REPORT DOCUMENTATION PAGE	1. REPORT NO. NSF/CEE-82028	2. PB83 101162

4. Title and Subtitle	5. Report Date
Acts of God, Acts of Man, Victimization by Natural Hazards in the United States	1982
	6.
7. Author(s) P.H. Rossi, J.D. Wright, E. Weber-Burdin, J. Pereira	8. Performing Organization Rept. No.
9. Performing Organization Name and Address University of Massachusetts at Amherst Social and Demographic Research Institute Amherst, MA 01003	10. Project/Task/Work Unit No.
	11. Contract(C) or Grant(G) No. (C) PFR7926741 (G)
12. Sponsoring Organization Name and Address Directorate for Engineering (ENG) National Science Foundation 1800 G Street, N.W. Washington, DC 20550	13. Type of Report & Period Covered
	14.

15. Supplementary Notes
Submitted by: Communications Program (OPRM)
National Science Foundation
Washington, DC 20550

16. Abstract (Limit: 200 words)

An overview of natural hazards victimization is presented for defined serious hazard events. Results of a telephone and mail survey of individuals who experienced a flood, hurricane, tornado, earthquake, or fire between 1970 and 1980 are provided. It is shown that 86% of the fires resulted in property damage, as did 76% of the floods, 65% of the tornadoes, 55% of the hurricanes, and about 14% of the earthquakes. Property damage was found to be the most common consequence of a hazard. Proportions of hazards causing personal injuries varied from 9% (fires) to about 2% (tornadoes); death was even less common, being reported in fewer than 1% of all cases. Patterns of aid to hazard victims are examined and it is noted that the large average losses sustained in these events were offset by aid and financial relief. Most victims of a serious hazard were contacted by at least one help-giving agency; those contacted reported a high degree of satisfaction with the services received. Appendixes to this report contain the survey questionnaire, and estimates of victimization and losses based on pre-1980 data.

17. Document Analysis a. Descriptors

Hazards
Earthquakes
Tornadoes
Hurricanes
Floods
Fires
Damage
Fire damage
Insurance
Claims
Surveys

b. Identifiers/Open-Ended Terms
Financial aid
Emergency management

P.H. Ross, /PI

c. COSATI Field/Group

18. Availability Statement	19. Security Class (This Report)	21. No. of Pages
NTIS	20. Security Class (This Page)	22. Price

Acts of God; Acts of Man

Victimization by Natural Hazards in the United States

by

Peter H. Rossi
James D. Wright
Eleanor Weber-Burdin
Joseph Pereira

Social and Demographic Research Institute
University of Massachusetts
Amherst, Massachusetts 01003

1982

Table of Contents

List of Tables

CHAPTER FOUR (Cont.)

CHAPTER FIVE

CHAPTER SIX

APPENDIX A

APPENDIX A (Cont.)

PREFACE AND ACKNOWLEDGEMENTS

The research reported in this volume was designed to provide estimates of the extent of damages and injuries from certain natural hazards inflicted on households in the United States. In addition, the research reports on sources of aid profferred to households and the extent to which there are any differences among households in the receipt of help.

This volume represents the latest installment in a series of monographs stemming from the Social and Demographic Research Institute's program of research on the effects of natural hazard events in the United States. The first volume in our series (Wright et al., 1978) reported on the long range effects of natural hazards on the population and housing stocks of neighborhoods and communities. The second volume (Rossi et al., 1982) assessed the support for hazard mitigation policies existing among local and state political elites in a sample of states and local communities in the United States. The main findings of these two monographs can be summarized as follows: First, long range effects (up to ten years post event) of natural hazard events are minimal: local communities and neighborhoods that have been impacted by floods, tornadoes or hurricanes appear to be no different in their population and housing growth patterns over the period 1960 to 1970 than comparable communities that went unscathed. Apparently, household and community resources plus outside aid were sufficient ordinarily to restore impacted areas to normal growth patterns. Secondly, our study of political elites indicated that few were deeply concerned about the issues of hazard mitigation, such as zoning regulation designed to lower the occupancy of high risk areas,

especially in comparison to issues such as inflation and unemployment. Indeed, it appeared as if the only local and state elite members that were deeply concerned with hazard mitigation issues were those whose professional roles required that they be concerned with such issues. Accordingly, Civil Defense and American Red Cross officials, for example, were among the most in favor of their states and local communities adopting hazard mitigation policies and the most knowledgeable about alternative policies.

The results of these first two studies were discussed in some detail at a conference held in 1980 in Washington, DC, attended mainly by social scientists concerned with the socio-economic aspects of natural hazard impacts. The papers given at that conference along with summaries of the ensuing discussions are published in Wright et al., 1981.

One of the conclusions of the conference was that the socio-economic effects of hazards were only poorly measured at the level of neighborhoods and local communities. An appropriate next step in the documenting of the the unsettling effects of natural hazards would be to study their impact on the more fine-grained level of households. Since in the ordinary natural hazard event, few households would be directly impacted, the effects of such events would be swamped and could not be detected on the neighborhood or community levels.

Accordingly, we designed the research described in this volume reaching a large sample of households to locate those who had directly experienced the impact of floods, tornadoes, hurricanes and earthquakes over the eleven year period, 1970 through 1980.

The research reported in this volume was generously supported by the National Science Foundation under Grant #PFR-7926741. Dr. William Anderson of the NSF staff monitored the grant and provided advice and encouragement over the two years involved. We were helped by many individuals. Dr. Fred Bates of the University of Georgia, Dr. Richard Berk of the University of California at Santa Barbara, Dr. Charles Fritz of the National Academy of Science/National Research Council, Mr. Ugo Morelli of the Federal Emergency Management Administration, Dr. William Petak of the University of Southern California, Mr. Roy Popkin of the American National Red Cross, and Dr. William Anderson of the NSF formed an Advisory Committee that provided help in the design of the study and offered helpful criticisms of the drafts of the instruments used. Of course, neither the National Science Foundation or the Advisory Committee should be held responsible for the faults of the study reported nor for its implications.

Audits and Surveys, Inc., of New York City collected the data reported in this volume under subcontract to the University of Massachusetts. Of course, the instruments used were designed by the SADRI staff, with Audits and Surveys organizing and carrying out the two stage household survey involved.

As usual we have been blessed with a secretarial staff, Ms. Jeanne Reinle and Ms. Cynthia Coffman, whose patience in dealing with the research staff is only exceeded by the skills they bring to the task of making our sprawling drafts into readable documents.

P. H. Rossi
J. D. Wright
E. Weber-Burdin
J. Pereira

Amherst, Mass.

CHAPTER ONE

NATURAL HAZARDS VICTIMIZATION: AN OVERVIEW

Existing estimates of the total annual losses from all natural hazards vary from five to ten billion, counting all costs, direct and indirect, public and private. Although variation from estimate to estimate is very large, all agree that the annual toll is in the billions. Such estimates typically are constructed by summing across various component costs, some of which may be very precisely known (e.g., SBA disaster loans) and some of which may be charitably regarded as "educated guesses" (e.g., local community expenditures). Perhaps the least well known among the components are the costs that are borne by households for which there are no centralized records stemming from the activities of federal agencies or national organizations.

The main purpose of the research reported here is to provide more precise and all-encompassing estimates of the damage and injury tolls experienced by households and arising out of natural hazards events. The approach taken was to survey by telephone a large national sample of approximately 13,000 telephone owning households locating those who recall experiencing a flood, hurricane, tornado or earthquake during the period 1970 through 1980. To provide a comparative frame, experiences with household fires were also studied. A subsample of the 4,000 households who claimed one or more hazards experiences were contacted by mail with a questionnaire asking for detailed information on injuries, damages, financial and other aid received and contacts with disaster agencies. Approximately 1,400 questionnaires were returned. (See Chapters II and III for

details of research design and implementation.)

The Incidence of Disaster Experiences

The large screening telephone survey can also be used to estimate the incidence and distribution of hazards experiences (see Chapter IV). Using the least stringent definition of hazard experiences -- self definitions of "experiencing" the event, whether or not injuries or damages resulted -- about one in four households experienced at least one such hazard event annually, amounting to an annual projected number of affected households of about 4 million households.

The above definition includes any experience, including clearly trivial events that caused neither injuries nor damages to the households in question. Using a more stringent definition of non-trivial events or victimizations that includes only those causing injuries and/or damages, the incidence is lowered to about 25 per 1,000 households annually, or if we omit household fires, to about 19 per 1,000 households. Table 1.1 contains annual rate estimates for each of the hazards as well.

Slightly more than half of the annual hazard victimizations involve tornadoes or severe windstorms that happen to nearly 800,000 households each year. About equal in incidence are floods and hurricanes (and tropical storms), each victimizing more than a quarter of a million households annually, on the average. Earthquakes and tremors victimize least (at least in the period 1970 to 1980) with a total coverage of about 138,000 households per annum. Note that hazard victimization is about on par with household fires in terms of incidence: Fires are

Table 1.1

Annual Rates of Natural Hazards Victimizations[a] and Projected Annual Numbers of Households Affected

Hazard	Natural Hazard Victimization: Annual Rate per 1,000 Households	Natural Hazard Victimization: Projected Annual Number of Households[b]
Household Fires	5.8	464,000
Floods	3.4	272,000
Hurricanes and Severe Tropical Storms	3.4	272,000
Tornadoes and Severe Windstorms	10.0	799,500
Earthquakes and Severe Tremors	1.8	138,000
Any of the Four Natural Hazards	18.7	1,495,000
Any of the Five Hazards (including Fires)	24.5	1,959,000

[a]A victimization is defined as any reported "experience" with a hazard event that involved injury to household members and/or non-zero damage to real or personal property of the household or its members.

[b]Based on estimated 79.5 million households as of 1980.

less than twice as frequent as either floods or hurricanes, three times more frequent than earthquakes, and about half as frequent as tornado and severe windstorm experiences.

Compared to other types of noxious events that could affect households, the four natural hazards events studied taken together appeared to be less frequent experiences than auto accidents, marital dissolutions, and unemployment but more frequent than drug addiction, alcoholism or personal bankruptcy. In short, natural hazard events and the accompanying experiences are among the common "bad luck" happenings that occur to the American population.

Although the spatial distribution of natural hazards events is fairly well known, their differential impacts among social groups is not. The data from the screening interview provided some information on how hazard events are distributed among various income levels, age groups, ethnic groups, and the like. No strong patterns appeared, however. Young households appear to be more likely victims of fires, floods and tornadoes. Higher income households appeared to experience tornadoes and windstorms more than their poorer counterparts, but no other trends of note appeared. In short, the five hazards appeared to be quite egalitarian, striking with equal frequency among the several social classes, ethnic groups, and among renters as well as owners. Of course, regions specialized in some types of natural hazards events, the association between Eastern coastal and Gulf states and hurricanes illustrating that well known pattern. In short, vulnerability to hazard events appears to be more a matter of regional location than of position within the social structure of the region.

Hazard Generated Injuries and Damages

Those households who claimed in telephone interviews to have experienced hazard events were sent mail questionnaires that called for finer details on injuries and damages sustained. The mail survey data on injuries and damages are discussed in detail in Chapter V. Table 1.2 summarizes the major findings of the chapter: Injuries to household members occurred in 9% of household fires, 8% of floods, but only in about 2% of the other hazard events. All told, injuries were not very frequent. Deaths were even more unusual events connected with the natural hazard events of the period 1970 to 1980, occurring in less than 1% of all the incidents.[1]

Damages to real and personal property holdings of the households were considerably more frequent. Nine out of ten household fires resulted in property damages that amounted on the average to $10,500. Three out of four flood events also resulted in damages that averaged $10,500. About half of the hurricanes were accompanied by damages that average $3,500, and two out of three of the tornado events involved average damages of $2,500. The earthquake and tremor experiences of the period 1970 to 1980 were on the whole trivial events, only 14% involving damages, averaging $2,000. Altnough the average amounts of damages inflicted appear to be high, these averages are very much influenced by a few households that experienced very large amounts of damages: The median values of damages are in every case much lower than the mean values.

---

[1]Since households who were dissolved by deaths did not survive to be interviewed, these are undoubtedly underestimates of the true death incidences caused by hazard events.

Table 1.2

Hazard Generated Injuries and Damages
(From Mail Survey)

	Hazard Event				
	Fires	Floods	Hurricanes	Tornadoes	Earthquakes
Percent With Any Injuries	9%	8%	2%	2%	2%
Percent With Any Damages	86%	76%	55%	65%	14%
N =	(267)	(151)	(261)	(581)	(363)
Average $ Loss for Those With Any Loss	$10,500	$10,500	$3,500	$2,500	$2,000
Median $ Loss for Any Loss	$2,500	$3,000	$800	$700	$1,000
Percent of Damage that is Structural	39%	31%	40%	46%	55%
N =	(218)	(112)	(142)	(365)	(44)

Most of the damages inflicted were to the housing structures and dwelling units. Structural damage amounts ranged between 31% (for floods) to 55% (for earthquakes) of all damages claimed. The remaining damages were mainly to furnishings and personal property items.

When we consider the "total dollar cost" of household hazard experiences (defined as costs incurred through injuries, deaths or property damages) we find that there are few household characteristics that dispose a household to incur greater or smaller "total dollar costs." Fires and floods are likely to be more costly to owners (as opposed to renters): structural damages to the dwellings of renters are borne by the structure owners. Higher income households experienced less damage from floods than lower income households, a finding for which no easy interpretation comes to mind. But, the main factor appears to be the extent of the natural hazard event. Those events that involve other households in the neighborhood and community are likely to inflict higher total costs than those that involve only one or a few households. In other words, large scale hazards events that are inflicted on many households appear likely to inflict larger total costs on any household.

Sources of Help

Americans traditionally have acted with great generosity towards the victims of natural hazards. A network of voluntary organizations has provided relief on the local level; a number of national organizations, notably the American Red Cross, provide aid of a variety of sorts. In the last few decades the federal government has also set up programs

that are more or less automatically triggered into action when larger hazard events occur. On top of all that, individual households help one another in a variety of ways. Finally, insurance coverage is routinely purchased by households to cover some of the more common insurable risks. All of these sources of aid cannot fully restore the status quo ante, but individually and in combination they can ease the road to recovery.

As shown in Chapter VI, the households who have suffered serious hazard events make considerable use of the sources of aid available to them. A summary of the coverages of various sources is given in Table 1.3. A majority of households suffering damages from fires, tornadoes and floods receive some reimbursement from insurance policies. Homeowner insurance policies routinely cover damages inflicted by high winds, wind driven water and household fires, and, as shown in Table 1.3, a majority of households victimized by those hazard events receive some financial help from the coverages purchased. By and large, households were highly satisfied with their treatment at the hands of insurance companies, even though some complaints were registered that payments were not high enough to cover replacement costs.

In contrast, few households received insurance payment help in the case of flood or earthquake hazards. In part, insurance coverage for those sources of damage was not available at "reasonable" prices during most of the period 1970 to 1980 and such coverage is not ordinarily a part of homeowner policies. In part, households are not inclined to take advantage of such coverage even when it is available at "reasonable" prices. The end result is that only small minorities (22% and 8% respectively) receive any help from insurance payments for flood and earthquake

Table 1.3

Sources and Types of Help Received by Households With Serious[a] Hazard Experiences

Source	Fires	Tornadoes	Hurricanes	Floods	Earthquakes
% Receiving Some Insurance Payment	76%	61%	56%	22%	8%
N =	(213)	(324)	(125)	(108)	(37)
% Receiving Loans	6%	5%	7%	13%	9%
N =	(218)	(365)	(144)	(112)	(44)
% Receiving Grants/Gifts	17%	6%	7%	18%	14%
N =	(218)	(365)	(144)	(112)	(44)
Number of Informal Sources of Help	1.34	1.02	1.26	1.57	.39
N =	(222)	(342)	(142)	(119)	(50)
Number of Contacts With Agencies	.92	.56	.87	1.81	.42
N =	(213)	(333)	(136)	(109)	(52)
Receiving Some Help From One or More of Above Sources	94%	77%	79%	89%	36%
N =	(184)	(302)	(126)	(102)	(50)

[a]"Serious" events include those in which household claimed non-zero damages.

damages.

Although only small minorities receive loans from any source (ranging from 5% to 13%) this source tends to be relied upon by households who have suffered greater losses and those who are also relatively poor. Note that loans are more likely to be used by flood and earthquake victims and that a frequent source of such loans are the low cost federal loan programs (SBA in particular).

Grants and gifts tend to be smaller than loans (when received) but are received by more households. Especially important are the grants and gifts received by flood and earthquake victims. The activities of such national organizations as the Red Cross are especially visible in this connection.

The native generosity of Americans is shown most clearly in the fact that informal sources of help -- usually in the form of labor and gifts -- are frequently received by hazards victims. Formal agency contacts are also quite frequent. Especially impressive is the extent to which households in every hazard experience cite the American Red Cross as a point of contact, especially flood victims.

