HEALTH AND HURRICANES IN THE DEVELOPING WORLD: A CASE STUDY IN THE DOMINICAN REPUBLIC

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A CASE IN THE DOMINICAN REPUBLIC

An Abstract of a Dissertation

Presented to

The Faculty of the Graduate School of International Studies

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ABSTRACT

This is a study of the public health consequences of a 1979 hurricane disaster in the Dominican Republic, an evaluation of the health relief that followed the disaster, and an investigation of the role that three communities played in their own protection and recovery.

The epidemiology section of the study used data from provincial and community levels. The provincial data, covering approximately three and one half years prior to and one and one half years following the disaster, demonstrate delayed-impact epidemic increases in typhoid fever, gastroenteritis, measles, and hepatitis. The delays represented two to three generations of the incubation periods of the pathogens, resulting in peak incidences one to six months following the hurricanes. Previous studies have failed to show these delayed-impact epidemics.

The community-level data were obtained by surveys administered two weeks and two years after the disaster. These data showed an approximately ten percent injury rate (mostly lacerations), and post-disaster increases in several infectious diseases, supporting the aforementioned provincial data.

In the evaluation of the post-disaster relief efforts we found several flaws. 1) Health relief was designed primarily to ameliorate acute trauma-induced problems and neglected measures to treat or prevent infectious disease. In fact, most health relief terminated before the epidemics occured. 2) The Ministry of Public Health failed to redirect a sufficient amount of the nation's medical resources to the most devastated areas, which are medically underserved in normal times, and

failed to use its own epidemiologic data for outbreak detection and monitoring. Relief providers agreed that most of their problems resulted from a lack of organization rather than a lack of supplies.

The investigation of the communities' responses to the hurricanes revealed two basic problems that augmented the public health threat, lack of knowledge and lack of compliance. The population had little idea of what kinds of dangers the storms would present, and knew little about post-disaster disease prevention measures. When such measures were suggested by national authorities via radio, community compliance was low. All three communities expressed a desire to diminish these problems by increasing local emergency response capacity.

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TABLE OF CONTENTS

CHAPTER ONE

INTRODUCTION

Problem Statement

Natural disasters[1] occur once every 8.5 days.[2] Since the conclusion of the Second World War, the international community has provided succor to disaster-affected communities within nations where the indigenous resources are, or are perceived to be, insufficient to protect the health and welfare of the disaster-affected population. Even though billions of dollars are spent annually to provide relief to disaster victims in developing nations,[3] we know little about the health effects of disasters, or the effects or effectiveness of the relief provided.

> Almost all of these programs have one thing in common: they repeat the mistakes which have been made countless times before and they rarely take advantage of lessons learned in other similar situations. The reason for this is simple: useful data on the performance of humanitarian assistance programs is

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[1] Disasters are events of relatively sudden occurrence which overwhelm the capacity of the community to protect the health and welfare of its population. These may be natural environmental events (weather-related, seismic disturbance, etc), man-made events (such as wars or nuclear accidents) or some combination thereof (such as dam failures after an earthquake). This work focuses on the hurricanes that hit the Dominican Republic in 1979, but most of the principles presented here are transferable to other types of disasters.

[2] Stephen Green. International Disaster Relief: Toward a Responsive System (New York: McGraw-Hill Book Company, 1977).

[3] Lynn H. Stephens and Stephen Green, eds. Disaster Assistance: Appraisal, Reform and New Approaches (New York: New York University Press [UNA-USA], 1979).

> money spent on relief, welfare, disaster reconstruction or development programs will have only limited effectiveness.(4)

The above statement is particularly pertinent in relationship to the focus of this research: the health care provided to victims of major natural disasters in developing countries. The author has conducted this study in keeping with the well-accepted premise that we must understand morbidity and mortality patterns before appropriate health service planning, implementation and evaluation can take place. For years disaster health care has been provided in developing countries, using both domestic and international resources. However, the disaster morbidity and mortality data required for good disaster response planning have been remarkably inadequate.

There are complicated reasons for the poor evaluation of disaster health care and compelling reasons for improving our evaluative processes. Although disaster health care is generally provided only for a short time after a natural disaster, it is both notably expensive and has the potential of positively (or negatively) affecting the quality of many people's lives. Thus, there is a need to evaluate whether disaster health care is effective in achieving its humanitarian goals and efficient in making maximum use of the available financial resources. As a result of growing fiscal restraints, it is increasingly important that every dollar invested in disaster health care be effectively spent.

