Chapter 10
Epidemiology in War and Disasters

1. Introduction

Over the years, whether with my mentors, colleagues, or my own students, I have noted different pathways that led them to choose epidemiology as a career. My choice for a career in public health and epidemiology was made as a medical student in the mid 1960s at the American University of Beirut. Two experiences were critical for my choice:

1. In the summer of 1965, I joined a small group of my fellow second year medical students on a research assistancehip with Dr. Nadim Haddad in field studies of the epidemiology of trachoma and its vaccine trials in the villages of South Lebanon. As one of the first ophthalmologists ever to become an epidemiologist, Nadim was able to get us excited about the whole field and its potential over sandwiches under an olive tree close to the villages where our field surveys and vaccine trials were taking us. I was soon to realize that epidemiology was as “scientific” as what we were exposed to in biochemistry and physiology.

2. During the winter of 1966 a major poliomyelitis epidemic was sweeping through Lebanon but more so in some of the poorer agglomerations. As a group of medical students we took the initiative of starting a mass vaccination program in some of the same villages that we were involved in our trachoma field research. Faculty volunteered to help us in this effort and most of our weekends during that winter were spent in this vaccination campaign. In the process we learned a lot about the epidemiology of poliomyelitis, in particular, how our preventive strategy could become more effective by our knowledge of the epidemiology of the disease within that particular socio-cultural environment.

Following graduation from medical school and after 3 years of residency training in internal medicine, a fellowship from the Commonwealth Fund in
1971 allowed me to spend about 3 years at the Department of Epidemiology at Johns Hopkins University with Abraham Lilienfeld as my advisor and a host of leaders in the field as my professors. My doctoral thesis topic had a specific focus on prostate cancer epidemiology (1,2) and I was trained probably as one of the first chronic disease epidemiologists from Lebanon and the Arab world.

Within a year of getting back to the American University of Beirut, the civil war erupted in Lebanon. The public health and other issues related to the war were very acute and serious. At this point, a shift of interest towards the use of epidemiologic methods for studying war related issues as well as disasters started to assert itself in my professional reality.

A two-year stint at the Ministry of Health in Bahrain during the oil boom period allowed me to be engaged on a number of levels in health services research. This was a period where my perspectives in epidemiology and public health were broadened and a number of unique health services developmental experiences streamlined my maturation as an epidemiologist (2-7).

In 1978, back in Beirut as a faculty member, I became the acting and later the Dean of the Faculty of Health Sciences at the American University of Beirut between 1981 and 1986. In partnership with faculty colleagues and students we were able to develop a number of epidemiologic studies on the effect of war related factors on specific diseases as well as the general health conditions. This was also an opportunity to develop emergency systems in health monitoring and providing a database for public health decision making for various agencies in the field like the UNICEF.

It was during this period that I developed a personal philosophy that has been an important guideline for my personal and professional life: how to turn a moment of adversity into positive achievement. An adverse and horrible situation, like the civil war around us had led many of our colleagues into a long period of professional retrenchment. Our alternative to retrenchment at the Faculty of Health Sciences was to initiate a number of investigations as to the short and long term effects of the major human disaster that was the civil war. It was important to learn from these disasters and wars to prevent excessive morbidity and mortality in such situations in the future. These were opportunities for learning and information that one may try to take advantage from. A meeting with Dr. Jens Amlie from the
ICRC led to our getting engaged as a Faculty of Health Sciences in a historically unique program of surveillance and monitoring of the health conditions and diseases of the population of a city under siege. West Beirut was under siege from the Israeli army and the University was within the part of the city under siege. All the government services were disrupted or paralyzed and the donor agencies and local community groups were in need of a continuous assessment of the health situation in the city under siege. Over a period of four months, the school of public health served as the hub where much of the public health activities were being initiated in the city assisted by our epidemiologic surveillance and investigation system (8). As will be described later on in this chapter, our engagement in this epidemiologic surveillance and investigation project in a city under siege set the model for a number of population based projects that the Faculty of Health Sciences carried out in the ensuing two decades.