Indeed, when we consider the combined coverage of insurance and other sources of help, with the exception of earthquakes, strong majorities of all victims have received help from one or more sources, ranging from 94% in the case of household fires to a low of 77% for tornado victims. Especially impressive is the fact that there appears to be very little inequity in the distribution of aid. Among natural hazard types, earthquakes appear to be poorly covered by any aid, possibly reflecting the

types of earthquake experiences during the period under study.[2] The social distribution of aid appears to be quite even, with older households and more affluent households appearing slightly less likely to receive aid than their counterparts.

When the patterning of aid by source is examined in detail, it appears that the various sources are complementary. That is, when insurance payments play a major role, for example, loans and gifts from government agencies or private organizations do not and vice versa. In each case, the high coverage of aid from some kind is achieved by varying mixtures of aid from a variety of sources.

Recovery and Lingering Effects

The final topic considered is the effects of the hazards experience that linger beyond the event itself. Most households are restored to full functioning within the space of a few days: At least their dwellings can be patched up enough for them to return to some semblance of workaday routine. Some are affected strongly enough by the event to experience depression and others borrow money to the extent that their debt burden is seriously increased.

Our analyses indicate that feelings of depression and of burdens of debt increase both with the amount of debt involved but also with contacts with all sorts of agencies. Although it is quite expectable that a family that doubles its mortgage should feel somewhat put out

---

[2]Most earth tremors during 1970 to 1980 were minor ones, inflicting only small amounts of damage. The San Fernando quake of 1971 was the only serious earthquake disaster occurring in this period.

over the increased payments and perhaps the longer pay period that resulted, it is not clear why contact with agencies should affect such feelings. Perhaps these findings simply reflect the fact that those with more troubles seek more help.

Conclusion

Experiences with natural hazard events are relatively rare but sufficiently frequent to affect about 1% of American households annually. A network of institutionally defined aid as well as insurance companies and informal helping out is available to victimized households. Majorities take advantage of the help offered by the aid system, but for some aid is only a buffer between themselves and the burdens of the experience which have to be borne nevertheless.

CHAPTER TWO

ESTIMATING HAZARDS EVENTS AND CONSEQUENCES THROUGH A VICTIMIZATION SURVEY

Introduction

Every year many lives are lost and much property is damaged by the ravages of natural hazards. There is some evidence, moreover, that the magnitude of these losses, especially to property, has increased substantially in constant dollars in recent years, mainly because economic growth has tended to concentrate more and more persons and property in high risk areas (Cochrane, 1975; Dacy and Kunreuther, 1969; White and Haas, 1975). In addition, the last decade has produced several very large scale disaster events that imposed severe burdens on the public treasury for relief and rehabilitation, for example, Hurricane Agnes in 1973.[1] Spurred by these rising costs and for other reasons, Federal hazards policy has been shifting away from providing relief and fostering rehabilitation in the aftermath of disasters, and towards developing strategies that are aimed at mitigating hazards risks before disasters strike. Perhaps in the long run, a vigorous and scientifically informed program of risk mitigation will, as hoped, reduce the need for relief and rehabilitation programs substantially. In the foreseeable future, however, it is clear that direct relief and rehabilitation of victims will figure prominently in the repertory of Federal disaster policies.

Precise estimates of the total costs of disaster relief and rehabilitation to the nation are difficult to construct. In part, this is

[1]Although Agnes occurred in calendar year 1972, federal expenditures were incurred in fiscal year 1973.

because of the many agencies, public and private, that shoulder some share of the burdens. Also, costs are difficult to estimate because losses are both direct and indirect; indeed, it is likely that many of the indirect losses (e.g., revenues lost because of hazard related unemployment) go unrecorded in the more easily accessible records. Nevertheless, it is possible to arrive at some estimates of at least major parts of the costs inflicted by natural hazards:

(i) For 1970 to 1979 (estimated), the annual Federal expenditure for "disaster relief and insurance" has averaged about $610 million per year (Office of Management and Budget, 1978: 70). Outlays have varied from a low of $300 million in 1970 to a high of $1.6 billion in 1973, the fiscal year of Agnes. Figures cited here include only direct costs to the Federal government and do not include any of the indirect costs, which range in source from income tax deductions for uninsured casualty losses[2] to productivity declines resulting from interruptions of normal economic activity that often follow major disasters (Cochrane, 1975).

(ii) In the most recent years, actual Federal disaster expenditures have greatly exceeded the estimated expenditures, owing to several very widespread or highly destructive disasters. Federal relief expenditures for the Johnstown flash flood of July, 1977, were about $215 million (National Oceanic and Atmospheric Administration, 1977: 4). The Western drought of 1976-77 was also very expensive to the Federal government. Through July of 1977, Federal drought assistance in California alone

---

[2] Dacy and Kunreuther (1969: 224) estimate that Federal tax revenues lost through the deduction allowance amounted to $255 million in 1965, the last year for which data were available.

totalled $37 million in loans and $17 million in outright grants (Comptroller General of the United States, 1977: 38-39). These figures, although high in an absolute sense, are dwarfed by the total cost of that drought to the nation. The Comptroller General's report estimates that drought-related losses to California agriculture were about $2.4 billion just in 1977.

(iii) Disaster costs to the Federal government represent only a fractional share of the total government disaster expenditure; some additional share is borne directly by state and local governments. At present, the largest bulk of Federal disaster assistance is dispensed under the provisions of the Disaster Relief Act of 1974 (PL 93-288). That Act states specifically that the Federal effort is to "supplement the efforts and available resources of states, local governments, and disaster relief organizations." Unfortunately, there appears to be no reliable information available on the disaster-related expenditures of state and local governments, so the size of their share cannot be estimated.

(iv) In general, governmental expenditures for disaster relief cover only some portion of the losses, those which are not covered by private insurance. According to data supplied by the American Insurance Association, disaster-related payments by its member companies exceeded $417 million in 1977 and have averaged more than $350 million annually over the last ten years (Walter Swift, private communication).

(v) Some disaster relief is provided, not by government or by private insurance, but by private or semi-private relief organizations, of which the American National Red Cross is by far the largest and most active. ANRC expenditures for disaster relief averaged about $9.3 million annually

for the years 1959 to 1964, increased to an annual average of about $18.1 million for the years 1965 to 1970, and have averaged roughly $27.9 million per year from 1970 to the present (ANRC Annual Summary of Disaster Services Activities, 1959 to 1977).

Figures cited in the previous paragraphs represent some (probably rather small) fraction of the known direct costs to the nation for natural hazards. Other costs are indirect, e.g., opportunity costs paid because dollars spent on disaster relief are not spent on something else, costs posed in developing and maintaining hazards warning systems, costs for research, costs of constructing and maintaining disaster control installations (such as dams, seawalls, dikes, etc.), and costs that result from stricter building standards enacted for risk-mitigation, etc.

Some (possibly large) share of the total costs is simply unknown because the people who shoulder these costs -- the hazards victims themselves (or their friends and families) -- may never apply for Federal assistance, may never come to the attention of the Red Cross, or may never file an insurance claim for compensation. These victims would not appear in any agency's records so their losses would not be accounted for in the data mentioned here.

Given the various difficult-to-estimate quantities that go into cost estimation for natural hazards, it is apparent that no one can state with any certainty just what the total annual costs to the nation are. Cochrane cites a figure "in excess of $5 billion per year" (1975: 1); the White and Haas (1975) estimate is $10 billion per year; certainly, these estimates seem at least reasonable given what has been said in previous pages. Thus, one would apparently be safe in characterizing

natural hazards in the United States as at least a multi-billion dollar yearly problem.

Research Strategy

Constructing accurate estimates of the total costs of hazards events in the United States would necessarily be a complicated undertaking that would employ the skills of accounting, economics and survey research, among others. In any event, the task is beyond the goals of this research. Our more modest aim is to construct estimates of one of the major components of the total costs of disaster events, those borne by private households directly through injuries and household property damages. Of course, part of the household costs are known through payments made by insurance companies, grants and gifts made by public and private agencies, and loans from various sources. The share of total losses reimbursed through such mechanisms is, however, unknown. Certainly, some costs (possibly a large proportion) are borne directly by households and for which no compensating payments are made. These "hidden" costs are an integral part of the estimates undertaken in this volume.

The overriding purpose of the research reported here is to estimate the burden that hazard events inflict on households and to determine how the costs of natural hazards are distributed among such victims. Although there are now several sophisticated studies bearing on the long-term effects of natural hazards on whole communities, very little research has focussed on the effects of disasters or hazards on the individual victims themselves, least of all over the long run (that is, beyond the

immediate post-emergency phase). Given the general magnitude of the natural hazards problem in the United States, it is somewhat surprising that better data on hazards victimization are not available for policy planning or hazards management.

Some of the questions to which we will provide answers are: What are the rates of victimization from natural hazards of various sorts? How many households suffer hazards losses in a typical time-span? What are the sizes of average losses? Of those who are victimized, what proportion receive relief assistance? How do average losses from natural hazards compare with other types of casualty loss, for example, home fires? Are there unintentional inequities in present relief-and rehabilitation efforts such that some victims are more likely to receive aid than others? And for those who receive assistance, how are the funds spent? What is the average "recovery time" for individual, family, and business victims? How long does it take for victims to be restored to their pre-disaster condition? Finally, what are the overall costs of natural hazards to their victims? And, of these costs, what share is covered by governmental assistance, what share through private insurance, what share through voluntary relief agencies, and what share by the resources of victims themselves?

Many of these questions appear to be so elementary to our understanding of the relevant policy issues concerning environmental risk management that it is surprising that so few answers have been furnished by previous research. The main reason for this apparent information gap is that social scientists have been usually (if not exclusively) attracted to the study of the effects of the largest and most cataclysmic hazard events.

Major tornado outbreaks, the largest floods (dramatic flash floods, especially), and the major hurricanes have attracted most of the attention of researchers. True, such catastrophic events are the ones that also attract the most attention from the media and from policy makers. Indeed, a very good case can be made that our disaster policies have been largely reactive to such events, major changes in Federal legislation usually following after some catastrophic event.

However important such catastrophic events appear to be, they are only a small, highly unrepresentative, and selective subset of the total set of destructive hazards. Indeed, it is useful to distinguish between natural disasters -- catastrophic natural hazard occurrences that involve widespread damage and injuries -- and natural hazard events -- any untoward hydrological, meterological or geological occurrence that causes sudden and unanticipated loss to at least one person. Using this distinction, it is clear that prior social science literature has dealt almost exclusively with natural disasters, whereas this monograph focusses on victimization by natural hazards events, whether the event in question qualifies as a "disaster" or not. In other words, a family suffering, say, a $5,000 loss in flood qualifies, in our minds, as a hazard victim worthy of study; whether that family was the only family suffering loss in the flood, or only one of hundreds of families suffering similar losses, is, from the point of view of that family (and of this monograph), more or less immaterial.

To give some concreteness to the relative scales involved, consider that between 1960 and 1970, about 8,500 tornadoes occurred in the United States. Of this total number, somewhat more than half (about 4,300) did

damages in excess of $5,000, a non-trivial loss if suffered by a single family or individual victim. And yet, of the 4000 or so tornadoes causing damages of this magnitude or higher, only 129 were serious enough to receive a Small Business Administration disaster declaration, a mere 25 received a Presidential disaster declaration, and no more than perhaps 5 or 10 received any serious or sustained research attention. Now, obviously, the scores of tornadoes receiving declarations and research attention were, far and away, the most serious tornado disasters of the period. But it is equally obvious that the net suffering and loss produced by the thousands of non-declared and unstudied tornadoes might easily equal or exceed the losses due to the several dozen genuine tornado "disasters." Any study of victimization by natural hazard, then, must obviously be concerned with the thousands of routine, "garden variety" hazard events as well as with natural disasters. The focus in prior literature on disasters has meant that social science has actually had very little to say about the questions posed above.

The policy issues posed by the above distinction are by no means trivial. At present, the official "disaster declaration" is the trigger for most (although not all) of the Federal disaster relief effort. In theory, a declaration is issued when the magnitude of destruction exceeds the state's or local community's ability to respond. In fact, large-scale and well-publicized disasters almost invariably receive a declaration, whereas small-scale and relatively anonymous ones do not. It is certainly possible that the aggregate loss due to the many thousands of these small-scale events exceeds (possibly even by orders of magnitude) the aggregate loss due to the few officially declared catastrophes, and

if that proved to be the case, then we would be dealing with a Federal policy mechanism that is designed and implemented so as to respond to the smaller part of the overall environmental hazard problem.

Research Design

The research findings contained in this monograph were derived from a large-scale data collection effort that was designed to provide estimates of the injuries and damages sustained by households in the context of their living quarters from natural hazards events. By "households" we mean groups of persons who live together in the same dwelling unit and who share in one way or another their living expenses. Although the typical household of today is a married couple and their dependent children, there are also many single person households, some households consisting of unrelated (by marriage or blood) persons, and some households that are mixtures of kin and non-kin.

Under this definition of our target population as households, we exclude all persons who are not members of households, the 2% of the adult population who live in group quarters, are hospitalized, or are in prison or in the military. These exclusions involve a minor portion of the population and are routinely adopted in sample surveys in order to simplify data collection.

The injuries and damages experienced by households to be estimated are those suffered by members of the household in the context of their dwelling units, excluding injuries and damages that might occur in workplaces, schools, while travelling, in public places, and so on. Again,

the purpose of the exclusion is to simplify data collection. Thus, the focus here is very much on household losses due to natural hazard events.

The general research problems addressed here (and consequently the general research design) are similar to those of students of criminal victimization. In an earlier era, the study of crime was more or less confined to crimes reported to or detected by the police. From the beginning, there was a recognition that such crime constituted only a fractional share of the total crime, but whether the fraction was large or small was largely unknown. Also, it might be supposed that some victims of crime would be more likely than others to report their victimization to the police. Thus, crimes known to the police were not only a fractional sample of all crime, but possibly a biased sample as well. In the middle 1960's, the method of the crime victimization survey was developed, whereby rates of crime were estimated by asking random probability samples of the population whether they had been victimized in the previous year. These studies showed that survey reported crimes exceeded officially reported crimes by factors ranging from 1.5 to 10, depending on the crime type. Much victimization by crime was "hidden" from official view.

The case of victimization by natural hazards is similar in important respects. Traditionally, the victims studied are those that have come to the attention of one or another relief agency or who otherwise appear in some official record. Whether this is a large or small fraction of the total victimized population has been largely unknown. Whether some victims are more likely than others to come forth for aid, or in other words, whether there are unintentional inequities in the relief effort, has also been unknown. Adapting the method of the victimization survey

to the case of victimization by natural hazards is therefore straightforward: using a random probability sample of the entire adult population, one can compute a victimization rate, and, as in the case of the crime surveys, the victims identified in this process can be queried as to the details and circumstances of their losses. Such, in brief, is the design of the research whose findings are reported in this volume.

The validity of this design, of course, rests heavily on the ability of household members to retrieve from their memories information on whether or not the household had experienced a natural hazard event and, if so, the details of associated injuries and damages. It stands to reason that major disasters involving large areas and many households will be remembered as salient life experiences. Any reader who has had such experiences will undoubtedly concur. The major problem lies in whether or not lesser natural hazard events will be recalled at all and whether or not the details of losses can be recalled with sufficient accuracy to serve as the bases for estimates.

Although natural hazards events may cause billions of dollars annually in losses, only very small proportions of the total U.S. household population are victimized in any given period of time. Victimization is a rare event with only very small minorities experiencing any one or any combination of hazard events in any decade. Hence in any random sample of the population, households who could give us information on hazards losses are necessarily only some small proportion of all households contacted. This distribution of hazards experiences led to a two stage sampling design. The first stage consisted of a large probability sample of telephone owning households who were interviewed primarily to locate

a subsample of persons who had experienced natural disasters over the previous 11 years. The second stage consisted of follow-up mail surveys of all households who had experienced one or more hazard events. The mail survey queried victimized households about the details of injuries and damages suffered as well as information on the aftermath effects of the experiences.

The first stage telephone survey contacted more than 13,000 households with a short interview that for most households lasted about ten minutes. Most (more than 85%) households in the United States have a home phone. Of course, those who did not have a phone in November and December of 1980 fell outside the first stage sampling operation, a sampling bias that results in an under-representation of poor households, older households and single person households. The telephone numbers contacted were generated by a computer routine that insures that unlisted and newly listed phone numbers are included. Sampling and interviewing on the phone were conducted under subcontract to Audits and Surveys, Inc. using the interview that is reproduced in Appendix B.

The period 1970 to 1980 was chosen as the base period for our study largely because our preliminary estimates of the incidence of victimization (as discussed in detail in Appendix A) led us to believe that a base period would have to be at least that long to produce a sufficiently large sample of victims. The study is therefore further biased to the extent that the 1970's were an uncharacteristic decade.

Any adult member of the household qualified as someone who could provide information on natural hazards experiences of the household. When our household informant indicated that the household had experienced

a natural hazard event during the base period, some basic information about the experience was collected along with the mailing address of the household.