While the evaluation of general humanitarian aid has probably lagged because of misguided notions about its inherent goodness,

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4 Alan J. Taylor and Frederick C. Cuny. "The Evaluation of Humanitarian Assistance," in Disasters, Vol. 3, no. 1, 1979, p. 37.

competition among agencies, or a desire to avoid spending donor funds for the administrative function of evaluation, disaster health care has doubly suffered because it is difficult to evaluate. The most basic type of evaluative information -- a needs analysis -- has hitherto been unavailable. Until the last decade, there were virtually no scientific studies of the effects that disasters have on the health of a population. As a result, disaster health care planning has been based on information provided by press reports, rumors, individual experience and guesswork. Frequently used health care system evaluative methodologies, such as systems analysis, have been difficult to apply to the field of disaster health care for two reasons: extreme variation in responses to disasters and the virtual impossibility of keeping accurate records. Disasters present themselves with a great deal of variation in such characteristics as type of disaster agent, magnitude of the event, damage done to the local population, and effects on transport and food storage. In addition, the human and organizational responses to the disasters vary significantly due to factors like population resource base, local political ties with (or against) potential relief donors, local government policies or willingness to receive aid from the outside. Concentration on the provision of relief activities during the post-disaster emergency period virtually prohibits accurate recordkeeping. Relief priorities combine with the above mentioned extreme variations in disaster-caused problems and responses to make the systems analysis approach to studying and evaluating disaster health care unuseful.

Patient outcome studies have not been used due to an inability to keep records on and follow through with individual patients, and because disaster health teams frequently leave the work site before patient outcome can be reasonably assessed.

Some of the above constraints also apply to the reason studies of disaster epidemiology have progressed slowly: recordkeeping is extremely difficult in disaster situations and is often seen as unnecessary annoyance, the involved parties often do not stay on-site very long; and developing countries frequently have poor baseline health statistics prior to the disaster. Yet without good epidemiologic information about what happens to a population's health as a result of a natural disaster, health relief planning is guesswork, and evaluation unthinkable.

It is only because of recent advances in the study of disaster epidemiology that we are now able to begin to consider examining the "goodness of fit" between emergency health care provided after a disaster in a developing country and the "health needs" that the disaster created. This research is an attempt to do just that, in the context of an understudied type of disaster -- the Caribbean hurricane. The goal of the study is to provide epidemiologic insight into the types of health needs occurring as a result of a Caribbean hurricane, and using this information, to evaluate the goodness of fit of the health relief provided in the Dominican Republic following Hurricanes David and Frederick in 1979. It is intended that the study will be used as a reference for regional preparedness and relief planning, and as a stimulus for further research.

The Organization of the Study

This study is divided into three major sections: (1) an epidemiologic investigation of the health effects of Hurricanes David and Frederick; (2) an evaluation of the disaster health care provided; and (3) an exploration of three communities' reactions to the hurricanes and the role each community played in its own post-disaster health outcome. The epidemologic section has two major data sources: government collected diagnosis reports at the provincial level, and local data collected in three small rural communities by way of two population surveys as well as interviews with local leaders, health promoters and emergency health care providers. The first survey was completed two weeks following the hurricanes while the second survey was finished two years later.

The evaluational section uses the epidemiologic data generated in the first part of the study to estimate "need" and, using this estimation, it analyzes the goodness of fit between the need and the care provided. The second part of the evaluational section is based on the administrators' experiences in most of the key relief organizations operating in the Dominican Republic during the hurricanes, and includes their problem reporting and evaluations. Assessments provided by relief recipients in the three survey communities are also included.

The last section of the study deals with the role the population plays in determing its own disaster health outcome. The author examines community reactions, attitudes and knowledge, as well as the population's actions which either protected or further endangered its health.

This study is significant in several ways. It is the first research known to the author that generates epidemiologic data about a disaster and then uses these data to help evaluate the health care which was provided after the disaster. It is also the first study to incorporate an examination of the population variable as this variable affects disaster health outcome. Furthermore, it is one of very few studies about the epidemiology of hurricanes, and it is the most complete study of its kind completed to date. The author hopes that this study will be directly useful in the planning of future hurricane relief and indirectly helpful by way of stimulating further research in the field. It is only through such research that disaster health care can be offered in a rational manner.