There are very few individuals, if any, who are full time professionals in disaster epidemiology. Circumstances and situations may impose on any epidemiologist to work in a disaster situation. Thus, one needs to be well prepared to deal with such situations. Anyone of us may be the next person to be called upon in our communities to render services in a disaster situation and one may be the only epidemiologist available there.

In December 1988 following the massive earthquake in Northern Armenia, the Soviet Union of Gorbatchev opened up to Western assistance. As part of a diasporan Armenian assistance group we were in Yerevan within 3 weeks of the earthquake. While much of the assistance was focused on the delivery of humanitarian aid, and in the absence of any effective health monitoring system in the earthquake zone, we focused with our colleagues from the Computer and Information Services of the Ministry of Health of Armenia on a surveillance and monitoring system of the health of the survivors of the disaster. This was also an opportunity to introduce a number of modern epidemiologic methods to a country in the Soviet Union where epidemiology had a very traditional infectious disease-microbiology base.

Some of the issues with the development and implementation of appropriate epidemiological investigations in situations of war and disasters will be presented in the next section.
2. The Interface of Epidemiology and Services in Disasters

In this section we will start with a review of important landmarks and innovations that have marked the use of epidemiology in disasters over the past 50 years.

Acute problem solving, like in outbreaks, has been at the core of early epidemiologic activity in disasters. Introduced in the late 50s and early 60s, this approach improved disaster epidemiology at the operational level. In one of the earliest reviews of the role of epidemiology in disasters, Saylor and Gordon (9) use the concepts of epidemic investigation to disasters. They propose epidemiologic terminology and methods for solving problems in disaster situations. For them, a single impact disaster can be studied like a point epidemic, and in general, the medical problems during the disaster can be studied along distributions of time, place and persons.

Michel Lechat (10) introduced multidimensional models in disaster epidemiology. He proposed a model for purposes of organizational-planning, and for the long-term evaluation of disaster prevention programs in public health. Lechat classified the time frame for studying problems of disasters as during impact, post impact and in the long term.

War and its long-term impact on human health have catalyzed interest towards longitudinal methods in the epidemiology of disasters. The best-studied cohort of a population exposed to a disaster is the longitudinal cohort studies of the Atomic Bomb Casualty Commission in Hiroshima and Nagasaki. Other longitudinal studies of the long-term health effects of war include studies of concentration camp survivors and psychological studies of other subgroups exposed to the major trauma of war and other violence (11-12).

Over the past four decades, a special unit at the Pan American Health Organization, under the leadership of Claude de Ville de Goyet, has produced an important literature dealing with various aspects of disasters including the use of epidemiologic methods. As proposed by de Ville de Goyet, epidemiology needs to be involved at all levels of disaster relief operations (13).

Thus, the role of epidemiology in disaster situations should include:
1) Surveillance and development of an action oriented information system;
2) Disease control strategies for well defined problems;
3) Assessment of the use and distribution of health services facilities;
4) Etiologic research on conditions related to disasters and related issues;
5) Initiation of efforts for the long-term development of surveillance and investigation systems in the community.

The following are some examples of projects that were conducted in wartime and during disasters that highlight the role of epidemiology in such situations.

A. Emergency Health Surveillance and Monitoring Program in Beirut

Within days of the siege of West Beirut by the Israeli army in the summer of 1982, the international agencies became cognizant of the lack of data and reliable information about the health conditions in the city under siege. A program was funded by the USAID and carried out by the faculty and students of the Faculty of Health Sciences at the American University of Beirut, to assess the health situation and identify major health problems for intervention and assistance. The four components of the program included:

1. Continuous surveillance and monitoring of hospitals and dispensaries;
2. A population based residential morbidity survey;
3. The setting of an epidemiologic investigation unit;
4. A system for continuous data analysis and reporting. Organizationally, a project management team had daily meetings to oversee problems and a total of 35 persons worked on the project at any one time (8).

One of the interesting observations from this program was that the major problems of acute morbidity in this population were the diarrheas, and the respiratory and childhood infections. There were no epidemics of major reportable communicable diseases. As per our household surveys mental health problems were rampant in the population at large (14). Three monthly reports were produced in addition to other reports produced for special purposes. The findings were directed to a citywide public health action committee that met regularly with participation from local groups as well as international agencies working in the city. As part of the program a mobile
laboratory was established to monitor water quality in all the neighborhoods and this helped direct the UNICEF’s safe water distribution project.