Interviews with the 13,000 households in the first stage of interviewing uncovered more than 2,600 households who had experienced one or more natural hazards events during the base period. As described in the next chapter, most of these households were mailed one or more questionnaires that asked for more detailed information about the experiences. The mail survey was also conducted under subcontract to Audits and Surveys, Inc. The questionnaire used is reprinted in Appendix B.

The mailed questionnaire covered a number of topics: injuries and deaths experienced, property losses, sources of financial aid and other forms of help, time of recovery, some information on aftermath effects and socio-economic characteristics of the household.

The Hazards Studied

Only a limited number of types of natural hazards could be studied. Some were so rare (e.g., soil expansion) or so geographically specific (e.g., tsunamis) that only one or two experiences could be expected even in a sample as large as 13,000. Others (e.g., heavy snowfalls) were very frequent, but only rarely produced major losses. Our strategy was to pick those hazards that were comparatively frequent and often quite serious -- hurricanes, tornadoes, floods, and earthquakes. In order to provide a comparative frame, we also included household fires, as events that were fairly frequent, often serious, and clearly localized

within dwellings. These are also the natural hazards that receive the most attention in the disaster strategy of public officials.

Plan of the Monograph

The present chapter has provided a brief overview of the design of and rationale for this research. In the following chapter, the design and execution of the study are described in more detail. As the more detailed discussion makes plain, there are three major areas of inquiry that can be pursued with our data. First, the results from the screening interview can be used to estimate the rates at which U.S. households are victimized by natural hazards events. With the same data, it is also possible to explore the correlates of hazard victimization, i.e., to ascertain which types of households are more and less prone to suffering a hazard-related loss. These analyses are described in Chapter Four.

As noted above, victimized households located in the first phase were sent a follow-up questionnaire through the mail. The results obtained from the mail survey bear, first, on the nature and extent of household hazards losses, and secondly, on the nature of the ensuing recovery. Chapter Five reports our analysis of hazards loss, focussing mainly on personal injury and property damages. In Chapter Six, attention turns to the process of recovery; here the focus is on the flow of relief and assistance to hazards victims.

CHAPTER THREE

THE VICTIMIZATION SURVEY:

DATA COLLECTION AND SURVEY IMPLEMENTATION

Data on victimization by household fires and natural hazards were gathered in two stages, following the general logic of the design discussed in the previous chapter. Because of the focus in the literature on very selective and possibly unique victim populations (namely, on the victims of well-publicized disasters), our hope was to generate a survey closely approximating a probability sample of the total hazard-victimized population of the United States. Such a population is, of course, unlisted, and no known sampling frame of the requisite scope exists. For these reasons, the first stage of data collection was a very large telephone screener interview which was used (i) to estimate hazard victimization rates for hazards of various types, and (ii) to locate a probability sample of victims for purposes of a more extensive and detailed follow-up questionnaire.

The screener interview was based on a Random Digit Dialing (RDD) probability sample of all telephone-owning households in the United States. Phone interviews were relatively short (average duration of about 10 minutes). Respondents were asked whether they had been victims of fires, floods, hurricanes, tornadoes or earthquakes over the previous eleven years. Persons responding "yes" to any of the questions in this sequence were also asked some brief follow-up questions about deaths, injuries, and dollar losses incurred in these incidents, and also whether they would be willing to participate in a more extensive

follow-up study. All phone respondents were also asked a few standard socio-demographic questions. Hazard victims isolated in this screener who agreed to participate in the follow-up study were subsequently mailed a questionnaire that requested more detailed information on the losses incurred, insurance coverage (if any), sources of relief and rehabilitation aid, and other matters concerning their victimization. These mailed questionnaires constituted the second phase of the data collection.

The present chapter describes more fully the survey methods and field procedures employed in these two phases of the research. Response rates are also calculated and analyzed. Finally, some basic descriptive information about the samples is presented.

The Screener Telephone Interview

The first stage of the study, the screener interview, was designed both to provide estimates of household hazard victimization rates and to locate a sample of disaster victims for later in-depth follow-up. At this stage, our concern was to sample enough households to provide reliable estimates of the victimization rates and to produce a large enough number of victims for the second stage. An analysis of existing data sources (see Appendix A) provided an initial "best estimate" that something on the order of 15% of all U.S. households would have experienced natural disasters (including household fires) during a 10 year period, although the uncertainties in this estimate were rather large. In turn, budgetary constraints dictated a follow-up mail sample of not more than about 2000-2500 cases. These considerations thus suggested

a sample size of about 13-14,000 cases for the screening interview: a sample of this scale would certainly provide reliable estimates of hazard victimization rates (whatever they happened to be) and would also give us plenty of cases for follow-up even if the true rate of victimization proved to be well below the "best guess" of about 15%.

The actual screening sample was obtained through a randomly-generated list of telephone numbers assembled by Survey Sampling, Incorporated, working under contract with Audits and Surveys. The RDD procedure followed gives a simple random sample of all U.S. households that have access to a telephone on the premises. Some households do not have a telephone, and so the RDD sample is biased against them, but the numbers involved are very small. The efficiency, reliability, and cost-effectiveness of RDD sampling for a screening process of this sort is well-documented in the survey literature (e.g., Dillman, 1978).

Approximately 36,000 actual phone numbers -- or about three times the number needed -- were included in the initial screener sample because it was known that many of these phone numbers would be ineligible (i.e., non-working numbers, business telephones, and the like). The final disposition of these 36,000 is shown in Table 3.1. As expected, slightly less than half (43.3%) of the numbers proved ineligible or for other reasons had to be excluded. Over half of these were non-working numbers (43.6%) or business numbers (11.0%). An additional 45% remained uncontacted (no answer or busy signal) after repeated call-back attempts. (Three attempts were made on each number before giving up.)

It is well known in the literature on telephone interviewing that unanswered numbers are inherently ambiguous. In some cases, a non-working number will, when dialed, result in a recorded message stating

Table 3.1

Disposition of Screener Telephone Interview Attempts
(N = 36,108 Random Digit Phone Numbers)

Phone numbers never contacted	15,622	43.3%
Not a working number	43.6%	
Business phone	11.0	
No answer	39.3	
Busy signal	6.0	
Phone numbers with at least one contact	20,486	56.7%
Adult respondent not available	7.8%	
Language problem	2.7	
Respondent refusal	26.1	
Completed interview	63.5	

100% = (36,018)

that the number is non-working or unassigned. These appear in Table 3.1 as "not a working number." In other cases, however, an unassigned number will appear to ring but go unanswered, and is thus indistinguishable from a not-at-home respondent. Thus, "no answer" includes both some non-working numbers and not at homes." For this reason, the actual "response rate" in a telephone survey is impossible to calculate; the appropriate denominator for such a rate is inherently ambiguous. The more commonly reported figure is thus the cooperation rate among contacts made with eligible households or respondents.

In the end, the phone interviewers made contact with 20,486 (94 56.7%) of the initial 36,108 numbers. This is somewhat higher than the average "contact rate" reported in the survey literature. Of the 20,486 interviewer contacts, 13,005 resulted in completed screening interviews, a completion rate of 63.5%. The largest source of non-completion were outright refusals to be interviewed, amounting to 26.1% of the contacted cases. Refusal rates reported in the literature vary from about 10% to about 35%; our rate was thus on the high side of average for phone interviewing of this sort. In about 8% of the cases, there was no adult respondent available when contact was made, and in the remaining 3% of the cases, non-completion resulted from language difficulties.

The screener interview instrument is shown in Appendix B. It was a fairly short interview in which respondents were first asked if they had experienced a household fire, flood, hurricane, tornado or earthquake within the last 10 years. If the respondent answered "yes," the interview continued with a few questions about the year (or years) of

the event(s), any deaths or injuries, and rough damage estimates. For most, the interview ended with a small number of questions about the demographic characteristics of the household. A 10% random subsample (N = 1245) was also asked an additional series of questions concerning experiences with other types of calamities that may have befallen them.

All told, 3,292 respondents indicated some experience with one or more of the five hazards over the previous ten years -- a "take rate" of just over 25%, or much higher than the originally anticipated 15%. Each of these 3,292 was requested to participate in a follow-up survey. About 2,500 agreed at this point and they were then asked to provide names and mailing addresses. Over the ensuing weeks, these families were mailed follow-up questionnaires, a separate questionnaire being sent for each disaster experience reported.

Field work for the screener interviewing was done by Audits and Surveys, Inc., under subcontract to the University of Massachusetts. Their interviewing staff completed the 13,000 telephone interviews over a three-week period during November and December, 1980. The phone interviewing was done through the use of a CATI (Computer Assisted Telephone Interviewing) system. The use of such a data-gathering system not only facilitated the interviewing process, but also allowed quick access to the final screener data base.

Initial analysis of the screener data revealed that 3292 households (25.3%) reported an experience with one or more of the five disaster types during the period 1970 to 1980. Specifically, there were 553 households reporting a household fire, 328 reporting a flood, 663 reporting a hurricane, 1440 reporting a tornado, and 977 reporting an earthquake.

As we show in later chapters, the numbers given above for tornadoes and earthquakes are somewhat misleading. The question for tornadoes asked about "tornado or severe windstorm," and that for earthquakes about "earthquakes or tremors." Thus, the "net" being cast is rather wider in these two cases than in the other three. Preliminary analysis also revealed, understandably, that large proportions of tornado and earthquake experiences were accompanied by no damage at all and no injuries or deaths. (See Chapter 4 for a detailed analysis of the death, injury and damage rates by type of hazard.)

As indicated, about 2500 of the 3292 hazard victims located in the screener agreed to participate in the follow-up; the rest declined. Further analysis revealed that most of the "refusals" were among persons with essentially trivial hazard experiences -- experiences generating no deaths or injuries and minor or non-existent amounts of dollar loss. Among the roughly 800 refusals, however, were some 203 households whose hazard experience was apparently not trivial, and we were anxious to include as many of them as possible in the follow-up study. Accordingly, the data collection sub-contractor was instructed to re-contact by telephone the respondents from these households and attempt to persuade them to participate in the study. These conversion efforts produced an additional 78 households for the mail survey, bringing the total sample size for the mail follow-up to 2,603 households.

The Mail Survey

The field work for the second phase of the study was also handled by the sub-contractor Audits and Surveys and began with a questionnaire

mailing to 2603 households. Each household received one questionnaire for each hazard event that had been reported in the phone interview. The first page of each questionnaire listed the type of event (flood, fire, etc.) and the year of the event as reported in the screener interview. Respondents were asked first to confirm this information and then to complete the questionnaire with regard to that one event. To emphasize, households reporting multiple hazard events were sent multiple questionnaires. Over all sampled households, the number of questionnaires sent varied from 1 to 39, with most households receiving only a single questionnaire.[1]

The initial mailing was followed a few weeks later by a postcard reminder to non-responding households urging their cooperation. The response rate after this first follow-up mailing was fairly low, standing at about 30%. The early returns suggested that many non-responding households had had relatively minor hazards experiences. Clearly, the disaster history of these households was of a lesser concern to the purposes of the research. Rather than continuing to pester these "less interesting" respondents through additional follow-up mailings, a more focussed follow-up strategy was adopted for the third mailing. The relevant details of the strategy we adopted are as follows:

First, any non-responding household that had indicated either a flood or a fire experience in the screener was sent a second set of

---

[1] The maximum number of questionnaires sent varied over hazard types. The high figure, 39 questionnaires, was registered for tornadoes. One earthquake household received 33 questionnaires. and one flood household, 21 questionnaires. As indicated in the text, however, the vast majority of the households (over 90%) received only a single questionnaire.

questionnaires, one for each fire or flood event. This strategy was followed irrespective of the reported damages and loss, for three related reasons. First, we had fewer fire and flood victims from the screening interviews than we had hoped for. Secondly, the number of "trivials" among fire and flood victims was known from the screener to be relatively low. Finally, relatively few households had reported multiple fire or flood experiences. In the third mailing, then, all flood and fire households who had not responded to the first two mailings were sent additional questionnaires. Included in the packet was a second cover letter urging their cooperation in the study.

Hurricane, tornado, and earthquake victims were treated differently. Any household reporting a non-trivial experience with one of these three hazards (that is, who reported at least some injury or property loss in the screener) that had not responded after the second mailing was sent a second packet of questionnaires, as in the fire and flood case described in the previous paragraph. These packets also contained a second cover letter. The remaining hurricane, tornado, and earthquake non-responders -- those reporting no damage or injury on the screener interview -- were sampled, and only the sampled households received the third mailing. Sampling of the "trivial" events, we felt, was justified because they would generate little or no useful information on hazard victimization. Sampling in this fashion also reduced the number of questionnaires that some non-responding households received, so that the task of completing questionnaires became less burdensome. Details on the numbers of events sampled, by hazard type, are given later in Table 3.3.

Several weeks after the third follow-up mailing, a number of households had still not responded. Each of these households was contacted by telephone and urged to complete and return their questionnaires. In cases where this telephone "reminder" proved inadequate and the household's questionnaire(s) had still not been logged in after a reasonable time, an effort was made to gather the relevant data directly over the phone. For this purpose, the mail questionnaire was edited down into two shorter versions. The first, which was used only for households whose experiences had been "trivial," omitted most of the questions on damage, injuries, insurance coverage, and reimbursements. The second, used with households reporting non-trivial experiences, was only slightly different from the mail questionnaire itself, the changes consisting mostly of amended instructions and response categories to provide a more appropriate format for a telephone interview. A total of 348 phone interviews were done, of which 234 concerned trivial events and 114 dealt with non-trivial events.

Field work was completed during the summer of 1981. At that point, a total of 1,694 households had responded to the hazard survey either by returning questionnaires or by completing the phone interview.

The final disposition of all households in this second phase of the study is shown in Table 3.2 A total of 3,292 households initially reported a hazard experience on the screener interview and were therefore eligible to be included in the follow-up survey. However, the final sample size for the mail survey was only 2603 households because of the exclusion of those refusing to cooperate, as discussed above. Of the 2603 households who agreed to cooperate, 108 (or 4.1%) never received

Table 3.2

Final Disposition of Sample Households

	Total[a]	Fire	Flood	Hurricane	Tornado	Earthquake
Total HH Reporting a Hazard Event in the Screener	3292	553	328	663	1440	977
Percent Non-Cooperating at the Time of Screening	20.9%	13.6%	16.8%	19.0%	19.7%	25.3%
Total HH Mailed a Questionnaire Packet	2603	478	273	537	1156	730
Percent Never Delivered	4.1%	6.3%	5.1%	4.1%	3.5%	4.9%
Total HH Eligible to Respond	2495	458	259	515	1115	694
Complete	55.3%	56.3%	56.0%	53.4%	52.6%	58.1%
Never Happened[b]	12.6	7.6	8.5	12.4	15.5	12.0
No Response	32.1	36.0	35.5	34.2	31.8	30.0
Overall Response Rate[c]	67.9%	63.9%	64.5%	65.8%	68.1%	70.1%

Table 3.2 (continued)

[a]Households could, and did, report more than one type of hazard occurrence, as well as multiple occurrences of a single type. Thus, the total households reporting an event (3292) is much less than the sum of the number reporting each type of event (3961).

[b]Respondent indicated that all reported events never occurred or were too trivial for response.

[c]Total households with Complete questionnaires + Never Happened/Eligible HHs.

their questionnaires because at each mailing their packets were returned as undeliverable. Attempts to confirm these addresses were unsuccessful by the close of the field work.

Of the households eligible to provide a response, some 315 (or 12.6%) responded by indicating that the specified hazard had never occurred. The "Never Happened" category includes those who later realized that the year of the event was incorrect (earlier than 1970 and thus ineligible for our study), those who insisted that the hazard experience was so minor as not to qualify as a "disaster," and those who responded simply that the hazard had never happened. Despite all efforts, 32.1% of the initial households never responded at all. The remaining 1,379 households completed one or more hazard questionnaires or phone interviews, for a completion rate against the initial sample of 55.3%. If the 315 households falling in the "Never Happened" category are counted as responders rather than non-responders, the final completion rate overall for the mail survey is 67.9%.

Table 3.2 also shows the response rates by type of hazard. In most cases, the variation in response by hazard type is modest and insignificant. As shown, 21% of the potential sample refused further cooperation with the study at the time of the screening interview: this refusal rate varies from a low of 13.6% among fire victims to a high of 25.3% among earthquake victims. Of those agreeing to cooperate, 4% never received a questionnaire packet owing to bad addresses (packets returned as Undeliverable): this figure varies narrowly from 3.5% to 6.3%. There is also modest variation by hazard type in the overall completion rate, ranging from a low of 52.6% to a high of 58.1%. The sharpest pattern

revealed in this panel of the table is in the "Never Happened" category, with higher proportions registered for the more diffuse hazards (hurricane, tornado, and earthquake). Clearly, many people "experience" such events without ever being "victimized" by them, a point confirmed in later analyses.

The last panel of Table 3.2 presents the final response rates of households in the hazard survey. This rate is defined as the total households responding at some level (either completing a questionnaire or phone interview or responding that the reported event should not be included in the study), divided by the total number of households eligible to respond. Again, there is little variation in this rate by type of hazard, the rate hovering around two-thirds in all categories.