CHAPTER TWO

PREVIOUS WORK ON DISASTER HEALTH ISSUES

The serious study of the health effects of natural disasters is less than two decades old. Because the field is young and the literature quite limited, a small number of published articles have had inordinate influence on the direction of thought in the field. One of the major findings of this research is that previous authors have made the mistake of extrapolating from the health consequences of earthquakes to broad statements covering disasters in general.

Prior to the time that scientists began to apply the principles of epidemiology[1] to the study of disasters, most information about the health consequences came from press reports and the reports of individual health care practitioners who had worked in the relief effort. These reports were largely anecdotal and evidenced a lack of understanding of how one evaluates the health of populations. The result of reports from untrained observers who were unfamiliar with the pre-disaster state of health in developing countries was a generalized belief that disasters cause epidemics of infectious disease. The press reports were so unanimous in reiterating the disaster -- epidemic phenomenon that the relationship came to be common "knowledge."

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[1] Epidemiology is the study of the cause and distribution of health problems within defined human populations. It combines the tools of biomedical, social, and statistical sciences.

Three independent movements coalesced to initiate interest in studying the health effects of disasters in a scientific manner. First, "third world" disasters came to be seen, as Phillip Knightly says, as a "growth industry."[2] In the post-war period, governments became increasingly involved in providing disaster succor to nations that had limited resources. In fact, disaster relief became an integral part of some foreign policies. At the same time, the non-governmental voluntary agencies began to grow in size and management complexity. As government involvement became more intense (and expensive), and the voluntary agencies (known as volags) became more complex, both groups began to realize the need to apply standard management techniques to the running of such large operations. Early attempts to evaluate them largely centered on an examination of so-called "process" or "through-put" variables, and treated the delivery of goods and services as the conceptualized goal of disaster relief.

This type of "evaluation" was popular with volags which receive the majority of their funding from private donations, because organizations could demonstrate their productivity by releasing a list of goods and services delivered to disaster victims. Eventually, however, outside researchers, government, and organization managers came to realize that the delivery of goods and services was only a tool in bringing about post-disaster succor. What needed to be evaluated was the effectiveness of organizations in mitigating the negative effects of disasters. Faced with this reorganization of disaster relief

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[2] Phillip Knightly. "The Wrong Disaster Aid," The Washington Post, July 9, 1978, p. B2.

evaluation, administrators and scientists came to realize that the health effects of disasters were essentially unknown, and that this was a crucial element in the ability to evaluate disaster health care. This realization helped stimulate research into the health effects of disasters, as one step in the process of evaluating disaster relief. We are only now beginning to reach the point where we can start to use disaster health research in evaluating the effectiveness of disaster health care.

The second independent movement, and one which actually preceded the realization that disaster relief involved more than an emergency delivery service, was the development within the field of sociology of the study of human behavior in disaster situations. This development was at least partially stimulated by U.S. Government interest in the issues of emergency response,[3] which was expressed through National Science Foundation funding of works such as L.M. Killian's An Introduction to Methodological Problems in Field Studies in Disasters.[4] A disaster research center was set up at Ohio State University and the serious study of disasters progressed quickly over the ensuing decades. Although the organized examination of disasters involved some rather difficult methodological and epistomological problems, it became clear from these studies that much could, in fact, be learned about human

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[3] Karl A. Western. "The Epidemiology of Natural and Man-Made Disasters - The Present State of the Art," doctoral dissertation submitted to the London School of Hygiene and Tropical Medicine, June 1, 1972, pp. 27, 28.

[4] L.M. Killian. An Introduction to Methodological Problems in Field Studies in Disasters, National Science Foundation, 1957.

response to emergencies. It also became increasingly clear that we did not know much about what happened to a population's health during and following a disaster, which was an important component of the overall analysis of how disasters affect communities.

