in public swimming pools for drowning accidents or incidents. Available data quantify drowning interventions by the fire and rescue service in public swimming pools of Calvados in a broad sense, but they also may include instances of hypoglycemia, heart attack, or asthma. Moreover, the reports stored in the ARTEMIS database do not provide details on the circumstances of accidents. What they do make possible is the production of overall statistics of activity, based on the state of the victim at the time of the call-out. SDIS 14 receives requests from the InVS for its drownings surveys. When the firefighter in charge of statistics has difficulties completing the questionnaire on drownings, especially those related to public swimming pools, a “trawl for information” is then launched, mainly based on the collective memory of SDIS members.

**Serious Accident Procedure (DDCS 14).** This is a reporting procedure common to all “sports and physical activities establishments” (EAPS) in France. Since 1993 (Decree of 1993, Article 322–6), the Code of Sport has required the operator of an EAPS to inform the Direction Départementale de la Cohésion Sociale (DDCS) of its department in case of any serious accident. There is a specific form for reporting such events through the website of the Ministry of Sport. Data are collected at the level of the department and then the whole country. It should be noted that this procedure excludes accidents occurring within school time. Its laudable aim is to protect users and bring to light malfunctions, especially regarding compliance with national rules. It also provides feedback to the Ministry as to whether the current regulations are adequate. The first problem arises in the definition of a serious accident: it leaves a large scope for interpretation to the operator. In addition, we interviewed 16 managers and instructors of aquatic facilities to find out whether they were aware of the existence of this requirement. Results of our interview revealed that at local level the reporting procedure was unknown in 90% of the cases. This lack of awareness revealed a second problem: The absence of any effective sanction against operators who fail to file a report which undoubtedly aggravates the phenomenon.

**Accidentological data on the public swimming pools of Caen la mer.** At the local level, data were collected in two ways. First, we inspected archives of the conglomerated facilities (216 altogether): registers, accident reports, insurance claims, and logbooks. This examination enabled us in some cases to go back as far as 2003. For some facilities, unfortunately a large part of the archives had been destroyed. ANPAP’s “Maires 2000” survey nonetheless underlined the limited reliability of the information collected which contained many errors and omissions: “We were often told that there had been a drowning in the pool some years ago, but no written record remained of it.”