As part of this program, a study was conducted of all the agencies providing emergency aid in the summer of 1982 in Lebanon. The analysis included an assessment of the approaches for material, personnel and cash flow in these organizations. Bottlenecks were identified, and unnecessary duplication of effort and other problems were listed. As a conclusion it was proposed to develop an interagency database geared towards disaster management (15).

B. Etiologic Research

While the civil war was in progress in Lebanon, the faculty and students of the Faculty of Health Sciences conducted a number of analytic epidemiological studies to investigate the effect of war related factors on various conditions of morbidity.

In 1975-6 while studying patients delivering at the University hospital, we observed with the medical students that during the war period patients required significantly less postpartum analgesia. The literature review revealed one previous report by Beecher (16) of a similar observation in American soldiers post operatively during the Second World War. Using appendectomy as a model and after adjustment for a number of variables, we were able to confirm that patients undergoing uncomplicated appendectomies during the war required significantly less analgesics and narcotics compared to patients undergoing the same operation in peacetime (17).

A case-control study was conducted of determinants of arteriographically assessed coronary artery disease (CAD) in wartime Beirut. Compared to normal controls, patients who had experienced two and more major war events had an odds ratio of 2.4 for severe CAD. Daily exposures, like crossing the green line separating the fighting groups had a similar adverse effect in the development of CAD (18).

Other analytic studies assessed the effect of wartime stressors on rheumatoid arthritis, enuresis in children and breast cancer. None of these studies identified any significant associations with wartime stressors.
C. Epidemiology following the Earthquake in Armenia

As part of our assessment of the health conditions in the population surviving the 1988 earthquake in Armenia, we initiated first a rapid case-control study of determinants of hospitalized injuries from Leninakan (Giumri). As a result of this study we were able to identify protective behaviors during the earthquake as well as factors like building type and location during the earthquake as determinants of serious injury (19).

The monitoring of the health of the population was conducted through a special cohort of 33,000 employees of the Ministry of Health from the earthquake region and their families. Following the collection of baseline epidemiologic and disaster experience data, this cohort was followed up for four years as to the long-term effects of the earthquake. The longitudinal follow up of the population revealed that much of the excess long term mortality and morbidity was limited to the first six months following the disaster; an observation that was partially made previously following the earthquakes of Thessalonica in Greece and Naples in Italy (20-21).

A geographically stratified sub sample of 1,785 adults were the respondents of a psychiatric questionnaire that assessed mental health problems about two years following the earthquake. This longitudinal cohort approach was unique not just for Armenia and the Soviet Union but also had not been done on this scale in previous earthquakes. During the two years following the earthquake, about 60% of this adult population had symptoms that could fulfill the diagnosis of either PTSD or depression; the risk of PTSD and depression was related to the amount of loss in the individual’s family. Sharing the experience at the moment of disaster with someone else and receiving support early on were protective factors for mental illness (22-23).

3. Information for Decision Making

Epidemiology is an information science, since, as a discipline, it aims at influencing decision making in a number of situations. Individuals, health professionals, and policy makers use data generated in epidemiology as information, albeit in a transformed format, for making decisions in dealing with various problems. The value of information is a function of its validity,
its utility to multiple users, our ability to use it in multiple situations (generalizability), the timeliness with which it is provided, its distribution, its amount, and the cost of producing it. These same principles apply when dealing with data generated during war and disasters.

The test of the work conducted by epidemiologists is in the appropriate use of the information generated. The examples provided in the previous section have highlighted the potential utility of such information. An organized approach to data collection in disaster situations assists us to improve decision-making and predict a variety of options we need to face. As presented in figure 1, our previously presented three-dimensional conceptual matrix assesses disasters along levels of action (ecologic and personal), type of action (preventive, curative, and rehabilitative), and timing of action (pre, during and post impact). Such a three-dimensional matrix will be useful for analysis, planning, and research in epidemiology during disaster situations.