The third independent movement which stimulated the development of disaster epidemiology was the post-war growth in the study and use of epidemiological methods in the examination of population health. Although the concepts of epidemiology had been used for more than a century in the study of infectious diseases as well as conditions like scurvy, the advent of antibiotics and the resultant decline in the relative importance of infectious diseases stimulated the use of epidemiological methods in the study of everything from chronic disease to the relationship between government economic policy and population health. When it became clear that we needed to know the effects of disasters on human health, epidemiology was the recognized method of choice.

Organized disaster epidemiologic research and the publishing of its findings grew rapidly in the decade of the 1970s, largely because of three institutional commitments to the field. The Centers for Disease Control in Atlanta made a commitment to send trained epidemiologists to major disasters.[5] The Universite catolique de Louvain in Belgium set up a disaster research center within its School of Public Health, headed by Dr. Michel Lechat. Finally, the Pan American Health Organization set up

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[5] Western, op. cit., p. 31.

an Emergency Preparedness and Disaster Relief Coordination Unit, which took as one of its main purposes the study of the health effects of disasters. This unit was headed by Dr. Claude de Ville de Goyet, previously of the Louvain School of Public Health.

The major international works that resulted from the support of the above institutions were based on findings from studies done on the 1970 Bangladesh cyclone, tidal wave and civil war,[6,7] the 1972 earthquake in Managua, Nicaragua,[8,9] the 1976 earthquake in Guatemala,[10] and more recently, the 1980 earthquake in Italy.[11,12] To the international works were added findings from studies done on smaller

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[6] Alfred Sommer, and Wiley H. Mosley. "East Bengal Cyclone of November 1970," LANCET I, May 13, 1972, pp. 1029-1036. Hurricanes

[7] Lincoln Chen, ed. Disaster in Bangladesh, (New York: Oxford University Press, 1973).

[8] Raymond L. Coultrip. "Medical Aspects of U.S. Disaster Relief Operations in Nicaragua," Military Medicine, November 1974.

[9] Ministerio de Salud Pública (Nicaragua). "Encuesta sobre algunos Efectos Demográficos y de Salud del Terremoto de Managua," Managua, Nicaragua, 1974.

[10] The principal articles have been written about this disaster by such authors as Claude de Ville de Goyet, Michel Lechat, H. Spencer, Roger I. Glass, A. Romero, etc.

[11] D. Greco, with A. Faustini, F. Forastieri, M.R. Galanti, M.E. Magliola, M.L. Moro, P. Piergentili, F. Rosmini, M.A. Staze, S. Luzi, L. Fantozzi, R. Capocaccia, S. Conti, A. Zampieri. "Epidemiological Surveillance of Diseases Following the Earthquake of 23rd November 1980 in Southern Italy," Disasters, Vol. 5, No. 4, 1981, pp. 398-406.

[12] David Alexander. "Disease Epidemiology and Earthquake Disaster: The Example of Southern Italy after the 23rd November 1980 Earthquake," Social Science and Medicine, Vol. 16, 1982, pp. 1959-1969.

disasters within the United States by people such as Roger Glass.[13] The results of these studies are synopsized below according to disaster type, along with a brief discussion of morbidity and mortality findings, and problems in organizing relief operations. This will be followed by an overview of the policy-relevant statements which have been made, based on the findings of the relatively few disasters which have been studied so far.

Hurricanes

The major works on hurricanes are Sommer and Mosley's "East Bengal Cyclone of November, 1970",[14] Chen et al's Disaster in Bangladesh,[15] and "The Pattern of Morbidity After Typhoons in a Tropical Country"[16] by B. Velimirovic and M. Subramanian. The first two studies took place in the Bay of Bengal in 1970 to 1972, the latter in the Philippines after several typhoons in 1970. (The words "hurricanes," "typhoons," and "cyclones" are used interchangeably here denoting a circular storm, usually bred over tropical waters, with sustained wind speeds or seventy-four miles per hour or greater.) The Philippine typhoons left more than 800 dead and an estimated 3,300 people injured. The study followed health conditions in and around Manila for a little

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[13] Roger Glass, with Robert B. Craven, Dennis J. Bregman, Barbara J. Stoll, Neil Horowitz, Peter Kerndt, and Joe Winkle. "Injuries from the Wichita Falls Tornado: Implications for Prevention," Science, Vol. 207, February 15, 1980, pp. 734-738.

[14] Sommer and Mosley, op. cit.

[15] L. Chen, op. cit.