The Event Sample

To this point, the discussion has been based upon the victimized households located in the screener interview. During field work, certainly, the household was the basic unit for tracking the data collection effort. However, the final sample is a sample of hazard events as well as a sample of victimized households; indeed, the 3,292 victims located in the screener reported a total of 6,177 discrete hazard occurrences, for an average of nearly two events per victimized household. In the next several pages, we discuss the final disposition of the 6,177 reported hazard occurrences; relevant data are shown in Table 3.3.

The first panel of the table shows the number of households reporting a hazard of each type, and the total number of hazard experiences reported. It should be noted that any single household could report multiple types

of disasters, as well as multiple occurrences of a single type. For this reason, the total number of households reporting any hazard event (N = 3,292) is much less than the sum of the number of households reporting an event of each type (N = 3,961).

The average number of occurrences varies substantially by type of disaster. Most fire victims report one and only one fire experience; the ratio of fires reported to households is 1.06. The figures for floods and hurricanes are similar (1.47 and 1.41, respectively) and are higher than that shown for fires. The highest ratios appear for earthquake (1.61) and tornado (1.80), again due (presumably) to the broader question asked in these latter two cases.

The second panel of Table 3.3 presents the percentages of total events that were either excluded or included in the follow-up sample. Overall, 67.3% of all reported events are covered by the mail survey. Events were excluded from the sample either because they were reported by households that refused to cooperate further in the study (17.7% of all events) or because the events were not selected in the sampling process described earlier (15.0% of all events). The percentage of events excluded by sampling was greatest among hurricane (12%), tornado (21%) and earthquake (17%) events, as would be expected from the sampling strategy.[2] There is also a large difference by type of hazard in the number of events excluded due to respondent refusal, with almost one out of every three tornado and earthquake events being lost due to this

---

[2] A small number of fire and flood events were excluded because their questionnaires were never sent for some reason, not because of sampling.

Table 3.3

Disposition of Hazard Events Reported on the Screener in the Mail Survey

	Total	Fire	Flood	Hurricane	Tornado	Earthquake
Total HH Reporting a Hazard Event	3292	553	328	663	1440	977
Total Events Reported	6177	587	482	933	2598	1577
Average per HH		1.06	1.47	1.41	1.80	1.61
A: Percentage of Events in:						
Non-cooperating HH	17.7%	7.0%	7.3%	15.5%	37.6%	32.6%
Excluded Through Sampling	15.0	0.5	0.6	12.0	20.6	17.3
Eligible for Survey	67.3	92.5	92.1	72.5	41.8	50.1
Total Events Eligible for Survey	4158	507	399	652	1652	948
Percent Undelivered	4.7%	6.3%	4.8%	4.6%	4.3%	4.7%

Table 3.3 (continued)

		Total	Fire	Flood	Hurricane	Tornado	Earthquake
B:	Total Events Eligible for Completion in Survey	3961	475	380	622	1581	903
	Completed Questionnaire	33.1%	44.0%	34.5%	34.2%	29.5%	32.3%
	Completed Phone Interview	7.4	9.3	4.7	7.7	6.8	8.6
	Never Happened[a]	13.6	7.8	11.3	12.9	15.9	14.3
	Refused	8.4	11.2	8.2	9.2	8.3	6.5
	No Response	37.4	27.8	41.3	36.0	39.4	38.2
	Overall Response Rate[b]	54.1%	61.1%	50.5%	54.8%	52.2%	55.2%

[a]Respondent indicated event never occurred or was too trivial for response.

[b]Total complete questionnaires + Phone Interview + Never Happened/Total Eligible Events.

reason. Since Table 3.2 showed only a small difference in the household non-cooperation rate among tornado and earthquake victims, the large differences shown here can only reflect the higher average number of total events reported by tornado and earthquake households. It is clear, in any case, that earthquake and tornado households who refused further cooperation with the study took more hazard events with them out of the sample than did the non-cooperating victims of the other hazard types. Thus, the rate of inclusion of events in the mail follow-up was very high for fire and flood events (over 90% of all reported fire and flood events were included) and lower for the other three hazard types.

Among those events included in the initial follow-up sample, a small percentage (4.7%) were lost due to undeliverable questionnaire packets. There is not much difference in this percentage across the hazard types, with fire events being the most likely to be excluded for this reason (6.3%).

Panel B of Table 3.3 presents the final disposition rates for the remaining hazard events that were eligible for the follow-up sample. This table shows both the percentage of events for which there is a completed mail questionnaire and those with a completed phone interview. Overall, the completion rate for fire events is highest (53.5% of all fire questionnaires were completed) and lowest for tornado events (36.3%). The rate of telephone interviews was much lower than completed mail questionnaires for all hazard types. Overall, 33.1% of the events had completed mail questionnaires and only 7.4% of the hazard event information was obtained by a phone interview.

Differences by type of hazard in the percentage of events for which a response of "Never Happened" was given are similar to those found in the household disposition counts in Table 3.2. Tornado and earthquake events are more likely to be reported as having "Never Happened" (15.9% and 14.3%, respectively) than are fire events (7.8%).

The last panel of Table 3.3 shows the overall response rate for the hazard events in the survey, calculated as before for households. Overall, the survey obtained a response for 54.1% of all eligible events and the response rate is similar for all hazard types (the highest response rate was for fire events, 61.1%).

Summarizing briefly: Households and the hazards they had experienced were lost to our research through any of several mechanisms. A (presumably) substantial number were lost at the stage of screening, among households who refused to participate in the screening interview or among those who did not participate in screening for other reasons. Since we have no additional information on the non-participants in the screening interview, no estimate of the ensuing bias can be made. Additional households were lost at the end of screening, among those who declined to participate in the follow-up mail questionnaire. Since screening data are available on these households, some analysis of the nature of our losses at this stage can be undertaken; see the following section.

Among victimized households who passed through screening and into the study's second phase, subsequent losses to the sample occurred, again, through several mechanisms. Some "victims" of non-damaging tornadoes, hurricanes, and earthquakes were sampled out as part of the follow-up strategy discussed above. Since this sampling was done strictly by

probability methods, the lost cases at this stage differ from the remaining "no damage" cases only by chance alone and no further analysis is warranted. Many additional households were, in effect, "lost" because they reported, contrary to the screening information, that their event "Never Happened." Most of these losses apparently concern minor events whose sequelae failed, on second thought, to qualify them as "disasters" in our respondents' minds. Finally, many cases were lost simply because eligible respondents, even after repeated pestering, never returned their questionnaires. Again, since we have screening data for each of these households, some analysis of the nature of these losses can also be undertaken.

Analysis of Non-Response

(A) Refusal to Cooperate After Screening

As we have stated previously, the screening interview located a total of 3,292 hazard-victimized households. Including initial refusals who were eventually converted, 2,603 of these households ultimately cooperated in the study at least to the extent of providing a name and mailing address. All told, then 689 otherwise potentially eligible households (20.9%) were lost to the study through refusing to cooperate further after screening.

The key distinguishing feature of the "refusers" at this stage is that their hazards losses were relatively minor, a pattern that holds across hazards types. Among fire victims (N = 553), for example, 78 reported that the fire they had experienced actually caused no damage;

among this group, refusal to cooperate further ran to 29.5%, versus a refusal rate of 10.9% among fire victims who reported any losses (N = 475). For flood victims, the corresponding rates were 27% (N = 89) among those suffering no loss and 13% (N = 239) among the remainder; for hurricanes, 25.3% (N = 360) vs. 11.6% (N = 303); for tornadoes, 28.3% (N = 637) vs. 13.1% (N = 803); and for earthquakes, 25.9% (N = 851), vs. 22.2% (N = 126). With the partial exception of earthquakes, then, the "refusers" at this stage are similar to the "Never Happened" category at the stage of the mail questionnaire: respondents with minor or trivial hazards losses selected themselves out of the study.

(B) Non-Response to the Mail Questionnaire

Of the 2,603 households eligible after screening for further participation, a total of 1,694 ultimately returned one or more of their questionnaires or, in a few cases, supplied their victimization data over the phone.[3] Thus, between the end of screening and the end of field work, an additional 909 cases were lost. Of these, 108 were lost through bad addresses (questionnaires returned to us as "undeliverable") and the remaining 801 were lost because they simply never returned any questionnaire and were never reached (or refused to cooperate) by telephone.

Differences among these three groups in their respective hazards experiences, as reported in the screening interview, are on the whole very modest. The 108 "undeliverables" have been discussed elsewhere in

---

[3]Of these, to be sure, 315 responded with the information that the event "Never Happened." These are included as responders in the ensuing analysis, although they are dropped from the substantive analyses of later chapters.

this chapter and require no additional commentary here. Among those who actually received questionnaires (N = 2,495), the tendency to return them was unrelated to hazard experiences. To illustrate, among those responding, 17% were classified as fire victims, 10% as flood victims, 20% as hurricane victims, 45% as tornado victims, and 29% as earthquake victims. (These sum to more than 100% since any household could have been victimized by more than one hazard type.) Among those never responding (N = 801), the corresponding percentages are 19%, 11%, 22%, 44%, and 26%. The largest difference between responders and non-responders is thus on the order of 3 percentage points. Among those actually victimized by each hazard type, the tendency to have suffered damage from the event was also unrelated to survey non-response; again, the largest difference between responders and non-responders in whether the event actually caused any damage was on the order of three percentage points. (Among the non-responding earthquake victims, 15% reported some damage from the event; among responding earthquake victims, 12% reported some damage from the event. For the other four hazard types, the difference was even less.) It is therefore manifestly apparent that non-response to the mail survey was uncorrelated with the disaster experiences of the household, contrasting the pattern of "refusals" at the earlier stage.

In order to inquire more fully into the characteristics of, and possible biases introduced by, non-response to the mail questionnaire, a variable was created that assumed the value "0" for the 801 true non-responders, and the value "1" for the 1694 responders. (Note, then, that the Undeliverables are excluded from this analysis, whereas the "Never Happeneds" are included and treated as responders.) This variable

was in turn entered as the dependent variable in a series of regression equations. The regressors in these equations included both event characteristics and household characteristics, and a large number of possible models were estimated. The analysis revealed a few statistically significant effects, all modest in substantive implications (see Table 3.4). For example, earthquake victims were slightly more likely to respond than were victims of other hazards; residents of large cities were slightly less likely to respond than residents of rural places; blacks were slightly less likely to respond as were renters. All these effects, while "significant," are very modest in actual magnitude. There was also a significant tendency for response to decline as the number of questionnaires sent increased, as one might expect. The only truly important finding to emerge from this set of analyses, however, is that the best fitting model we examined accounted only for 3% of the variance in response. As a substantive conclusion, then, it can be stated that non-response to the mail survey was for all practical purposes random with respect to the variables available for analysis.

Non-response to the mailed survey represents a loss not only of respondents but also of hazard events. After screening, there remained 2,603 eligible households, representing 3,961 eligible hazard events. (See Table 3.3 for details and definitions of eligibility). Table 3.5 presents the completion rates within the event samples according to characteristics of the event. The event information shown here is, of course, obtained from the screener interview and therefore contains little detail. However, the table does allow us to check whether respondents were more or less likely to respond to questionnaires directed at hazard events of

Table 3.4

Regression of Household Completion Status[a] on Hazard and Household Characteristics

	b	SE
Fire Experience	-.001	(.003)
Flood Experience	-.006	(.035)
Hurricane Experience	-.010	(.029)
Tornado Experience	.005	(.026)
Earthquake Experience	.057 *	(.029)
Total Questionnaires Sent	-.015 *	(.006)
Pacific[b]	-.105 *	(.051)
Mountain	-.054	(.072)
West North Central	-.048	(.050)
East North Central	-.026	(.042)
West South Central	-.083	(.048)
East South Central	-.029	(.049)
South Atlantic	-.035	(.044)
Middle Atlantic	-.059	(.046)
Large City 250,000+ [c]	-.070 *	(.035)
Medium City 25,000 - 250,000	-.016	(.030)
Small Town under 25,000	-.014	(.028)
Suburban Area	-.028	(.028)
White Respondent[d]	.147 *	(.037)
Other Race (non-Black)	.138 *	(.070)

Table 3.4 (continued)

	b	SE
Income (in thousands)	.001	(.001)
Homeowner[e]	.078 *	(.065)
Constant	.549 *	(.065)

R^2 = .030*

N = (2449)

---

[a]Completion Status 1 = Completed questionnaires or Never Happened response 0 = No response or refused.

[b]Dummy variables for region. Omitted category is New England.

[c]Dummy variables for city size. Omitted category is Rural.

[d]Dummy variable for race of respondent. Omitted category is Black.

[e]Dummy variable for Tenure. Omitted category is Renter.

*Significant at .05.

different types.

The first section of the table shows a breakdown of the response rates within categories of damage. Overall, there is little relationship. In fact, events with large amounts of reported damage ($1000 or more) were slightly less likely to result in a response than were those causing no damage (52.7% vs. 60.2%). However, this pattern varies across the five hazard types. Response to fire events increases with damage, the anticipated pattern. A mixed pattern is found for floods: 47.1% of the no damage floods and 55.8% of the largest damage floods generated a completed response, but the highest response rate is for floods that caused modest amounts of damage (70.8%). For the remaining three hazards, the tendency is for response to fall as damage increases. In part, this apparently counter-intuitive pattern reflects that "Never Happened" is treated as a response (vs. non-response) in this table.

The table also shows the response pattern by year of occurrence. The response rates for fires, floods, and hurricanes show very little difference by year. The pattern for tornadoes and, more strongly, for earthquakes shows higher response rates for more recent events, as might be expected given the high proportion of "trivials" in these two categories.

Sample Characteristics

Net of all losses, there were in the end 13,005 households who completed the screening interview and 1,379 households who eventually supplied follow-up data on hazard victimization, this latter excluding the respondents in the "Never Happened" category. These are, in essence, the samples available for (i) estimating the rates of victimization by natural hazard

Table 3.5

Percentage of Eligible Events[a] for which a Response[b] was Obtained in the Mail Survey by Event Characteristics

	Total	Fire	Flood	Hurricane	Tornado	Earthquake
Total Response Rate	54.2% (3961)	61.1% (475)	50.5% (380)	54.8% (622)	52.2% (1581)	55.3% (903)
Damage Category[c]						
No damage	60.2% (1323)	51.2% (41)	47.1% (70)	60.7% (196)	59.9% (394)	62.2% (622)
$1 - $100	56.2% (317)	57.9% (38)	70.8% (24)	71.9% (32)	55.0% (180)	39.5% (43)
$101 - $500	49.5% (602)	56.8% (74)	50.0% (54)	52.0% (98)	47.3% (349)	48.1% (27)
$500 - $1000	56.0% (300)	66.0% (53)	38.0% (50)	59.3% (59)	56.0% (125)	69.2% (13)
$1000 or more	52.7% (729)	63.6% (217)	55.8% (113)	43.9% (114)	50.4% (232)	30.2% (53)
Unknown	47.0% (690)	61.5% (52)	47.8% (69)	51.2% (123)	46.2% (301)	39.3% (145)
Year of Occurrence[c]						
1970 to 1975	50.6% (1250)	61.7% (180)	50.0% (164)	51.1% (176)	48.9% (468)	45.8% (262)
1976 to 1980	55.7% (2449)	61.0% (277)	50.5% (200)	55.6% (383)	53.4% (1016)	59.0% (573)
Unknown	58.0% (262)	55.6% (18)	56.3% (16)	60.3% (63)	55.7% (97)	60.3% (68)

[a] Percentages based on "eligible events" excluding non-cooperation and undelivered questionnaires. See Table 3.3.

[b] Response includes completed questionnaires and "Never Happened."

[c] Data obtained from screener interview.

in the United States (the final screener sample), and (ii) estimating the average losses, insurance coverage, relief assistance, and so on of hazard victims (the final mail survey sample, net of the "Never Happened" group). Some basic descriptive data on these two samples are shown in Table 3.5.

Focussing first on the screener interview, we note a fairly large "bias" in favor of female respondents. Since households are the unit of analysis for this research, and any adult was treated as an eligible informant for the household as a whole, screening interviews were conducted with any adult who happened to be present in the household when contact was made. The differential tendency of women to be in the home, relative to men, at any given time thus accounts for the indicated pattern. Note that women were also more likely than men to fill out the mail questionnaire, presumably because the name of the phone respondent was used on the mailing label.

The remaining distributions, for both the mail and screener samples, are about as one would expect given the known demographic characteristics of the U.S. population; all the reported proportions are within a few percentage points of the correct values. Note that differences between the two samples can arise in either of two ways: (i) because of correlated non-response to the mail follow-up (i.e., certain classes of respondents may have been more hesitant to return their questionnaires than other classes), or (ii) because some groups in the society are more vulnerable to victimization by hazards than others. In general, however, the distributions reported for the two samples are quite similar, which suggests that neither of the above noted processes was at work.

