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Disaster Deaths Research Challenges

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Abstract

This study is a first-order overview at consolidating limitations and gaps in disaster deaths research. Thirteen factors in four groupings are identified. Grouping A examines the definitional challenges of (1) disaster, (2) event, and (3) hazard and vulnerability classifications. Grouping B examines data to use in terms of (4) skewed statistics, (5) category choice, (6) prevented deaths, and (7) non-immediate deaths. Grouping C looks at people's behavior for (8) risk judgments, (9) risk-related actions, and (10) warnings. Grouping D focuses on the analysis of (11) the relative importance of factors, (12) death rates, and (13) the geographic distribution of deaths. Some disaster deaths data might not be collectable. However, not all policies to reduce disaster deaths might need complete data or detailed science to support their implementation. The main recommendation is that disaster deaths research should focus less on partitioning data and analyses by hazard and instead try to resolve vulnerability characteristics for reducing disaster deaths, irrespective of the hazard.

Key Words: casualties, deaths, mortality, research challenges, vulnerability

Disaster Deaths Research Challenges

Despite impressive and interdisciplinary work regarding the causes and circumstances of deaths from disasters, this field requires plenty of further research, particularly to ensure that policies and practices are based on robust and comparable evidence. This study is a first-order overview at consolidating research limitations and gaps in disaster deaths while seeking ways of overcoming the challenges. Literature examining deaths in specific disaster events was examined, which does not include the literature on loss of life modeling or disaster-related injuries. Events covered include astronomical phenomena (such as meteorites or comets striking or grazing Earth), avalanches, earthquakes, floods, heat and cold, landslides and related phenomena, lightning, storms (including cyclones and tornadoes), tsunamis, and volcanoes. Examples of other events to be considered are cold weather phenomena other than temperature (such as blizzards, freezing rain, and ice storms), disease, drought, hail, insect and other animal attacks (macrobiological hazards), wildfires, and wind. Thirteen factors in four groupings are identified for disaster deaths research challenges.

Grouping A: Definitional Challenges

1. Disaster. A particular difficulty is determining how to exclude deaths from non-disaster events since not all fatal events are disasters. An example is fifteen solo snowmobilers dying in fifteen separate avalanches compared to three neighboring families of five people each dying in the same avalanche. The definition of disaster affects which fatalities are considered when tallying avalanche disaster fatalities.
2. Event. Consistently defining start and stop times for disasters can be difficult. For example, lahars on Mount Pinatubo continued killing more than a decade after the 1991 eruption (e.g., Gaillard 2002). As well, aggregating and disaggregating events by geographical area, timeframe, and sequential versus simultaneous occurrences is often arbitrary. For instance, if one event hits multiple countries, some studies consider that to be multiple events (EM-DAT 2007).
3. Classifications. Hazard and vulnerability categories frequently overlap and are not always consistently defined. One database (EM-DAT 2007) labeled Bangladesh cyclones as wind storms even though studies state that most deaths were from drowning in the storm surge, so perhaps the event should have been labeled as a flood. Some earthquake-induced landslide deaths have been labeled as both earthquake deaths and as landslide deaths while tsunamis have many origins, yet their deaths are often pooled as tsunami deaths.

Grouping B: Data to Incorporate in Analyses

4. Events, small and large, can skew statistics in three ways. First, a single large event could radically alter long-term trends. The literature does not report any human deaths from a meteorite strike in recorded history, but a single large event could dwarf the total death toll from all disasters over the past millennium. Second, underreported small events have less influence on overall statistics

than they should have, which is termed "invisible disasters" problem (La Red et al. 2002). Third, hazard and vulnerability baselines are changing suggesting difficulties in establishing trends.

5. Similarly to factor (2), choices occur regarding how to classify some fatality data. For example, if a pregnant woman is killed, some jurisdictions count the fetus as a separate death (HCME 2005). Meanwhile, disaster deaths studies vary about whether or not they include homicides and suicides as disaster-related deaths. For storm deaths, some tolls include traffic crashes, yet others label those as traffic but not storm deaths as discussed by Jonkman and Kelman (2005). A similar discrepancy arises from crashes induced by wildfire smoke.
6. Deaths can be prevented due to a disaster event, such as fewer traffic crashes if people do not drive in a blizzard or if they stay indoors due to a hurricane. Should disaster deaths researchers calculate background rates of all "normal" deaths and add or subtract any differences following a disaster? Or should the focus be only to identify who is clearly killed in a disaster rather than worrying about overall rates? As well, some studies have noted that in the months and years following a major event, the background rate of deaths can decrease, because the disaster killed the most vulnerable members of the population who would have soon succumbed to "normal" death causes without the disaster. This observation has been termed "the harvesting effect" (e.g., Grattan 2005, 2006).
7. Non-immediate deaths from disaster-related physical or psychological complications can occur months or years after an event. This factor relates to the longer-term public health impacts of disasters, especially factor (2) regarding when an event stops.