[16] B. Velimirovic and M. Subramanian. "The Pattern of Morbidity after Typhoons in a Tropic Country," International Journal of Biometeorology, Vol. 16, No. 4, 1972, pp. 343-360.

over a year after the storms. The authors found no increases in cholera or typhoid fever, and some large (but statistically insignificant) increases in pneumonia and gastroenteritis. Velimirovic and Subramanian stated that the lack of statistical significance was probably tied to the low numbers they were working with, and called for more studies of the health effects of hurricanes.

The two studies in Bangladesh made the startling finding that after almost 250,000 people died in the cyclone and tidal wave of 1970, the remaining population was healthier than the population of surrounding (but unaffected) areas, measured several months after the storms. The storm-caused mortality was highest in the oldest (70+ years) and youngest (0-4 years) age groups, and lowest among 35-39 year-olds. Females had higher mortality than males in all but the youngest age groups. The mean mortality was 16.5%. Sommer and Mosley suggested that the post-disaster drop in morbidity among the worst disaster-affected populations was because the weaker members of society all died in the storm. Further into the post-cyclone period there were significant increases in several infectious diseases, but these were related to the civil war and to extreme crowding in refugee camps.

Several less thorough studies have been done on hurricanes in the United States, such as the work of Queen and Stewart[17] in Texas after Hurricane Beulah. They reported treating a large number of cases of conjunctivitis, pyoderma, unspecified diarrhea, dehydration, upper

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[17] C. Queen and R.S. Stewart. "Physician Evaluating Medical Aspects, Effectiveness of Plans in Beulah," Texas Medicine, Vol. 63, 1967, pp. 124-130.

respiratory tract infection, and pneumonia. They did not use epidemiologic methods to investigate any medium- or long-term health effects.

As a result of the above major studies and several minor studies, the principal writers in the field of disaster epidemiology, such as Karl Western, Claude de Ville de Goyet and Michel Lechat, reached a consensus that hurricanes (1) probably cause only limited mortality (unless combined with flooding); (2) probably do not leave large numbers of survivors with traumatic injuries; and (3) probably do not result in significant increases in infectious disease, although they recognized that the possibility for them does exist. The above hurricane studies, with the exception of the Chen work, did not contain an investigation of the organization of disaster relief.

Earthquakes

The majority of the quoted epidemiologic work on earthquakes consists, in reality, of only two studies done on one disaster, the 1976 earthquake in Guatemala. This earthquake is estimated to have killed some 22,000 people and injured more than 75,000 more.[18] Claude de Ville de Goyet et al[19] found that mortality ranged up to 21.5 percent in a given community and that the most vulnerable age groups were ages 5-9 and above 60. Women had higher mortality than men. Typical injuries

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[18] G. Asturias Montenegro and R. Gaticia Trejo. Earthquake S.O.S. - Guatemala 1976, (Guatemala City: Girblan & Co. LTD, 1976).

[19] Claude de Ville de Goyet, with E. del Cid, A. Romero, E. Jeannee, M.F. Lechat. "Earthquake in Guatemala: Epidemiologic Evaluation of the Relief Effort," Bulletin PAHO, Vol. X, No. 2, pp. 95-109.

were fractured clavicle, spine, and pelvis. Little or no "crush syndrome" was reported. The ratio of injury to deaths was about 3.4 to 1. This group of authors had been involved in investigating rumored disease outbreaks in the first few post-disaster weeks, and all "outbreaks" proved to be unsubstantial. They did, however, report an increase in dog and bat bites.

Roger Glass, et al,[20] intensively studied one small community for clues to the etiology of the deaths and injuries. Five percent of Santa María Cauque's population died in the earthquake. The age distribution of deaths was similar to that in the previously mentioned study, but the age distribution of injuries differed; few people under twenty were injured, and the risk of injury increased with age. Again, women were more at risk than men, possibly because of the higher probability of osteoporosis in women. Eighty-two percent of the deaths and injuries were attributed to the effects of falling adobe bricks. The study concludes with the following:

> The major health consequences of earthquakes in Latin America consist not of the epidemics or famines that are over-popularized and relatively unimportant, but of the trauma that occurs within moments of the major quake.(21)

Numerous authors have used the findings of the above two studies in Guatemala as a basis for their own conclusions about the epidemiology of earthquakes, or disasters in general. The only other primary

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[20] Roger I. Glass, with Juan J. Urrutia, Simon Sibony, Harry Smith, Bertha García, Luis Rizzo. "Earthquake Injuries Related to Housing in a Guatemalan Village," Science, Vol. 197 (August 12, 1977), pp. 638643.