Table 3.6

Socio-Demographic Characteristics of the Screener and Follow-Up Samples

	Screener Sample	Mail Sample
Sex		
Male	38.5%	39.1%
Female	61.5	60.9
N =	(13005)	(1379)
Race		
White	89.4%	91.5%
Black	7.6	5.4
Other	3.0	3.1
N =	(12608)	(1371)
Tenure		
Own	74.7%	77.5%
Rent	25.3	21.8
N =	(12589)	(1379)
Community Size		
Rural	21.3%	23.3%
Small Town under 25,000	26.7	25.3
Suburb of City 25,000+	22.8	23.6
Medium City 25,000-250,000	16.4	17.0
Large City 250,000+	12.6	10.5
Other	0.2	0.3
N =	(12517)	(1369)

Table 3.6 (continued)

	Screener Sample	Mail Sample
Age of Head of Household		
Under 25	6.0%	7.1%
25-34	23.4	28.6
35-44	20.4	25.5
45-54	17.7	17.5
55-64	16.2	12.8
65+	16.4	8.6
N =	(12295)	(1356)
Age		
Mean	46.3	42.8
Family Income		
Mean	$18,503	$20,876
N =	(11008)	(1275)
Number of Persons in Household		
Mean	3.0	3.3
N =	(12520)	(1347)

CHAPTER FOUR

THE INCIDENCE OF HAZARD EXPERIENCES

Introduction

How many households are victimized by natural hazard events? What kinds of households are especially likely to have such experiences? These are the two main topics of this chapter. To provide a calibrating framework for natural hazards phenomena -- floods, hurricanes, tornadoes and earthquakes -- we compare the incidence of such events with household fires and with other unpleasant occurrences.

Whether or not a household has experienced any one of the happenings about which we are concerned is subject to some degree of ambiguity. A household fire is perhaps best defined since only those fires which occurred in a dwelling qualify. But there are ambiguous fires: Should a flare-up of grease while cooking be counted? Or a cigarette burn on a rug? Floods are also subject to some ambiguity: If a river overflows its banks and waters swirl around the second story of one's home, there is no doubt that a flood event has occurred. But what about a storm drain backup in the basement caused by heavy rains? Even more ambiguous are hurricanes, tornadoes and earthquakes. The direct path of a tornado is usually quite narrow but dwellings near the path are also often affected by accompanying high winds and torrential rains. Hurricanes cover even wider areas and set off secondary effects such as tornadoes and floods. Earthquakes are similar to hurricanes in not having very definite boundaries of impact. (Indeed, while writing this chapter an earthquake of

magnitude Richter 4.8 and with an epicenter some 300 miles away was felt as a slight tremor in Amherst, Massachusetts. Certainly a tremor was "experienced" by the authors, and several million others in New England, but scarcely at a level of intensity that endangered life or property.)

The inherent ambiguity of natural hazards experiences was resolved in the design of our questionnaire by deciding to include at the first level of measurement any event that was regarded by a household as an "experience" with any of the hazards under study. These hazard experiences would then be filtered through a series of questions that would separate out the trivial (and remote) experiences from those with serious consequences and direct immediate impact. The question used in our telephone interviews was worded as follows:

> "Since 1970, has your family or household experienced a (hazard) in a house or apartment in which you were living as a group?"

The hazards were described as follows:

> "a fire"
> "a flood caused by the overflowing of a river or stream"
> "a hurricane or severe tropical storm"
> "a tornado or severe windstorm"
> "an earthquake or tremor"

The intent of the question was to focus the attention of the respondent on a specific period (1970 through 1980) and on events that occurred in or around a dwelling unit occupied by the group of persons who then currently constituted a household or living group. How successful these questions were in focussing the respondent's attention on that period or on the specific household, as intended, is a matter of speculation. Our main safeguard against errors were follow-up questions that asked about specific dates of occurrences and about the length of time the

household in question had been in existence.

Of course, this strategy leaves it completely up to the respondent to define a hazard "experience." We have assumed that most respondents used low thresholds in reporting on experiences. Indeed, as we show later in this chapter, that assumption is justified.

The next stage of the filtering process was to ask in which year during the period between 1970 and 1980 the event was experienced. A few persons (5.0%) could not remember dates of occurrence and no further filtering questions were asked of them.

The second stage filter was a series of questions asking whether deaths, injuries and/or damages were experienced as a consequence of the event. As we indicate later, many of the experiences were apparently quite trivial events; at least no one in the household was hurt and no household property was damaged.

The term "hazard experience" is used in this chapter to designate all the reports received from our respondents in response to the first question listed above, less those events for which they could not provide a date. A hazard experience, then, is the most inclusive category of measurement, including all those happenings for which the respondent could provide a year of occurrence that appeared to the respondent to have been a household fire, flood, hurricane, tornado or earthquake (irrespective of loss). Later, we distinguish between "experience" and "victimization," the latter being any experience where some loss was incurred.

The Base Period and Its Representativeness

The incidence rates to be presented in this chapter are tied to the particular base period used, the eleven years contained in 1970 through 1980. The rates computed are historically specific and may not be representative of incidence rates computed over different periods or over longer ranges of time. This potential unrepresentativeness is particularly troublesome for those hazards and for hazard magnitudes that have long or irregular return cycles. Thus, household fires do not vary much from year to year and from decade to decade. The household fire incidence rates are therefore likely to be typical of any eleven year period. But major earthquakes have longer return cycles and hence our findings about that hazard is likely to be particular to an historical period in which only one major earthquake occurred, the San Fernando tremor of 1971, and that event was scarcely a major catastrophe. Similarly the floods spawned by Hurricane Agnes in 1972 were not the ordinary sequelae of a severe tropical storm, but only of one that turned into heavy rainstorms when it left the coast and veered inland.

There is simply no way that we could claim with complete confidence that the period under study is clearly representative of all historical periods and all future periods. The best we can say is that 1970 to 1980 is not totally misleading for fires, torandoes and floods. However, one should take our findings with respect to earthquakes with due regard for the fact that during the period in question, no serious earthquake catastrophe occurred. With respect to hurricanes, the appearance of Agnes in the time window affects findings to some extent.

Of course, the same cautions should be exercised when we consider the traces of public policy effects, shown in Chapter VI. A major change in federal policies affecting relief and rehabilitation measures occurred with the passage of PL93-288 in 1974. In addition, the federal flood insurance program began to get underway in earnestness in the last few years of this period. Whatever traces we see of the actions of federal agencies is therefore reflected in the patterns of aid claimed by the households studied that arises out of several major policy shifts that occurred during this period.

In short, our findings are historically specific, as the findings for any eleven year period in the past and future would be.

Hazards Experiences

The percentages of the 13,005 households contacted during screening that claimed hazards experiences of any magnitude are shown in the first column of Table 4.1. Even under our rather lenient and inclusive definitions, hazards experiences are relatively rare. During the 11 year period, 4.3% experienced a household fire, 2.5% a flood, 5.1% a hurricane (or severe tropical storm), 11.1% a tornado (or severe windstorm), and 7.5% an earthquake (or tremor). All told, a little more than one in every four households (25.3%) experienced at least one of the five hazards in that period.[1]

---

[1]Households experiencing more than one hazard or several instances of the same hazard are counted only once in this calculation.

Table 4.1

All Hazards Experiences[a] Reported by Respondents from 1970 to 1980
(N = 13,005)

Hazard Type	Percent Reporting Any Experience[a] (1970-1980)	Any Experience[a] Annual Rate per 1,000 Households[b]	Projected U.S. Households All Experiences[a,c] (Annual)
Household Fires	4.3%	6.8	544,000
Floods	2.5%	4.4	352,000
Hurricanes or Severe Tropical Storms	5.1%	8.2	656,000
Tornadoes or Severe Windstorms	11.1%	18.2	1,455,000
Earthquakes or Tremors	7.5%	13.7	1,095,000
All Hazards Experiences Combined	25.3%	51.2	4,093,000

[a] Includes any report of each hazard, regardless of seriousness of incident. Does not count separately multiple incidents occurring within any year or over the period. Includes any event reported at any time during 1970 thru 1980.

[b] Computed by considering as base only households that had been formed at the time of the incident.

[c] Based on U.S. Census 1980 count of 79,951,490 households in continental contiguous states (excludes Hawaii and Alaska), rounded to nearest thousand.

In the second column of Table 4.1, we have converted the reported experiences into rates per 1,000 households per year, a calculation that takes into account the fact that some of the households in the sample had been formed sometime during the 11 year period and hence were not exposed to risk during the entire period.[2] Annual "experience" rates per 1,000 households range from a low of 4.4 (floods) to a high of 18.2 for tornadoes and severe windstorms. All told, about one out of twenty households can be expected to experience one or another of the five hazards during a typical year.

The third column of Table 4.1 projects the total expected numbers of U.S. households who will experience each of the five hazards annually, assuming that the 11 years, 1970 to 1980, provide an adequate basis for such projections. About four million U.S. households will have at least one experience in a year, about half of such events consisting of earthquake tremors and tornadoes (including windstorms).

---

[2] Rates were calculated as follows:

$$\text{Rate} = \left(\sum_{i}^{N} H_i / Y_i \right) \times 1{,}000$$

where H_i = Number of hazard events reported by individual i.

Y_i = Number of years during the period 1970-1980 the household of individual i was in existence.

N = Total sample (13,005)

Hazard Victimization Experiences

At the level of hazard experiences, natural hazards appear to be quite frequent, experienced by about a quarter of all households in an average decade. But this definition, of course, includes many events of only momentary consequence, e.g., events not accompanied by any damage to property or injury to household members. For policy purposes, then, the definition of hazard experience is over-inclusive, as Table 4.2 shows. In that table, the proportions of experiences involving deaths, injuries or any damages are shown. The bottom row shows that most of the events reported were fairly trivial occurrences: memorable enough to report, to be sure, but with minimally serious or non-existent consequences in the way of injuries or property damage. Indeed, nearly two-fifths of the experiences reported (39.2%) were trivial events, in the above sense.[3]

---

[3]To avoid misunderstanding, a "trivial" hazard experience is here taken to mean an experience reported by a household that did not result in death or injury to any member of that household and that did not generate any damage to the household property. This is a narrow definition of "trivial." To illustrate, consider a family that resided on the outskirts of a major tornado path. The tornado itself may well have destroyed hundreds of homes and injured scores of people. If our hypothetical family escaped unscathed, incurring no injuries or loss themselves, the "event" is counted here as a "trivial" one, even though the tornado itself clearly was not. (It must, of course, be remembered that the households directly in the path would have been equally likely to appear in our victim sample.) Too, from a psychological viewpoint, the above "experience" would in all likelihood have not been "trivial," even in the absence of direct losses to themselves. To the contrary, it may well have been the most awesome and terrifying event in the whole of their existence.

Table 4.2

Deaths, Injuries and Damages from Natural Hazard Events

Natural Hazard Type	Deaths		Injuries[d]		Damages[c]		Victimization Hazard Events: Deaths, and/or Injuries, and/or Damages	N of Household Reporting Any Experience of Each Type[a]
	N	%	N	%	N	%		
Fires	(17)	3.1%	(39)	7.1%	(475)	85.9%	85.9%	(553)
Floods	(7)	2.1%	(9)	2.7%	(239)	72.9%	73.2%	(328)
Hurricanes	(2)	0.3%	(4)	0.6%	(303)	45.7%	46.0%	(663)
Tornadoes	(8)	0.6%	(14)	1.0%	(803)	55.8%	56.0%	(1440)
Earthquakes	(9)	0.9%	(7)	0.7%	(126)	12.9%	13.6%	(977)
All Hazard Types Combined	43	1.3%	73	2.2%	1,946	59.1%	60.8%	(3292)[b]

[a] Number of households reporting each hazard type. Actual separate incidents within each hazard type are not counted as individual incidents.

[b] Number of hazard types combined reported by households, not counting separate events within each type.

[c] Any damages, regardless of amount or extent.

[d] Any injuries reported.

As the table shows, there are sharp differences across hazards types in the proportions of "trivial" events reported. Fire experiences captured by our methods are least likely to be trivial events: about 86% of the reported incidents were accompanied by some damages. The same is true in lesser degree for floods; 73% of the flood events in the sample inflicted at least some damage. In contrast, geographically diffuse natural hazards experiences with earthquakes and hurricanes were most likely to be trivial events (86.4% and 54.0%, respectively, being accompanied by no injuries or damages). Tornadoes and windstorms occupied a middle ground with 44.0% classifiable as trivial events, in our terms.

When we narrow the definition of hazard events to include only hazard victimization experiences, as in Table 4.3, the overall incidence declines considerably. In the sense used in this table, a "hazard victimization experience" is one that is accompanied by death and/or injury and/or non-zero damage to property. Of course, since injuries and deaths are relatively rare (as Table 4.2 indicates) most of the hazard victimization experiences are ones which caused some damage to property and/or possessions.

Table 4.3 shows that when we consider only hazard victimization experiences (or in other words non-trivial hazard events), the incidence proportions and rates decline, on the average, to about half the size of the corresponding numbers in Table 4.1.

About 14% of the households surveyed experienced some hazard victimization event in the 11 year period, equivalent to a rate of slightly less than 25 households out of a thousand in any year. Projected to the total household population of the contiguous 48 states, about two

Table 4.3

Hazard Victimization Experiences[a] Reported by Respondents from 1970 to 1980 (N = 12,352)[a]

Hazard Type	Percent Reporting Hazard Victimization Experience[a]	Victimization Experience[a] Annual Rate per 1,000 Households	Projected U.S. Household with Victimization Experiences[a] (Annual)
Fires	3.8%	5.8	464,000
Floods	1.9%	3.4	272,000
Hurricanes and Severe Tropical Storms	2.5%	3.5	272,000
Tornadoes and Severe Windstorms	6.5%	10.0	799,510
Earthquakes and Tremors	1.1%	1.8	138,000
All Hazard Victimization Experiences Combined	14.3%	24.5	1,959,000

[a]A "hazard victimization experience" is defined as one involving death, and/or injury, and/or damage to property.

[b]Excludes households who could not recall year of occurrence, or by error, were not asked follow-up questions on injuries, deaths or damages.

million households annually experience one or another of these five events with resulting damage and/or injury.

Note that this definition of non-trivial can easily be regarded as very much on the lenient side. Although the respondents claim some damage, the amount of damages involved may be quite small. Indeed, as we show in the next chapter, many of the non-trivial experiences counted in Table 4.3 are not very different from the trivial ones that we have excluded from that table.

Among the hazards studied, tornado and windstorm victimization experiences are easily most frequent with annual rates of 10.00 per 1,000 households. Since the best documentary records indicate a considerably lower incidence of damage and injuries for tornadoes alone,[4] we suspect that many of the incidents reported were windstorms without accompanying tornado activity. Household fire victimizations are next in terms of frequency, with annual rates of 5.8 per 1,000 households. Hurricanes and floods have about the same victimization incidence levels, 3.5 and 3.4 per 1,000 respectively. Least frequent of all were reports of earthquake victimization events, with annual rates of 1.8 per 1,000.

By and large, households experienced only one type of hazard victimization event throughout the period 1970-1980. Table 4.4 indicates that about 13.6% of all the sampled households experienced one or more hazard victimizations, of which 12.3% experienced only one hazard

---

[4]See section later in this chapter for comparisons with other estimates.

Table 4.4

Multiple Victimization Experiences with Natural Hazards:
1970 to 1980

A. Number of Hazard Victimization Experiences of Any Type

Number of Event Years	Percent
0	86.4%
1	12.3%
2	1.2%
3 or 4[a]	0.1%
N =	(13,005)

B. Pairwise Overlapping of Hazard Victimization Experiences

		Floods	Hurricanes	Tornadoes	Earthquakes
Fires	%	0.17[b]	0.15	0.35	0.06
	N	(22)	(20)	(45)	(8)
Floods	%		0.18	0.22	0.03
	N		(23)	(29)	(4)
Hurricanes	%			0.30	0.02
	N			(39)	(3)
Tornadoes	%				0.07
	N				(9)

[a]Only one household reported four victimization incidents.

[b]Percent of total sample (N = 13,005) experiencing both fire and flood victimization experiences. Number in brackets is number of households with that joint experience.

victimization between 1970 and 1980.[5] Only a very small proportion experienced 2 or more (1.3%) and only one household experienced four non-trivial hazard types, the highest number occurring.

The bottom panel (B) of Table 4.4 presents counts of the joint occurrence of pairs of hazard victimization. Not very much can be noted in this display: Joint experiences of different non-trivial natural hazards events over the period 1970 to 1980 were quite rare. Indeed, while there is a slight tendency for all the events to be slightly positively related, these patterns are so weak as to be insignificant substantively and statistically.

Comparisons With Other Estimates

In order to design the research that is discussed in this monograph, it was necessary to assemble as much as possible of the existing information on household victimization by hazards. Indeed, it was those estimates upon which we based the size of the Screening Interview sample and calculated the costs of contacting impacted households by mail. The resulting design estimates are shown in Table 4.5. (Appendix A provides a detailed account of how these estimates were constructed.)