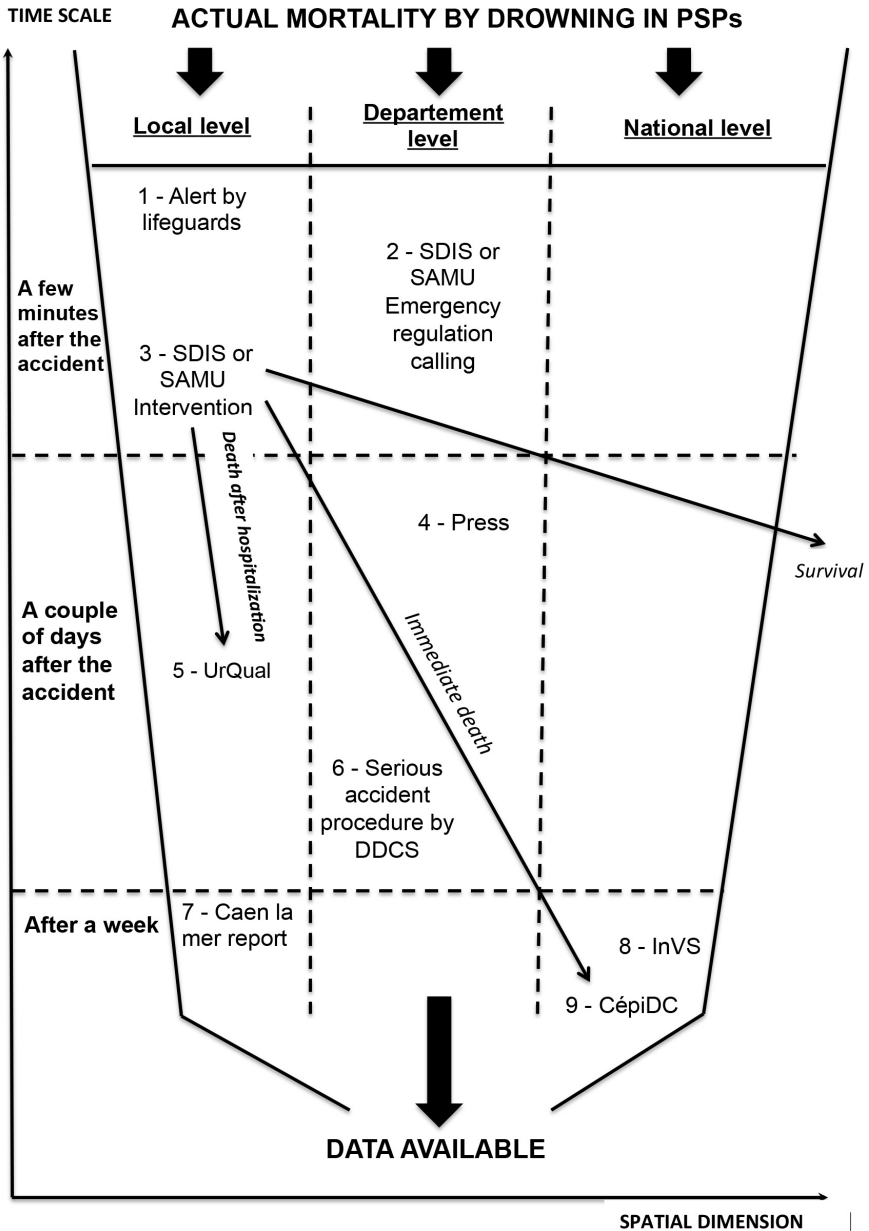
## Synthesis of Results and Analysis

The various mobilized sources unveiled an intricate complexity. To clarify the analysis, we have modeled the different channels of accident reporting. The X-axis is time-related, while the Y-axis relates to the geographical dimension (see Figure 1).

Table 4 offers a global overview of our gathered data. It discloses important gaps and shortcomings, resulting in an estimation of fatal drownings that is much lower than the most optimistic hypotheses evoked in the paper’s introduction. We set out in Table 5 a summary of the usefulness and limits of each source that we investigated.

We summarize the results of our investigation into five categories of shortcomings leading to substantial approximation as to the actual number of fatal drownings that may occur each year in French public swimming pools.

1. Availability of some data (e.g., Caen la mer) mostly depend on stakeholders’ good will, since the corresponding procedures are not mandatory, but only discretionary.
2. The CégiDC and SDIS data set suffered from subjective and/or poorly described categories. Since such codes entail quite a bit of interpretation, they are not reliable.



**Figure 1** — Model of reporting channels for drowning accidents in French public swimming pools (PSPs).

3. Some data (like those of SAMU 14) were not computerized. Despite its potential relevance, lack of digitization and computerization makes this information impossible to exploit especially since the number of reports is considerable.
4. Some sources (e.g., InVS, press, Urqual) clearly lack comprehensiveness.
5. Noncompliance with the requirements to report serious accidents (e.g., in the case of the DDCS) creates a serious problem with data gathering, availability, and accuracy.

## Practical Applications

Taking into account these results, we have made several recommendations. We limited ourselves to the most feasible possibilities. Out of the eight sources, six were particularly likely to benefit from this analysis (see Table 6).

## Conclusions

The collection of quantitative data on fatal drowning in PSPs was held back by a number of methodological barriers which make this question a “blind spot” in our knowledge. The relative rarity of fatal drownings in PSPs the existence of multiple definitions of the accident phenomenon known as “drowning,” the diversity of the available emergency services (and therefore of the many actors who apply varying degrees of rigor), and the underuse of the statistical software and nomenclatures made available to the emergency services (either through lack of training or unawareness of their usefulness) make it impossible, at the present time, to evaluate precisely, or even generally to within 50 cases, how many people have drowned in PSPs. A similar conclusion is even more marked in the case of nonfatal drownings (Moran, 2010). We also observed a lack of pooling of the information and database sources (although this is clearly necessary at the national level) over the long term which argues strongly for the creation of a national registry of drowning in public swimming pools. The absences of such a registry prevents learning from experience that has clearly proved effective in other areas of risk prevention and management. Even if it serves as a useful starting-point, the InVS survey is based on fragile foundations, which can in turn give rise to debatable conclusions and interpretations, particularly on the part of the media and the general public.

This study confirmed our conviction that accidentology and incidentology should be constructed closer to the local level at sports facilities by adequately-prepared professionals themselves to produce reliable data. Our findings also confirmed that any retrospective analyses must take a route through the local level. Data at the local level were very poorly developed; very few swimming pools undertake this learning from experience, essentially because of lack of time, out of a sense of culpability, and perhaps also because of a fear of disturbing shared internal responsibilities. As Lebihain explained, “There is no common documentary base that can give an account of the few reflections . . . , as if an accident was an admission of failure and it was shameful to talk about it.” Ironically, such a review of and reflection on experience is precisely what could enable organizations and facilities to learn from their mistakes.