[21] Ibid., p. 643.

research this author could find was Hazel Weymes and Julius Holt's[22] mention of a clinic in Comalapa, Guatemala, where at four weeks post-earthquake, the primary complaint of seventy percent of the inpatients was infected wounds. Forty-one percent of the outpatients were seen for infections of the eyes, skin, and respiratory tract. Prior to the time that I started the literature review for this chapter, I was under the impression that a large number of original studies had been done on Guatemala, because mention of the Guatemalan findings is frequent in the literature. Only after close reading did I conclude that the data are almost exclusively derived from the two above-mentioned studies.

On the 23rd of November, 1980, well after this research project was under way, a large earthquake hit Southern Italy. The epidemiologic findings from this disaster have been chronicled by David Alexander[23] and D. Greco, et al.[24] Greco, et al, reported that the earthquake killed over 2,400 people and injured more than 7,500, for a roughly three to one injury/death ratio. The injury mortality rate was 5.6 per 100,000 for the entire earthquake-affected area, and as high as 119/100,000 population in the hardest hit areas. The percentage of the population injured was less than one percent (1,000/100,000) for the entire area, reaching a high of only 2.2 percent in communities which suffered the destruction of seventy-five percent of the available

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[22] Hazel Weyments and Julius Holt. "Rural Centre and City Slum After the Guatemala Earthquake," Disasters, Vol. 1, No. 2, 1977, pp. 90-97.

[23] Alexander, op. cit.

[24] Greco, op. cit.

housing. Thirty-two suspected epidemics were investigated, with only two being confirmed (one of gastroenteritis and one of hepatitis A). Neither outbreak was reported to be of serious proportion.

Alexander also reported that the earthquake did not have a highly significant effect on infectious disease. He did report small increases in upper respiratory tract infections, lice and scabies. Up to eighty percent of the children and old people in temporary camps in Campania and Basilicate contracted bronchitis or influenza.

Although it is not the focus of this study, some important epidemiologic work has been done on several man-made disasters. Notable examples are studies such as the Stewart, et al, report on delayed effects of A-bomb radiation in Hiroshima and Nagasaki,[25] and the works of Western[26] and Blix, et al,[27] on the famine which resulted from the Biafran War.

Relief

The literature covering the problems of relief after earthquakes is a little more abundant. Claude de Ville, et al,[28] found in Guatemala

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[25] Alice M. Stewart, George W. Kneale, Regina T. Kokoszynska. "The Case for Including Myelofibrosis Among Delayed Effects of A-Bomb Radiation" (Birmingham, England: Department of Social Medicine, Queen Elizabeth Medical Centre, August, 1980).

[26] Karl A. Western. "Nutrition and Population Surveys in Biafra, October - November, 1969." Paper presented at the American Public Health Association Annual Meeting, Houston, 1970.

[27] Gunnar Blix, Yngve Hofvander, Bo Vahlquist, eds. Famine: Nutrition and Relief Operations in Times of Disaster (Uppsala, Sweden: Almqvist & Wiksells Boktryckeri Aktiebolag, 1971).

[28] de Ville de Goyet. "Guatemala," op. cit.

that local and foreign emergency medical forces mobilized rapidly and began pouring into the earthquake impact zone. By day two, six foreign field hospitals had been set up in various locations and more were on the way. The one hundred bed U.S. field hospital in Chimaltenango was monitored for admissions and occupancy rate, with the finding that the patient load began to decrease rapidly after the ninth day. It was obvious that the emergency period was near its end, yet as of day fourteen, five two hundred bed packaged disaster hospitals had arrived in the country, and ten more were being sent.

This convergence continued. Hundreds of medical personnel and tons of pharmaceuticals poured into the country, often unannounced and usually uncoordinated. By day sixteen, there were over one hundred tons of pharmaceuticals in and around the airport that had been "emergency" airlifted. About ninety percent of these were unsorted, requiring a huge investment of man-hours in merely sorting drugs. This was made more difficult because many donors thought it necessary to airlift tons of useless material, such as outdated drugs, vitamin pills, and previously used disposable perfusion sets.