---

[5] Note that this table is based on the total sample, 13,005, and includes those who were not able to remember the year in which a reported hazard occurred. Table 4.3, excludes the latter and hence reports a slightly higher proportion reporting a victimization hazard event (14.3%). Note also that this tabulation counts all separate occurrences of a natural hazard type that took place within a calendar year as a single event. Since very few households experienced multiple occurrences of a given disaster type within a year, this mode of presentation does not seriously distort reality.

Table 4.5

Ex Ante and Ex Post Hazard Victimization Estimates for U.S. Households[c]

Hazard Types	Ex Ante Estimates: High Estimate	Ex Ante Estimates: Low Estimate	Ex Ante Estimates: Design[d] Estimate	Ex Post Decade Estimates: Hazard Experiences Reported	Ex Post Decade Estimates: Hazard Victimization Only
Fires[a]	5%	1.0%	4%	4.3%	3.8%
Floods[b]	4%	1.1%	3%	2.5%	1.9%
Hurricanes[b]	5%	1.5%	3%	5.1%	2.5%
Tornadoes[b]	2%	0.3%	1%	11.1%	6.5%
Earthquakes[b]	0.7%	0.01%	0.5%	7.5%	1.1%
Combined			14.5%	25.3%	14.3%

[a]Based on data gathered in a household survey in selected California communities, plus data gathered in a survey of state and local political elites (see Rossi and Wright, 1982, for detailed discussion of these data). In addition, survey data gathered by the National Fire Prevention and Control Administration (National Household Fire Survey, 1977) and compilations of the chapter reports of the American National Red Cross were consulted.

[b]Based on data from the chapter reports of the American National Red Cross plus the two surveys cited in footnote a above.

[c]See Appendix A in which these estimates are derived in detail.

[d]"Design estimate" is compromise between high and low estimates used in the design of the victimization study sampling strategy.

Since there were several sources of existing data that were consulted, estimates of victimization per decade varied slightly depending on which source was used. American National Red Cross Chapter Reports (filed by chapters after rendering aid in disaster events) tended to be concerned with disasters of relatively wide scope, and hence under-counted impacted households when only a few were involved. Surveys conducted by the senior authors in California and among political elites in a sample of states and local communities asked respondents about lifetime experiences and hence produced over-estimates, especially since the questions eliciting victimization reports used the phrase "experienced," as in the Screening Interview. Hence "high" and "low" estimates were calculated. The "design" estimate shown in the third column of Table 4.5 contains the "compromise guesses" upon which the size of the Screening Sample was based.

Note that the design estimates are close to the hazard victimization findings, as reported in the last column of Table 4.5, but depart considerably from the "hazards experiences" reported (i.e., the total of non-trivial and trivial hazard reports), especially for tornadoes and earthquakes (the two hazards for which many trivial event reports were reported). Since the sources upon which the design estimates were based counted mainly what were thought to be household victimizations, we find the correspondence to be comforting.

The design estimates and the actual findings concerning hazard victimizations do depart in significant ways, however. The design estimates lead one to expect more flood victimizations than the sample reported (3% as compared to 1.9%) and considerably fewer tornado or windstorm victim-

izations than the sampled households reported. We have no easy explanation for the differences between the two flood estimates, except to question whether the "compromise" should have been centered as close to the "high" estimate. We suspect that the discrepancy between design and findings for tornadoes occurs because we added "severe windstorms" to the tornado category in the screening interview, while the design estimates are based on events that were limited to tornadoes alone.

Year by Year Hazard Victimization Rates, 1970 Through 1980

Table 4.6 contains annual hazard victimization rates (per 1,000 households) year by year for the period 1970 to 1980. Although 1980 was not a particularly hazardous year, the highest overall annual rate was recorded for that year, largely reflecting the high rate that year for tornadoes and windstorms (14.77). Note also that there appears to be a trend through the eleven year period for the combined overall annual rate to increase. We suspect that this is due to the "telescoping" effect noted in several similar investigations.[6] Events which occurred sometime ago tended to be recalled as happening more recently. Thus the reports of natural hazards events in the later years of the period may actually refer to ones that took place much earlier.

Year to year fluctuations in the rates are also of interest. Some reflect the occurrence of fairly large scale hazard events. For example,

---

[6]This telescoping effect is even more severe if we consider the trivial hazard events as well as the ones reported in Table 4.6. Combined victimization and trivial annual rates show an even stronger tendency to an apparent increase towards the end of the eleven year period. Since victimizations are more likely to be remembered in sharper detail, we would expect trivial ones to be more likely to be telescoped.

Table 4.6

Annual Hazard Victimization Rates: 1970 Through 1980
Incidents per 1,000 Households[a]

Year	Fires	Floods	Hurricanes	Tornadoes	Earthquakes	Combined Serious Hazards
1970	2.39	1.02	1.14	3.41	1.02	8.97
1971	1.71	0.88	0.77	2.97	3.74	10.12
1972	3.05	5.69	1.90	4.21	1.47	16.32
1973	2.84	1.83	1.83	4.67	0.20	11.47
1974	4.21	1.08	1.37	5.88	0.29	12.83
1975	4.03	1.31	1.69	4.97	0.28	12.29
1976	4.26	1.90	2.08	5.07	0.09	13.41
1977	3.92	2.44	2.18	7.23	0.44	16.20
1978	4.90	3.49	3.49	8.22	0.25	18.84
1979	4.79	2.07	6.30	9.18	0.88	23.22
1980	4.38	2.46	4.15	14.77	1.85	27.60

[a]Considers only victimization incidents (involving deaths, injuries, or damages). Rates computed by considering only households in existence in the year in question.

the high rate for floods in 1972 is consistent with the severe flooding of the valleys of the Susquehanna as a consequence of that year's Hurricane Agnes. Similarly the high earthquake rate for 1971 coincides with the San Fernando quake of that year and the high rate for 1980 coincides with the Ohio Valley shocks of that year.

These findings suggest that the recall methods used in the Screening Interview do not lead to perfectly precise and accurate locating of even non-trivial hazard events in time.[7]

Multiple Natural Hazard Victimization Events

The data shown in Table 4.3 provide one way of answering the question of how important natural hazards events are. The answer given there is that victimization by floods, hurricanes and earthquakes are, at least for this period, less frequently encountered than household fires. Table 4.3 also indicates that tornadoes and windstorms are more frequent than fires, a bit more than two-thirds more frequent.

It is important to note that our measures of incidence center around whether or not a household has had any victimization encounter with a hazard of a given type. Thus a household that has had only one fire victimization within the period 1970 to 1980 is considered as having had a non-trivial

---

[7]The "telescoping" of hazards events into proximate years makes it difficult to produce annualized rates that do not artificially enhance the incidence of hazards among newly formed households. Since such newly formed households have been in existence for a short time, the telescoped events reported by them lead to artificially enhanced rates of occurrence. Hence in the remainder of the chapter, we consider whether or not a household reports an experience with at least one serious hazard event (of each type) as the basic measure of hazard incidence.

encounter. Households that have had more than one victimization are treated identically as those with a single encounter.

Because of a technical error in drafting the screening interview, we did not ask death, injury and damage questions separately for each hazard event that occurred within a single year. Hence while we are able to tabulate the number of separate hazard events that were claimed as experiences by the respondents, we cannot separate out the trivial from the non-trivial within any given year of multiple events. Table 4.7 contains the counts of all separate events -- trivial and non-trivial -- that were reported by the respondents. Note that it is precisely among the hazard types that are likely to contain many trivial occurrences -- tornadoes and earthquakes -- that most of the multiple within-year reports are obtained. The main message of Table 4.6 is that households reporting a hazard experience as occurring during the period 1970 to 1980 overwhelmingly report only one such occurrence. However, the range is considerable. One respondent reported 110 tornado-windstorm events over the decade and another reported 33 earthquake-tremor experiences.[8] It is a safe guess that most of these multiple reportings are of trivial events.

---

[8] These maxima are artificially precise. In the interview protocol, allowance was made for up to ten events to be reported in any single year. There were eleven years asked about. Thus, by construction, the maximum number of events of any type that could be reported for the base period was 10 x 11 = 110. In like fashion, the report of "33 earthquake or tremor" events over the base period is derived from a response of "Oh, there must have been about three a year," multiplied by the eleven years.

Table 4.7

Numbers of Event Years, Separate Events and
Event Incidence Rates
(Trivial and Victimization Incidents Combined)

A. Household Fires

Years with Fires	%	Number of Fires	%
0	95.75%	0	95.75%
1	4.14	1	4.06
2	.10	2	.16
3	.01	3-6	.03
Average	.044	Average	.045

Incidence of Separate Fires per Decade per 1,000 Households: 7.328

Number of Separate Fires Reported in Sample: 586

B. Floods

Years with Floods	%	Number of Floods	%
0	97.48%	0	97.48%
1	2.28	1	2.04
2	.18	2	.32
3-11	.05	3-21	.16
Average	.030	Average	.037

Separate Flood Events per Decade per 1,000 Households: 6.114

Number of Separate Flood Events Reported in Sample: 483

C. Hurricanes

Years with Hurricanes	%	Number of Hurricanes	%
0	94.90%	0	94.90%
1	4.62	1	4.22
2	.37	2	.49
3-11	.11	3-4	.25
		5-20	.14
Average	.060	Average	.073

Separate Hurricane Events per Decade per 1,000 Households: 11.487

Number of Separate Hurricane Events Reported: 946

Table 4.7 (continued)

D. Tornadoes

Years with Tornadoes	%	Number of Tornadoes	%
0	88.93%	0	88.93%
1	10.28	1	8.73
2-3	.55	2-5	1.90
4-11	.25	5-11	.40
		12+	.12
Average	.136	Average	.200

Separate Tornadoes per Decade per 1,000 Households: 30.917

Number of Separate Tornado Events Reported: 2,501

E. Earthquakes

Years with Earthquakes	%	Number of Earthquakes	%
0	92.49%	0	92.49%
1	7.03	1	5.87
2	.32	2	.78
3-11	.16	3-5	.62
		6-33	.25
Average	.087	Average	.123

Separate Earthquake Reports per Decade per 1,000 Households: 21.917

Number of Separate Earthquake Reports: 1,601

F. Combined Hazards

Years with Hazard Reports	%	Number of Hazard Reports	%
0	74.69%	0	74.69%
1	19.53	1	17.02
2	4.24	2	4.74
3	.85	3	1.55
4-13	.70	4-13	1.70
		14+	.21
Average	.356	Average	.478

Separate Hazard Reports per Decade per 1,000 Households: 77.763

Number of Separate Hazard Reports: 6,217

In any event, because of the impossibility of sorting out the trivial experiences from victimizations year by year in the data obtained from the screening interview, the remainder of the chapter focusses primarily on what might be called the "victimization-year." That is, we count as a single occurrence a report of one or more hazard victimization events occurring within a year.

Calibrating Natural Hazard Incidence

In order to develop an appreciation of the comparative importance of hazard victimizations, it is useful to compare how frequently other unpleasant experiences occur. In order to provide such comparisons, we asked a subsample (1 household in 10) whether or not each of seventeen unpleasant events had happened to someone in the household during the period 1970 to 1980.[9] A tabulation of those unpleasant experiences is shown in Table 4.8.

---

[9]The exact wording of the question was as follows: "Now I will read you a list of acts of nature or other serious events that sometimes happens to people. For each event, please tell me whether or not your family or household has had any experiences of that sort since 1970." For persons who claimed that an event happened to them or their households, a follow-up question asked, "Were there damages or injuries?" This follow-up was only asked for events in which damages or injuries were not obvious consequences (e.g., we considered that unemployment carried obvious consequences). The seventeen "noxious" events were chosen somewhat arbitrarily: The natural hazards were chosen because the ones in question are frequently referred to as important natural hazards dangers in the United States; the others were chosen by the research staff as relatively serious events that were alleged to be fairly frequent household experiences.

Table 4.8

Selected Other Noxious Events Experienced[a]
During Period of 1970 to 1980
(N = 1,245)

Event	Percent Experienced	Percent of Experiences with Damage and/or Injury		N of Events
		N	%	
A. Other Natural Hazard Events				
Lightning	6%	(39)	52%	(75)
Landslides	0.5%	(2)	33%	(6)
Hailstorms	11.3%	(66)	47%	(141)
Snowstorms	37.4%	(39)	8%	(466)
Ground Subsidence	2.7%	(3)	9%	(34)
B. "Bad Luck" Events				
Auto Accident	8.2%	(85)	83%	(102)
Victim of Crime	14.5%	(65)	36%	(180)
Victim of Shooting	0.6%	(5)	71%	(7)
Unemployment (6 or more months)	13.0%	----[b]		----[b]
Birth of Defective Child	2.3%	----		----
Unexpected Death of Family Member	8.8%	----		----
C. Personal Breakdowns				
Arrests and Imprisonments	1.5%	(2)	10%	(19)
Drug or Alcohol Addiction	1.0%	(3)	23%	(13)
Mental Depression	3.8%	----		----
Child in Trouble	4.0%	----		----
Marital Breakup	8.7%	----		----
Personal Bankruptcy	1.4%	----		----

[a]Asked only of 1 in 10 subsample of those given the screening interview.

[b]Questions on damages or injuries not asked of noxious events marked by "----."

Because the unpleasant experiences (noxious events) are tabulated in Table 4.8 as incidents of all sorts, trivial and serious combined, the appropriate comparisons are with the five hazard percentages shown in Table 4.1.

The noxious events have been grouped in Table 4.8 according to whether they refer to natural hazards, "bad luck events" (events over which nouse-holds had little control), and "personal breakdowns" (events towards the occurrence of which the households and/or individual may have made some contribution). Hailstorms and severe snowstorms were the two natural hazard events that were very frequent, the latter being more frequent than any of the natural hazard events studied in detail in this survey. Lightning strikes appear to be about as common as household fires, with landslides being more rare than any of the five, and ground subsidence being somewhat rarer still. Of course, the seriousness of the natural hazard events shown in Table 4.8 is somewhat uncertain. On the one hand, about half of the lightning strikes produced injuries and/or damages, but only 8% of the snowstorms and 9% of the ground subsidences had such effects.

The incidence of "bad luck" events appears to be of about the order of the five main hazards experiences. Unemployment lasting six or more months strikes about as frequently as hurricane experiences and victimization by crime. Unexpected deaths and serious auto accidents appear to be about as frequent as earthquake/tremor experiences. Few households were victims of shooting and few suffered the misfortune of the birth of a defective child.

Most of the personal breakdown events were more rare than any of the five hazards, the main exception being marital disruptions, experienced by a little less than nine percent of the households.

Another way of presenting these materials is shown in Table 4.9, which contains annual incidence rates per 1,000 households.[10] The annualized rate for the other natural hazards combined is about twice that for the main five hazards combined, a comparison which means that severe snowstorms and hailstorms are more likely to occur than any of the five main natural hazards.

But so are "bad luck events" more likely to occur as a combined set than the five natural hazards. Only personal breakdowns as a group are less frequently encountered than the five hazards of main interest.

In more specific terms, Table 4.10 groups the noxious events studied into those that occur more often than the five natural hazards under study, those that occur less frequently, and finally those that occur about as often. The five natural hazard experiences (trivial and non-trivial) are thus seen to be on about the same order of magnitude as lightning strikes, auto accidents, mental depression, unexpected family deaths and marital disruptions.

---

[10] Note that annual incidence rates for the five natural hazards differs from that presented in Table 4.1 (48.3 versus 51.5) because it was computed only for the 1 in 10 subsample who were asked the noxious events questions.

Table 4.9

Incidence Rates for Noxious Events Compared
to Natural Hazard Experiences
(N = 1,245)

	Annual Rates[a] per 1,000 Households
A. All Five Trivial and Non-Trivial Natural Hazards (fires, floods, etc.)	48.3
B. Other Natural Hazard Events (lightning, snowstorms, etc.)	99.6
C. Bad Luck Events	90.6
D. Personal Breakdown Events	42.4
E. All Noxious Events (B to D)	232.6

[a]Computed by adding up the events that occurred in each category and dividing by the number of years households were exposed to risk.

Table 4.10

Noxious Events and Natural Hazard Experiences Compared
(Percent Reporting At Least One Event)

A. Noxious Events That Happened More Often Than the Five Natural Hazards

Severe Snowstorms	(37.4%)
Severe Hailstorms	(11.3%)
Victimization by Crime	(14.5%)
Unemployment for Six Months or More	(13.0%)

B. Noxious Events That Happened Less Often Than the Five Natural Hazards

Landslides or Cave-ins	(0.5%)
Drug or Alcohol Addiction	(1.0%)
Arrest or Imprisonment	(1.5%)
Being Victim of Shooting	(0.5%)
Birth of a Defective Child	(2.3%)
Personal Bankruptcy	(1.4%)
Ground Subsidence	(2.7%)

C. Noxious Events That Are as Frequent as Five Natural Hazards

Lightning Strikes	(6.0%)
Auto Accidents	(8.2%)
Mental Depression	(3.8%)
Unexpected Family Death	(8.8%)
Marital Disruption	(8.7%)

The Spatial and Social Distribution of Natural Disaster Events

Natural hazard events have definite ecological distributions. The paths of hurricanes that strike the continental U.S. are more likely to strike the Gulf states and the lower Atlantic seaboard. Interior states may sometimes be affected by flooding accompanying heavy rainfall, as in the case of the 1972 Agnes-caused flooding in Pennsylvania, upper New York and Maryland. Tornadoes are known to favor a diagonal belt running from the Southwest to the Northeast. Earthquakes are more likely to occur along the known fault lines. Floods are less specialized -- even the arid states are subject to flash flooding -- and all states are subject to some flooding. In contrast, house fires occur all over the country in a much more even-handed distribution.