Grouping C: Understanding People's Behavior

8. Judging and misjudging risks, including possible consequences, occurs prior to and during disasters, often influencing whether or not an individual is killed or survives.
9. Once a judgment is made regarding risks, the form of risk-taking or risk-avoiding actions influences fatalities, especially active versus passive risk taking or risk avoidance. An example is climbing an erupting volcano for photography or gas samples compared to poverty forcing people to live in slums on a volcano's slope.
10. Warnings are sometimes highlighted as being one of the most significant behavioral influences in disaster deaths, regarding how the possibilities for warning and responding to warnings influence the factors leading to death.

These factors have strong links and overlaps with many confounding factors including whether a disaster event kills directly or simply exposes chronic conditions that would have killed the same people anyway.

Grouping D: Data Analysis Approaches

11. The relative importance of factors analyzed can vary, especially the sensitivity of results to many of the issues raised here.
12. Rates of deaths (also termed mortality) might be more important for policy and practice than absolute numbers of deaths.
13. Geographic distributions of deaths should be further analyzed, both by comparing multiple scales and by comparing multiple locations.

Discussion

Strong connections occur amongst the different points, but no ranking of importance is implied in the order given above. Two main conclusions are that for disaster deaths research, basic methodological choices influence the results and that consistency is not always evident in studies. This conclusion, however, is not necessarily a consequence of inadequate research. In contrast, most studies are robust, needed, and helpful within the contexts which they define. Six main impediments to disaster deaths research are identified that explain the inconsistencies and the difficulties inherent in resolving the concerns, because some disaster deaths data might not be collectable:

1. Collecting detailed fatality data is not always a post-event priority.
2. Formal death records with all the information requested might not always be available.
3. Treating bodies and the bereaved with proper respect is important, and, in some situations, might preclude collecting desired data.
4. Disaster deaths data can be colored by political agendas that inflate numbers to attract help or that reduce numbers to avoid outside attention and intervention or to minimize compensation.
5. Determining the decision making process of each individual fatality—for example, understanding

how a warning was received (or not received) and acted upon (or not acted upon)—is challenging. Techniques for doing so are not always transferable across different event types or circumstances.

6. For establishing long-term trends, much data has been irreversibly lost.

Additionally, policies that are known—or just assumed—to be effective are often difficult to prove with research. For example, at least half of all flash flood deaths in the United States are said to occur in vehicles and the "Turn Around, Don't Drown" campaign is based on that premise (see http://tadd.weather.gov). Anecdotally, this campaign saves hundreds of lives each year—or more. But data on decision-making process, blood alcohol content, and vehicle type rarely appears in studies. Yet we know for certain that alcohol impairs judgment and reaction time, so do we really need to calculate the percentage of vehicle-based flash flood drownings who were drunk? Similarly, a debate raged in one journal regarding the safety of cars versus mobile homes in a tornado although extensive scientific data were not available.

Finally, after the research-related deaths of a dozen volcanologists in the early 1990's, Codes of Conduct were developed for volcano research (IAVCEI 1994, 1999). Research codes of conduct are a good idea, but given the small sample size of volcanologist deaths, it would be challenging to prove that the codes save lives. Is such proof relevant to implementing the codes of conduct? These examples suggest that certain aspects of disaster deaths might represent cases where policies and practices can be developed and implemented without solid scientific research or detailed data as a basis.

This information is useful for moving forward with disaster deaths research. In particular, accepting and admitting the severe limitations of disaster deaths data analysis, as many authors do, should be done all the time. That does not mean stopping the work, either the scientific publication or the policy influence. More cross-hazard work would be most important, rather than being isolated with one's preferred hazard. Additionally, more consistency might be possible in studies by sometimes using other authors' methods and spreadsheets rather than always inventing one's own for a specific study. That includes applying the papers that propose disaster deaths frameworks and seeing if common data collection methods and categories might be helpful across hazards. Overall, disaster deaths research should move away from the tendency to focus on hazard parameters and to compartmentalize research by hazards. Instead, disaster deaths researchers should focus more on resolving vulnerability characteristics, irrespective of the hazard.

Notes on References

This paper was written on the basis of approximately 100 publications, focusing on peer-reviewed journal articles and books at the exclusion of conference proceedings, dissertations, or unpublished work. About two dozen of the publications used were review papers or completed detailed literature reviews of their hazard-specific areas, describing and analyzing between a dozen and a hundred other references—and including conferences, dissertations, and unpublished work. Therefore, this paper covers approximately 700 disaster deaths references of all forms, approximately 15% directly and 85% by proxy. Due to length restrictions on and the large number of references used for this paper, these references are not provided in this document. Instead, references are listed and updated at www.ilankelman.org/disasterdeaths.html

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