Foreign volunteers from neighboring countries were found to be at a distinct advantage over volunteers from more distant industrialized countries. Their command of the language and familiarity with local conditions enabled them to adjust rapidly to the situation and carry out their work efficiently. A number of foreign medical personnel without official connection to relief organizations had entered Guatemala, and they were found to be a net drain on transport and other logistical resources.

Luis Raggio, from the United Nations Disaster Relief Office, reported that one of the greatest disaster relief services was provided by the owners of small private aircraft in Guatemala who flew numerous relief missions in an untiring manner at their own expense.[29] He also cited the value of the U.S. helicopters and the unique gift from the Government of Belgium -- the free use of a military Hercules aircraft. On the other hand, Raggio mentioned the insufficient use made of the United Nations Disaster Relief Office (UNDRO) for coordinating the international response, and the inefficiencies which resulted from it.

Ian Davis[30] surveyed the emergency housing component of the Guatemalan relief effort. Thousands of tents had been flown into the country within hours of the earthquake. Many of these were quickly set up by the government in refugee camps. To many people's surprise, the populace refused to occupy the tents, even when forced to move in by gunpoint. People did not want to leave their old homesites where they had animals and their few salvageable possessions.

Davis' major conclusions were several. First, building homes for disaster victims is very expensive and not always well-accepted. It is better to assist them in rebuilding their own homes in a fashion which provides more disaster protection for the future. Second, this is made difficult because aid organizations have the incentive to produce

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[29] Luis Raggio. "International Response to Disaster in Guatemala," Disasters, Vol. 1, No. 2, 1977, pp. 8082.

[30] Ian Davis. "Housing and Shelter Provision Following the Earthquakes of February 4th and 6th, 1976," Disasters, Vol. 1, No. 2, pp. 8289.

homes which will look nice in the glossy photos shown to the donating public back home. Third, too many organizations usurped and overwhelmed local authority structures by imposing their own ideas and decision-making on them. Finally, at the heart of reconstruction problems in Guatemala were long-term disputes over land tenure. Considerable political turmoil, and at least one murder, were evidenced as competing power blocks vied with each other over the questions of reconstruction, resettlement, and land tenure.

In his review of the health relief after the Guatemalan quake, Michel Lechat[31] reiterated the points made by Claude de Ville, but added emphasis on the value of the post-disaster disease surveillance system used in Guatemala. The surveillance not only allowed relief directors to monitor health needs as they occurred, it also gave authorities the wherewithal to quash rumors of epidemics before they became sufficiently widespread to alarm the public. The same point was made by Alexander and Greco, et al, regarding the 1980 earthquake in Italy.

General and Policy-Relevant Statements

Although the number of actual studies of the health effects of disasters in resource-poor countries has been small, a larger group of authors has started to review the available evidence and interpret it for other scientists, relief administrators, and the public. The earliest and perhaps broadest attempt at this kind of work was Karl Western's doctoral dissertation, "The Epidemiology of Natural and Man-

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[31] Michel Lechat. "Considerations on Health Relief, Guatemala Earthquake, 1976," Disasters, Vol. 1, No. 2, pp. 9798.

Made Disasters -- The Present State of the Art," submitted to the London School of Hygiene and Tropical Medicine in 1972.[32]

On the question of the possibility of epidemics following disaster, Western stated, "We know very little about the risk of epidemics following disasters in poor areas of the world."[33] With that, he stressed the need to establish post-disaster disease surveillance systems and to continue carrying out normal medical care after the disaster. He added, "Studies of long-term effects of disaster upon a community are practically non-existent,"[34] while acknowledging that "The long-term effects of disasters may not develop for several years."[35] Western's work was clearly instrumental in stimulating further study in the field.

Although Western was relatively careful to avoid generalizing from one type of disaster to others, succeeding authors have not been as careful in their statements. John Seaman,[36] a physician with the London Technical Group, stated, "With the single exception of crowding of refugee camps without adequate sanitation and water supply, an increase in the transmission of communicable disease seems only rarely to have been associated with natural disaster."[37] Roger Glass made the

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[32] Western, op. cit.

[33] Ibid., p. 94.