The social distribution of natural hazard impacts, however, is not as well known. To the extent that different kinds of households are attracted to different areas of the country, the geographical distribution of disasters will affect some parts of the population more than others. The types of structures inhabited by, say, the poor as opposed to the affluent may make some families more susceptible to the impacts of natural hazards. And so on through a list of the ways in which households differ one from the other.

It cannot be expected that social characteristics of households will account for much of the variation in natural hazards impacts. Hazards affect households so infrequently that even if some are more likely to be seriously affected by, say, floods, the vast majority of such types of households will live unscathed through any given period. In addition,

widespread hazard events, such as hurricanes or earthquakes, affect large areas that are inhabited by a wide variety of households and can hardly be expected to single out particular types of households for especially hard treatment.

Table 4.11 contains victimization hazard rates by selected household characteristics. The entries in the table are the number of households per 1,000 households that experienced a victimization instance of the relevant hazard during the period 1970 to 1980. Thus the first entry in the upper left hand corner of the table states that out of every 1,000 households whose heads were 30 or under, 41.7 experienced non-trivial household fires during the period 1970 to 1980.[11]

The first panel of Table 4.11 indicates how victimizations of households vary with the age of the head. By and large, households headed by younger persons are more likely to be victimized. Thus 41.7 per 1,000 of the households headed by someone under 30 had a serious household fire. The rates increase slightly to 46.3 for households with heads between 30 and 44 and then decline to 35.9 and 15.9 for households in the two oldest age groups. Similar patterns are shown for floods and hurricanes. For these three hazards, households whose heads are between 30 and 44 have the highest rates and the oldest households (with heads over 65) have the lowest rates. In contrast,

---

[11] While annualized rates might have appeared to be appropriate, the telescoping effect of recall would have over-estimated rates for younger households and produced inflated rates for such households and for any age related household characteristics.

Table 4.11

Hazard Victimizations (1970-1980) per 1,000 Households
by Selected Household Characteristics

Household Characteristics	Fires	Floods	Hurricanes	Tornadoes	Earthquakes	Combined Hazards	N =
A. Age of Head of Household							
Under 30	41.7	22.1	19.6	78.1	12.8	174.3	(2037)
30 to 44	46.3	23.3	29.4	72.0	11.5	182.4	(4085)
45-64	35.9	17.2	24.7	64.2	10.8	152.8	(4175)
65 and Over	15.9	12.9	17.9	32.3	4.0	82.9	(2014)
B. Tenure							
Renter	42.1	22.0	18.5	55.9	12.2	150.8	(3184)
Owner	35.2	17.5	25.5	65.4	9.8	152.4	(9421)
C. Place of Residence							
Rural	36.3	22.1	22.8	77.1	4.1	162.4	(2673)
Small City	32.8	19.7	17.6	65.1	8.1	143.2	(3351)
Suburb	38.9	14.7	31.2	56.8	14.7	156.3	(2853)
Medium Sized City	33.2	19.5	30.2	66.3	8.3	157.6	(2050)
Large City	49.8	20.2	17.0	49.2	20.8	157.1	(1585)

Table 4.11 (continued)

Household Characteristics	Fires	Floods	Hurricanes	Tornadoes	Earthquakes	Combined Hazards	N =
D. Number of Persons in Household							
1 Person	26.6	19.1	20.6	43.6	7.8	111.8	(2039)
2 Persons	30.3	17.8	18.9	50.7	9.8	127.5	(3867)
3-5 Persons	43.3	18.5	26.5	77.2	10.9	176.4	(5777)
6 or More	62.8	26.7	34.9	65.1	10.5	200.0	(869)
E. Household Race							
White	35.5	19.1	23.0	67.1	9.6	154.2	(11284)
Black	52.8	15.5	31.3	29.0	10.4	138.7	(966)
Other Non-White	39.6	18.5	26.4	34.3	26.4	145.1	(379)
F. Sex of Respondent							
Female	37.5	17.1	21.6	54.6	10.0	141.3	(7997)
Male	34.9	20.6	25.6	73.7	10.6	165.3	(5008)
G. Region							
Pacific	35.8	10.7	6.6	26.3	84.7	163.5	(838)
Mountain	42.0	14.8	4.9	42.0	17.3	121.0	(405)
East North Central	37.9	13.8	10.6	98.8	8.1	169.2	(2825)
West North Central	31.1	21.0	8.4	89.2	4.2	154.0	(1188)

Table 4.11 (continued)

Household Characteristics	Fires	Floods	Hurricanes	Tornadoes	Earthquakes	Combined Hazards	N =
G. Region (continued)							
West South Central	48.2	19.8	34.8	78.3	3.2	184.1	(1265)
East South Central	30.8	19.1	62.6	41.7	7.4	184.7	(942)
South Atlantic	40.3	13.4	36.5	42.4	2.5	135.1	(2384)
Middle Atlantic	30.8	31.7	22.2	41.2	4.3	130.1	(2113)
New England	32.0	18.4	18.4	31.0	1.0	100.8	(1032)
H. Household Income							
Under $9,000	35.6	20.8	21.7	53.7	8.8	140.7	(3312)
$9,000 to $15,000	45.3	22.0	17.5	57.6	11.6	153.9	(1546)
$15,000 to $20,000	42.0	20.4	28.4	72.6	9.1	172.5	(1762)
$20,000 to $25,000	36.6	16.6	25.8	79.1	9.6	167.7	(2403)
$25,000 to $35,000	27.3	23.9	34.1	64.8	6.8	157.0	(293)
$35,000 and Over	41.4	20.7	33.1	91.0	17.1	203.3	(1692)

tornadoes and earthquakes have a more regular pattern with the youngest households having the highest rates and the oldest the smallest. The most consistent finding in Table 4.11 across all natural hazards types is the much lower incidence of victimization for the oldest households. As the rates per 1,000 households for all hazards combined shows (last column on the right), the oldest households (heads over 65) have rates that are about half those of the younger group.

In part, these age differences reflect the correlates of age that affect exposure to natural hazards events. Older households are more likely to be homeowners and thus live in better structures.

Panel B considers tenure differentials in hazard victimization. Overall, there is not much difference between households who rent and those who own. However, renters are slightly more likely to have experienced non-trivial fires, floods and earthquakes, while owners are more likely to have been victimized by hurricanes and tornadoes. These patterns, we suspect, reflect the structural and locational differences among rental and owner-occupied units in the typical housing stocks of American communities.

Panel C tabulates rates by place of residence. No clear dominant pattern appears consistently across the five hazards types. Large city residence is most likely to expose a household to a higher risk from household fires, and to earthquakes, and small city residence is likely to lower all risks. However, no other pattern emerges and even these patterns are not very pronounced.

Panel D considers the influence of household size on hazards victimization. Clearly, larger households are more likely to have non-trivial fires, the incidence per 1,000 households rising from 26.6 for one person households to 62.8 for those composed of 6 or more. Although larger households generally appear to be exposed to more risk, the patterns with respect to other hazards are not as clear-cut as in the case of household fires. Of course, household size is related in a complicated way to age -- with both younger persons and the very old more likely to live in small households -- and hence some of these patterns may simply be reflecting that fact alone.

Racial differences among households are considered in Panel E. No consistent pattern of racial differences is shown. Black households are more likely to experience non-trivial household fires and hurricanes, but whites are more likely to be victims of non-trivial floods and tornadoes. Other non-whites (mainly Hispanic) are much more likely than either to experience earthquake victimization.

Sex differences (based on the sex of the respondent) are also unclear. Indeed, since males and females in a majority of the households are reporting for the entire household, there should not be much in the way of differences. Of course, in single person and single adult households, only one adult was available and hence such respondents represent largely their own personal experiences. Such sex differences likely will disappear when we hold other information about the households constant. In any event, considered by itself, the sex of the respondents has its strongest effect on tornado victimization, with male respondents being considerably more likely to report serious tornado events than females.

Panel G tabulates non-trivial experience rates by each of the nine major Census regions of the U.S. Regional differences appear with respect to all of the natural hazards considered. Victimizations by fire appear to be more frequent in the Mountain and West South Central states and least frequent in New England and the Middle Atlantic states. Non-trivial floods show a rather flat regional profile: the Pacific and South Atlantic states have the fewest flood victimizations while the highest rates are to be found in the Middle Atlantic[12] and the West North Central states.

As to be expected, hurricane victimizations cluster heavily in the Gulf and South Atlantic states with only a few victims to be found in the Pacific or Mountain states.[13]

The regional clustering of tornado victimization is also quite pronounced with high rates in the East and West North Central and the West South Central, the states through which Tornado Alley passes.

Finally earthquakes show a pattern of very high incidence in the Pacific states, as expected, with low rates almost everywhere else. Indeed, earthquakes show the strongest regional patterning, the victimization rates per 1,000 households being 84.7 for the Pacific states and 1.0 for

---

[12] Undoubtedly reflecting the widespread effects of the flooding accompanying Hurricane Agnes in 1972.

[13] Possibly reflecting the experiences of households that had migrated from South Atlantic and Gulf states during the period 1970 to 1980.

New England.[14]

Panel H considers total household income (as reported). No particular pattern shows up with respect to this measure of household socio-economic status. The least affluent households tend to report fewer serious hazards events, possibly reflecting the lower incomes of the aged. The most affluent households report more tornado and earthquake victimizations, but no other particular patterns appear.

The findings of Table 4.11 consider only one household characteristic at a time. To the extent that such characteristics are interrelated, any of the findings might be reflecting some of the others. In short, the effects of age shown in that table might simply reflect the fact that the age distributions of regional populations may vary. In order to estimate the separate or "net" effects of each of the household characteristics, we have calculated regressions, as shown in Table 4.12.

The dependent variables in the regression equations of Table 4.12 are the number of hazard victimizations from 1970 to 1980 of the types in question per 1,000 households. Each row of the table presents regression coefficients (unstandardized), with the standard errors

---

[14]Note that these rates count each household at its present location, not necessarily at the residence in which the household was residing at the time the hazard experience took place. Hence, it may well be the case that all the New England households claiming an earthquake experience actually were living in the San Fernando Valley in 1971 and hence are reporting a California rather than a New England event. Given the migration and mobility patterns of the U.S. population over an eleven year period, considerable portions of the households studied may have lived in several regions in that period. (Annual interstate migration rates range between 3 and 4%, cumulating to about 25% over a decade.)

Table 4.12

Regressions of Hazard Victimizations on Selected Household Characteristics
(N = 10,701)

(Dependent Variables are Numbers of Hazard Victimizations
During 1970-1980 per 1,000 Households)

Independent Variables	Fires	Floods	Hurricanes	Tornadoes	Earthquakes	Combined Hazards
A. Household Characteristics						
Age of Head						
b =	-.6652***	-.2582***	.0633	-.8391***	-.1231	-1.946***
SE =	(.144)	(.104)	(.116)	(.184)	(.076)	(.305)
Years in Existence[a]						
b =	1.870**	.3772	.4448	2.029*	.3079	5.022***
SE =	(.713)	(.512)	(.572)	(.910)	(.376)	(1.51)
Number of Persons						
b =	4.39***	.5248	2.066*	2.513	.2773	9.761***
SE =	(1.23)	(.884)	(.988)	(1.57)	(.649)	(2.60)
Household Income						
b =	-.1754	-.0564	.2444	.7555**	.0058	.7808*
SE =	(.176)	(.126)	(.141)	(.224)	(.009)	(.372)
Owner						
b =	-6.656	-3.468	2.370	-3.423	-.1411	-11.35
SE =	(4.78)	(3.43)	(3.83)	(6.10)	(2.52)	(10.1)
White[b]						
b =	-1.630	6.639	1.209	34.18***	1.910	38.41**
SE =	(6.20)	(4.46)	(4.98)	(7.92)	(3.27)	(13.1)
Other Non-White[b]						
b =	-5.372	4.094	7.243	8.409	.6812	15.01
SE =	(12.2)	(8.73)	(9.76)	(15.5)	(6.41)	(25.7)
Male Respondent						
b =	-3.798	2.102	2.013	13.38**	-.6549	15.04
SE =	(3.78)	(2.72)	(3.04)	(4.83)	(2.00)	(8.01)

Table 4.12 (continued)

Independent Variables	Fires	Floods	Hurricanes	Tornadoes	Earthquakes	Combined Hazards
B. Place of Residence[c]						
Small City						
b =	-2.205	-2.160	-3.256	-8.154	3.825	-12.0
SE =	(5.27)	(3.79)	(4.23)	(6.72)	(2.78)	(11.1)
Medium Sized City						
b =	-3.621	-1.468	10.36*	6.453	-.3198	-1.659
SE =	(6.06)	(4.35)	(4.86)	(7.73)	(3.19)	(12.8)
Suburbs						
b =	2.691	-7.260	9.652*	-19.93**	7.386	-7.660
SE =	(5.55)	(3.99)	(4.45)	(7.08)	(2.93)	(11.7)
Large City						
b =	12.22	-1.704	-1.220	18.89*	10.00**	.1310
SE =	(6.71)	(4.82)	(5.38)	(8.56)	(3.54)	(.142)
C. Region[d]						
Pacific						
b =	-7.338	-3.475	-9.266	-14.69	66.60***	40.20
SE =	(12.5)	(8.99)	(10.0)	(16.0)	(6.59)	(26.5)
West North Central						
b =	-10.10	6.071	4.862	45.45**	12.06*	34.15
SE =	(11.9)	(8.55)	(9.56)	(15.2)	(6.28)	(25.2)
West South Central						
b =	4.990	5.476	30.18**	38.40*	-14.15	64.83**
SE =	(11.8)	(8.48)	(9.47)	(15.1)	(6.22)	(25.0)
East North Central						
b =	5.319	.5721	5.509	56.67***	-9.057	47.16*
SE =	(10.9)	(7.89)	(8.82)	(14.0)	(5.80)	(23.2)
East South Central						
b =	-11.42	4.862	58.93***	24.13	-8.958	67.43**
SE =	(12.3)	(8.86)	(9.90)	(15.7)	(6.50)	(26.1)

Table 4.12 (continued)

Independent Variables	Fires	Floods	Hurricanes	Tornadoes	Earthquakes	Combined Hazards
C. Region (continued)						
New England						
b =	-10.27	3.957	12.87	-13.19	-15.81**	-22.49
SE =	(12.2)	(8.73)	(9.75)	(15.5)	(6.41)	(25.1)
Middle Atlantic						
b =	-13.24	17.73*	17.81*	1.837	-13.51*	10.60
SE =	(11.2)	(8.07)	(9.01)	(14.3)	(5.92)	(23.8)
South Atlantic						
b =	-2.142	-26.87	31.94***	3.74	-14.49	18.71
SE =	(11.2)	(.801)	(8.95)	(14.2)	(5.88)	(23.6)
Intercept						
b =	53.81***	20.45*	-14.28	17.03	17.09	94.13**
SE =	(14.9)	(10.7)	(12.0)	(19.1)	(7.88)	(31.6)
R^2	.007**	.004**	.014**	.022**	.041**	.015**

[a]Number of years (1-11) household was in existence during period 1970 to 1980.

[b]Dummy variables: Omitted category is "black."

[c]Dummy variables: Omitted category is "rural."

[d]Dummy variables: Omitted category is Mountain States.

*p < .05
**p < .01
***p < .001

of the coefficients in parentheses below. The interpretation of the coefficients is fairly straightforward: the coefficient -.6652 for age in the column labelled fires means that for each year of age, holding everything else in the equation constant, fire victims per 1,000 households occurring during the period 1970 to 1980 drops by .6652. That is, 1,000 households whose heads are 25 years of age report 29.9 more household fires than 1,000 households whose heads are 70 years of age. Similarly, 1,000 households who own their dwellings report 6.6 fewer household fires for that period than households who rent.

Note that we have included in the equations a variable that measures the time a household was in existence during the period 1970 to 1980. This variable holds constant the variations in exposure to risk occasioned by the fact that some households (about one in three) were formed during the period 1970 to 1980 and hence were not exposed to risk during the entire 11 year period.

At the bottom of each of the columns in Table 4.12 are the R^2's for the equations. This coefficient is a measure of the extent to which variations in the exposure to risk are "accounted for" by the variables in the equations. Because the overwhelming majority of all households did not have any non-trivial natural hazards experiences during the period under study, but nevertheless differ among themselves in age, tenure, and so on, these independent variables cannot make much of a difference in determining exposure to risk. Hence, none of the equations are expected to "account for" much of the difference in hazard victimization. Indeed, such is the case. Less than 1% of the variation in fire and flood victimizations can be accounted for, and the other equations also explain very

modest amounts. Indeed, we can do best in accounting for earthquake victimizations (R^2 = .041) but by any standards usually applied to social research, this is also a very modest amount.