**Table 4 Global Overview of Gathered Drowning Data for French Public Swimming Pools (2003–2014)**

Geographic Scale	Source	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
National	In VS	5	8		5			6			8		
	CépiDC	3	1	0	1	3	1	3	3	0			
	Presse	1	1	0	0	0	0	1	3	2	4	5	2
Départemental	SAMU 14												
	SDIS 14												
	DDCS 14												
Local	UrQual												
	Caen la mer									1			

**Table 5 Synthesized Information From the Different Types of Sources, Their Usefulness, and Any Limitations of Data**

	<b>Geographic Source</b>	<b>Data Collected</b>	<b>Usefulness</b>	<b>Operational Limits?</b>
CépiDc	National & local	Yes	Exhaustive source on deaths by drowning, with possibility of refining research in public swimming pools	Complexity of ICD-10 taxonomy; doctors' unawareness of all available variables; lack of training
DDCS 14	National & local	No	Gathers details of serious accidents at the local level, collected at national level to learn from experience	Pool operators unaware of this procedure; lack of sanctions in case of nonreporting; vagueness of the definition of a "serious accident"
InVS	National & local	Yes	National reference, best-known approach, based on different sources	No reporting from some emergency services; survey covers only a third of the year (i.e., 4 summer months)
Print media	National & local	Yes	Provides a threshold of cases of drowning with strong media impact Media watch (RSS feeds, Google, and Twitter alerts) makes possible, through correlation, the counting of cases of drowning appearing in media (more or less exhaustively)	Software and search method do not make it possible to count all cases of drowning in public swimming pools (which do not appear systematically in media); criteria for media attention to drowning little known
RéAC	National & local	No	Data collected with great precision; amount of information provided on the circumstances of accident, techniques attempted, and state of the victim	Cardiac arrest following drowning or drowning following cardiac arrest?
SAMU 14	Local	No	Precise medical data	Data entry in process of standardization in SAMU and SMUR of France
SDIS 14	Local	No	Fire and rescue services are systematically present when an accident requires emergency services in a public place	SAMU 14 call-out reports not computerized; large quantity of reports does not make it possible to identify cases of drowning in public swimming pools Coding of reason for call (and often for dispatch) makes call-out reports unsuitable for identifying all cases of drowning in public swimming pools; call-out reports very succinct
UrQual	Local	No	Exhaustive source on emergency admissions (including pediatric); precise information on circumstances of drowning (to assist doctor in diagnosis); possibility of obtaining information on outcome for patient	Research teams must assemble a scientific project to have access to these medical records



**Table 6 Recommendations to the Different Stakeholders**

Source	Recommendations
CHU de Caen	Raise awareness of the different CIM 10 codes among medics Point out the importance of producing epidemiological data regarding drownings, and especially the victims' future Share the same thesaurus for the different services within the CHU
InVS	In spite of its approximation, the most relevant source in France Draw attention of public authorities to the necessity of a really comprehensive survey launch, on a regular and consistent basis Include the different rescuers' organizations systematically, as well as PSPs' managers Broaden the scope of the survey to secondary mortality
SDIS	Convince firemen to gather precise data regarding their rescue activity in PSPs, especially while writing accident reports (i.e., include the root cause)
DDCS	Call to order the managers of aquatic facilities regarding the mandatory declaration of serious accidents
SAMU	Raise awareness of the different CIM 10 codes among medics Point out the importance of producing epidemiological data regarding drownings Prompt physicians to fill out the death certificates accurately Equip each SAMU in France with software for the purpose of handling an inventory of medical operations through CIM 10 The computerized interface between firemen and SAMU should be effective for the whole French territory
Managers / Caen la mer / Lifeguards	Raise awareness of the importance of producing data regarding drownings among lifeguards and managers Adopt the InVS's drowning declaration form Comply with the DDCS's procedure of declaring serious accidents

In the light of these observations, we strongly encourage future research studies which include methodologies in which different sources can be compared such as listening to and analyzing the context of emergency calls in detail. We also envision disseminating a questionnaire to a significant sample of SAMU dispatching doctors as well as the fire and rescue service crew managers with the ultimate aim of gathering information to be contributed to a national database or clearinghouse on drowning that would include local branches.

### Acknowledgment

This article was written as part of a doctoral research study funded by the agglomeration community of *Caen la mer* (Normandy, France) and the Association Nationale de la Recherche et de la Technologie (ANRT; *National Association for Technological Research*).

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