[34] Ibid., p. 101.

[35] Ibid., p. 100.

[36] John Seaman. "The Effects of Disaster on Health: A Summary," Disasters, Vol. 4, No. 1, 1980, pp. 1418.

[37] Ibid., p. 15.

statement even broader when he wrote, "Despite popular beliefs to the contrary, outbreaks of contagious diseases are found infrequently after natural disasters even when they are specifically monitored as they were after the earthquake in Guatemala and the record snowfall in New England in 1978."[38] Both statements are generalizations based mainly on earthquake-supplied evidence, for which there is a good argument that the lack of disease transmission results because earthquakes cause people to disperse, rather than congregate. (This argument is better explained in Chapter 5.) Neither statement specifies the mechanisms of disease transmission or why some kinds of disasters might result with different disease experiences than do others. Claude de Ville, however, did mention one specific aspect of disease transmission, and still managed to generalize. He wrote, "It is difficult to see how a disaster can seriously worsen a situation where no sanitary infrastructure existed and standards of personal hygiene were poor."[39] Dr. de Ville seems to have forgotten that there is <u>always</u> some kind of sanitary infrastructure. People simply do not live in their own excrement, and different kinds of disasters have varying degrees of power to rearrange a population's exposure to others' body wastes.

The above general statements came from physicians who work actively in the field of disaster epidemiology. Therefore, it should come as no suprise to find that non-specialists and the general press

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[38] Roger Glass. "Wichita Fall," op. cit., p. 738.

[39] Claude de Ville de Goyet. "The Risk of Disease Outbreaks After Natural Disasters," <u>WHO Chronicle</u>, Vol. 33, 1979, pp. 214-216.

have adopted and promoted the idea that disasters do not engender increases in infectious disease. Phillip Knightly, writing in the Washington Post, stated, "With the exception of earthquakes, medical needs in disasters are usually exaggerated."[40] He also added, "Disasters rarely destroy food stocks..." Both statements are based on information provided by earthquake experience, and may be highly misleading for other types of disasters, as we shall see later in this research. In an environmental health journal Leonard Paulozzi wrote, "In fact, a review of the literature demonstrates only that the single sure epidemic following disasters is a widespread fear of disease."[41]

While careless generalization in the press is bothersome, and perhaps even inevitable, it can be dangerous when the same statements are made in publications which are meant to provide guidance for disaster relief administrators and providers. The Pan American Health Organization, in its guide, Emergency Health Management After Natural Disaster, wrote:

> Disaster does not usually result in outbreaks of infectious diseases, although in certain circumstances it does increase the potential for disease transmission. The most frequently observed increases in disease are caused by fecal contamination of water and food; hence, such disasters are mainly enteric.(42)

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[40] Knightly, op. cit., p. B2.

[41] Leonard J. Paulozzi. "Great Myths in Disaster Relief: Epidemics," Journal of Environmental Health, Vol. 43, 3, 1980, pp. 140-143; quote p. 140.

[42] Pan American Health Organization. Emergency Health Management After Natural Disaster, Scientific Publication No. 407, 1981, p. 5.

The Committee on International Disaster Assistance of the U.S. National Academy of Sciences, wrote in its Assessing International Disaster Needs:

> The problem of epidemic disease outbreaks following floods, earthquakes, and hurricanes reflects more an irrational fear on the part of the public in disaster areas and in affluent donor countries than an actual increase in the risk of transmission.(43)

What is the obvious message to the disaster relief administrator? He or she becomes convinced that post-disaster (almost any kind of disaster) health needs (with the exception of earthquake-caused trauma) are insignificant and do not deserve serious consideration or resource allocation. The experts have said so.

We shall see in the ensuing chapters that the above generalizations about the lack of disease following disasters are not accurate for the hurricane disaster studied here. These statements probably represent an over-reaction to the previously held belief that epidemics always follow disasters. They may also represent the tendency of researchers to generalize about the findings of their specific work as it relates to the larger general field of study. The findings of the present research are in direct contradiction to the above cited works, and call into question any complacency which may have developed in regard to the role of infectious disease following at least certain kinds of disasters.

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43 Committee on International Disaster Assistance. Assessing International Disaster Needs (Washington, D.C.: National Academy of Sciences, 1979), p. 64.