Based on this model, we developed two-dimensional matrices that can be used to list the various decisions that one may need to make at the different phases of the disaster. Thus, at the pre-impact phase, the decisions are concerned about delineating the at-risk subgroups of the population and assessing the emergency preparedness and the flexibility of the existing surveillance system. During impact, characteristics of the affected population and the need for services have to be assessed quickly, while the post-impact phase needs information on long term rehabilitation and health services reconstruction. The epidemiological investigation has to cater to the information needs of the decision-action process of the specific disaster and, thus, it cannot be detached from it (24-25).

The problems related to implementing epidemiologic investigations under conditions of war and disaster have been described in previous publications and will be briefly summarized. Having presented in the previous section investigations during war and a natural disaster, we will next highlight some of the differences between these situations in particular as it relates to the difficulties facing the epidemiologist:

1. Disaster epidemiology, in particular epidemiology in wartime, provides the opportunity for the professional to be involved in acute problem solving situations and to be instrumental in having a direct impact in relieving human suffering. We have heard in the past some criticism of epidemiological investigations in disasters and in particular in wartime on
moral grounds. If war is considered a disease at the societal level that causes death and suffering to millions of human beings every year, then war is an important problem that needs to be studied by epidemiologists at various levels of operation. (26) Following the principle that the epidemiological investigation will have to serve the needs of decision makers in such situations, and that the information generated could be used for preventive action for future disaster situations should dampen such criticism.

2. Compared to natural disasters where events are more acute, war has both epidemic and endemic presentations as exemplified by the endemic civil wars of the third world in particular in Sub-Saharan Africa. In many of these endemic war situations the acute single impact or point epidemic model of disaster epidemiology does not apply. In most wars, we are dealing with a situation that is constantly and dynamically changing with periodic exacerbations and remissions.

3. In wartime, the personal risk for injury and harm during collection of data and fieldwork is very real and serious. There is more than a moral responsibility that one carries in initiating epidemiologic investigations under conditions of war. Thus, the first decision one has to make is whether the data collected will influence significantly decision making to an extent of saving lives. Such a risk benefit analysis is important particularly as it relates to the immediate needs of the situation rather than potential benefits at some future time and place. Thus, in both Beirut during the civil war and in post earthquake Armenia, our investigations were part of a surveillance and monitoring system of the health of the population and would serve the needs for decision making of public health programs in the short and long term (27-28).

4. If we are interested in the determinants of injuries and death during war, we may be hampered by inappropriate or inadequate data because of the sensitive military nature of such information. It may be difficult to conduct liberal interviewing of the affected population.

4. The Will and the Challenge for Action

Considering that as health professionals we are under the moral obligation of providing humanitarian assistance and relief in a disaster situation, most epidemiologic initiatives have been primarily used to assist in the disaster relief efforts rather than to address some basic research concerns related to
the disaster and the prevention of morbidity and mortality in future disasters. Thus, because of our primarily utilitarian concern, methodological innovations have been relatively few in disaster epidemiology over the past fifty years.

Although, over the past couple of decades efforts have been made to develop rapid and valid epidemiological assessment techniques to be used under such circumstances, the majority of epidemiologists are ignorant of these techniques and standard epidemiological textbooks have shunned away from presenting such approaches.

Epidemiologists have traditionally focused on issues of validity and reliability of data in ascertaining various sources. No systematic effort has been made to assess such issues of validity and reliability of data sources in a disaster situation in addition to the completeness, accessibility and timing of these sources.

In this chapter we have highlighted some of the responsibilities that epidemiologists may carry during disasters and wartime. However, much of what is being done in this area is palliative rather than preventive. Philosophically we may have no difficulty in accepting a role as public health professionals in the prevention of disasters in particular man-made ones, but when we get to wars as a disaster situation, we may not be as clear about our commitment in its prevention. This is where we need to have concerted action by all health professionals in order to influence the political process and milieu that leads to such wars. Developing a consensus within and between our international professional organizations is a good place to start. Assisting other organizations working for peace and justice is another option.

The will to be involved in action during disasters and wars is what probably most epidemiologists have. Getting involved is a challenge very few of us will actually get the opportunity.

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REFERENCES


Figure 1. A model for assessment and planning in disaster preparedness