The regression equation pertaining to fire victimizations is shown in the left hand column of Table 4.12. Major influences on non-trivial fire experiences are age, years in existence, and number of persons in the household. Fire victimizations decline with increasing age, increase with years in existence and increase with the number of persons in the household. None of the other factors in the equations is significant. Note that some of the differences we saw in Table 4.11 have now declined in significance: Renters appear no more likely than owners to be victims of fire, once we take into account the fact that renters tend to be younger than owners and to be recently formed households.

Despite the low R^2 for the fire equation, the differences in incidence among extreme types of households can be quite large. Thus a household that has been in existence throughout the period and is headed by a person who is 30 years old has a predicted victimization rate (per 1,000 households) of 54.4 as compared to 9.1 for a household with a seventy year old head that was formed in 1980.

The equation for flood victimizations is somewhat weaker than for fires, with only 0.4% of the variance being explained. Only the age of the household head makes any difference, along with living in a Middle Atlantic state. All the other elements in the equation yield insignificant coefficients. Thus households headed by a 30 year old person and living in the Middle Atlantic states have a victimization rate (per

1,000 households) of 30.43 as compared to 2.38 for households headed by 70 year olds living in the Mountain states.

Exposure to hurricane victimization is somewhat better predicted: R^2 = .014. A different set of predictors plays the important roles in hurricanes. As might be expected, regional location constitutes a strong influence with residence in the West South Central and Middle Atlantic states being important, along with living in medium sized cities or suburbs. Among household characteristics, only the size of the household makes a difference, with larger households more likely to be victims of a hurricane. Again, the extremes can be quite dramatic: A 6 person household living in a medium sized city in the South Atlantic region has an expected victimization rate of 38.7 (per 1,000 households) as compared to essentially zero for a comparably sized household that lives in the Mountain states.

Tornadoes are even better predicted than hurricanes, with R^2 for the equation reaching .022. Regional differences are strong, with the Central state regions having significantly high positive coefficients. But, household characteristics also make a difference: Older persons are less likely to have suffered a serious tornado or windstorm experience. Whites are more likely than blacks, perhaps reflecting the fact that blacks are mainly to be found in the larger cities within those regions. A significant positive coefficient is also found for years of household existence, indicating that tornadoes occur at about the same rate each year and the longer a household has been in existence, the more likely it was to have a serious tornado experience. Perhaps most intriguing of all is the high positive coefficient for male respondents, a finding

for which there appears to be little interpretation.[15] More sensible is the positive coefficient for income, indicating that upper income households are more likely to be victims of a tornado or windstorm of more than minimal intensity.

The range of experience caught by the tornado equation is also best illustrated by taking an extreme case: A white household headed by a 30 year old, reported through a male respondent, with an annual income of $40,000 and living in a large city in the East North Central region had an estimated rate of 139.12 tornado victimizations per 1,000 households. In contrast, a black family living in the Mountain states, headed by a 30 year old person, earning $40,000 per year and living in a rural area had an expected rate of tornado victimization of essentially 0.0 per 1,000 for the period 1970 to 1980.

Earthquake victimizations appear to be primarily a locational matter. Persons living in large cities were more likely to claim non-trivial earthquake experiences, but no other characteristics of households such as income, race, age, or years in existence played any role. The main determinants appear to be regional, with a very high positive coefficient for living in the Pacific states and low negative ones for living in New England and the Middle Atlantic states.

The extreme predictions are as follows: A Los Angeles family would face an experience rate of 93.96 (per 1,000), while a New England rural family faced a rate of only 1.28 (per 1,000).

---

[15] One might speculate that the probability of a male answering the telephone interview was differentially distributed among areas, but that explanation is unconvincing.

Considering the five combined hazards experiences (as in the last column of Table 4.12), we note that it is most hazardous to belong to a young, affluent, and large white household that lives in the hurricane or tornado belts. As in the case of the single hazards considered separately, the equations do not predict very well the kinds of households that will have these experiences, the R^2 for the combined hazards equation being only .015. In short, some households are exposed to a greater risk, but the overall level of risk is not high enough to be able to predict with any accuracy which kinds families will be disproportionately affected.

Comparison With Other Noxious Events

It is useful to compare the social distribution of hazards experiences, as shown in Table 4.12, with the social distribution of the "other noxious events" discussed in an earlier section, as in Table 4.13. In that table, we have combined the noxious events into the three categories discussed earlier, namely, "Other Natural Hazards Events" (consisting of experiences with the five natural hazards events of the 17), "Bad Luck Events" (experiences such as auto accidents and unemployment), and "Personal Breakdown Events" (such as depression and bankruptcy). Each of the three types of events plus a combined index encompassing all three are used as dependent variables in regression equations having the identical structure to those shown in Table 4.12.

While the sizes of the coefficients in Table 4.13 cannot be compared with those of Table 4.12, it is valid to compare which household characteristics are statistically significant. Thus, Table 4.13 indicates that the age of the head of the house is consistently important for expe-

Table 4.13

Regression of Noxious Events on Selected Household Characteristics
(N = 1,035)

(Dependent Variables are Number of Events per 1,000 Households During 1970-1980)

Independent Variables	Other Natural Hazards	Bad Luck Events	Personal Breakdown Events	Combined Noxious Events
A. Household Characteristics				
Age of Head of House				
b =	-3.871*	-4.060**	-2.718**	-10.87***
SE =	(1.52)	(1.65)	(1.04)	(2.86)
Years in Existence[a]				
b =	5.495	-8.130	-9.183	-12.08
SE =	(7.87)	(8.51)	(5.24)	(14.8)
Number of Persons				
b =	.6419	4.934	-1.015	4.493
SE =	(6.91)	(7.48)	(4.60)	(12.9)
Owner				
b =	-23.55	-16.70	-98.24**	-140.1
SE =	(53.9)	(58.3)	(35.8)	(101.2)
White				
b =	250.1**	159.1*	58.29	467.2**
SE =	(74.4)	(80.5)	(49.5)	(139.7)
Other Non-White[b]				
b =	-22.49	192.9	-36.56	133.2
SE =	(14.1)	(152.1)	(93.5)	(263.9)
Household Income (000's)				
b =	3.887	.8928	-1.313	3.442
SE =	(2.11)	(2.28)	(1.403)	(3.97)
Male Respondent				
b =	-.7098	-84.53	-1.520	-87.83
SE =	(44.9)	(48.6)	(2.99)	(84.4)
B. Place of Residence[c]				
Small City				
b =	-6.116	35.59	-24.14	5.220
SE =	(60.7)	(65.6)	(40.4)	(113.9)
Medium Sized City				
b =	-22.16	60.06	9.610	46.31
SE =	(70.8)	(76.6)	(4.71)	(132.9)

Table 4.13 (continued)

Independent Variables	Other Natural Hazards	Bad Luck Events	Personal Breakdown Events	Combined Noxious Events
B. Place of Residence (continued)				
Suburbs				
b =	29.77	53.15	-29.39	52.98
SE =	(62.8)	(67.9)	(41.7)	(117.8)
Large City				
b =	121.3	240.35**	54.70	414.4**
SE =	(76.4)	(82.6)	(50.8)	(143.4)
C. Region[d]				
Pacific				
b =	-442.2**	83.85	28.54	330.3
SE =	(149.3)	(161.5)	(99.3)	(280.4)
West North Central				
b =	396.4**	103.6	1.015	293.2
SE =	(140.2)	(151.6)	(93.2)	(263.2)
West South Central				
b =	-187.5	20.75	114.5	52.98
SE =	(140.)	(15.1)	(93.1)	(262.9)
East North Central				
b =	206.6	22.6	65.69	294.4
SE =	(129.6)	(14.0)	(86.2)	(24.4)
East South Central				
b =	-240.4	-80.58	25.33	-295.7
SE =	(142.0)	(153.7)	(94.5)	(266.8)
New England				
b =	132.0	67.71	15.85	215.1
SE =	(142.5)	(154.2)	(94.8)	(267.6)
Middle Atlantic				
b =	10.76	51.80	-16.58	23.89
SE =	(131.2)	(141.9)	(87.3)	(246.4)
South Atlantic				
b =	200.2	5.330	29.64	-165.2
SE =	(130.7)	(141.4)	(86.9)	(245.3)
Intercept				
b =	433.6**	533.7***	398.0***	1381.4***
SE =	(170.1)	(184.1)	(113.7)	(319.5)
R^2	.135	.037	.051	.084

Table 4.13 (continued)

[a]Number of years (1-11) household was in existence during period 1970 to 1980.

[b]Dummy variables: Omitted category is "black."

[c]Dummy variables: Omitted category is "rural."

[d]Dummy variables: Omitted category is Mountain States.

*p < .05
**p < .01
***p < .001

riences with noxious events, older households being less likely to have had such experiences during the period 1970 to 1980. For the five natural hazards, the age of the head of the house was significant for some and not for others. Younger households are simply more likely to be exposed to risk, especially bad luck events and personal breakdowns.

More recently established (less than 11 years) households are no more likely to be exposed to risk of having such noxious experiences. Negative findings of the same sort also characterizes household size and income.

Owners are somewhat less exposed than renters to personal breakdown events. And white households are more likely to experience the natural hazards, most likely snowstorms and hailstorms that are so large a component of these additional hazards. Whites are also more likely to experience "bad luck events," and they are also more likely to occur to those who live in large cities.

Finally, the regional variables appear to show that the Pacific states are less likely to experience these natural hazards and the West North Central states more likely. Again this pattern probably reflects that fact that snowstorms and hailstorms dominate this index in terms of frequency. It is therefore hardly surprising that snowstorm and hailstorm experiences are reported infrequently in California and frequently in the western portions of the North Great Plains.

The patterns of correlates for the seventeen noxious events are different from those discussed in the last section. Hence, at least one explanation is ruled out -- namely that respondents were simply complaining about their lives, elevating minor happenings into major trauma,

as would be suggested if all the events had the same distribution among households. On the contrary it appears that noxious events and natural hazards behave differently, the former being heavily dependent on region and the latter being more dependent on household characteristics.

Summary

Experience with natural hazards -- fires, floods, tornadoes, hurricanes, and earthquakes -- is relatively frequent for the U.S. population as a whole. Over the decade of the 1970's, about one household in four experienced such an event. Roughly half these experiences were "trivial" in the sense that no injuries or property damages were incurred. Thus, the rate at which families are actually victimized by natural hazards is on the order of 10-15% per decade.

Vulnerability to hazard victimization appears to be conditioned mainly by geography, and much less so by social and demographic characteristics of households. Net of the well-known regional differences, victimization by natural hazard is more or less randomly distributed over the population.

Of course, to know that a household experienced a hazard event, or even was victimized by one, says little about the magnitude of loss. Some victims suffer minor amounts of damage, and others substantially larger amounts. The nature and magnitude of losses sustained by hazards victims are the topics of the next chapter.

CHAPTER FIVE

DEATHS, INJURIES, DAMAGES, AND TOTAL COSTS

Introduction

The total costs to a household of a natural hazards event consist of all the burdens incurred because of the event minus any benefits that may have accrued. When we consider that the burdens can cover a miscellaneous congeries of troubles, only some of which can be translated into monetary terms, then the task of estimating costs becomes formidable. Benefits present no less of a problem for measurement. Indeed, since benefits from a disaster are likely to be indirect or occur as side effects, they may be difficult to detect at all.

Nonetheless, some costs can be approximated fairly accurately, especially when they are easily converted into monetary terms. The damages to property and possessions and the direct monetary costs of injuries can be estimated through reports from victimized households. Since the dollar values of damages are usually ascertained necessarily when repairs are made or when insurance claims are filed, we can expect that many, if not most, households would know the sums involved, at least approximately. Similarly, the dollar costs of medical care are also known from bills paid or from medical insurance claims made.

These, to be sure, are not the only costs borne by a household experiencing a natural hazard. The trauma inflicted by the experience itself, the impairment of functioning, and the disruption of normal routines are perhaps less tangible, but equally real. In addition, households may experience indirect effects of the event, involving the

disruption of public services, or of normal economic activity in the local community, and so on. The monetary costs discussed in this chapter do not include any of these costs. Here, rather, we deal with the consequences of hazards that result directly in damages and injuries. Furthermore, only those costs that have been recorded in monetary terms in the memories (or records) of our respondents are counted. The restriction to relatively straightforward damages and injuries, of course, is not a judgment on the importance of these other, less palpable, costs, but rather a confession of the limits of the research methods employed in this project.

A cautionary note: the period 1970 through 1980 is also a period in which inflationary processes changed drastically the purchasing power of our currency. The reader is advised to keep this fact in mind when reading dollar amounts that have not been converted into constant dollars. Of course, where especially appropriate such calculations will be made, as noted in the legends of statistical tables and in the text.

The issues addressed here are primarily descriptive ones: What is the distribution of costs? From what sorts of damages and injuries do they arise? What kinds of households are likely to suffer large as compared to small amounts of monetary costs? And so on. The focus in all cases is on what might be called the "gross costs" incurred as a result of the disaster -- that is, the initial damage done and injury inflicted as a direct result of the event. The "net cost," that portion of the original cost that remains after insurance claims are paid, relief monies provided, and other forms of assistance are rendered, is considered in some detail in the following chapter.

The findings reported in this chapter are derived from the mail follow-up survey whose implementation was discussed in Chapter III. With due allowances for non-response, the mail survey sample can be taken as a probability sample of surviving households that experienced one or more of the five hazard events during the decade 1970-1980.[1] Owing both to refusals to cooperate in the study after screening (which, it will be recalled, was correlated with the extent of damages inflicted by the event) and to the decision to "sample out" a fraction of the "trivial" hurricane, tornado, and earthquake events that were identified in the screening interviews, the final sample of victims is probably skewed somewhat in favor of victims suffering higher-than-average costs. As noted previously, the final sample is a sample both of households and of hazard events. The number of households involved is just under 1,300, but these households supply victimization data for a total of 1,625 events. This latter constitutes the case base for all analyses reported in this and the following chapter. Table 5.1 shows the distribution of these 1,625 events according to the type of hazard each represents.

Estimating "Total Dollar Costs"

"Total dollar costs" can be defined as the dollar value of damages

---

[1] Because the study is retrospective, the sampling strategies employed do not cover households in which all family members died as a result of the event, or households who emigrated to other countries subsequent to their victimization, or households that were dissolved for any other reason.

Table 5.1

Frequency of Hazard Types in Mail Survey

Type of Hazard	Number of Cases	Percent
Fires	268	16.5%
Floods	152	9.4%
Hurricanes	261	16.1%
Tornadoes	581	35.8%
Earthquakes	363	22.3%
TOTAL	1625	100.0%

to property and possessions, plus the dollar value of medical care resulting from hazard related injuries, plus all other expenses related to the event. Total dollar cost is a critical variable in this chapter and hence a detailed description of how it was constructed is important.

The strategy followed was to ask about specific kinds of damages and the dollar amounts involved, followed by a summary question that asked for an overall estimate of the sum of those damages (and any other monetary costs borne). The entire series of questions was prefaced by the following filter questions:

> "Was anyone in your family or household injured or killed or did anyone become physically sick as a result of the event?"
>
> "Did you and your family or household suffer any damage to your house or apartment or damage to your furniture and personal property as a result of the event?"

Any respondent who indicated that someone had been injured or killed was then asked a series of questions on the costs of medical care involved (if any). Similarly, anyone who indicated any property damage was asked a series of questions on damages to specific categories of property or possessions (e.g., roof, walls, jewelry, cars, etc.), and followup questions on the dollar amounts involved.

A summary question which followed these two series then asked:

> "What were the total dollar costs to you and your family that resulted from the event? Please include the costs that resulted from the injuries and damages that you listed in Questions 12 and 14, any losses of valuables in Question 16, costs of living in other places in Question 18, and <u>any other</u> expenses you had as a result of the event."

(See Appendix B for details on this series of questions.) Note, then, that two estimates of "total cost" are available.[2] The first is the

---

[2]To emphasize, throughout this chapter, we use the term "cost" to refer to the monetary loss involved regardless of whether the amount was reimbursed through insurance or any other financial aid.

respondent's own estimate of total dollar losses, and the second is the sum of responses given to each of the category-by-category cost questions. Rather than make an a priori decision as to which of these was the more valid measure, we simply compared the two estimates and took whichever was the higher as the household's actual total cost figure.

There is, of course, yet a third estimate available -- that provided by respondents in the course of the screening interview. Although the screening estimates were made "on the spot" and preceeded the more detailed estimates made in the mail follow-up by weeks or even months, the "total dollar cost" variable employed in this chapter correlates at about .70 with the estimates obtained in the screening interview.[3] This correlation gives one some confidence in the reliability of the cost data available for this analysis.

Defining Serious Hazard Events

As discussed in Chapter 4, to "experience" a hazard event does not necessarily imply that people were injured or property losses incurred. Hence, as in that chapter, we are concerned to separate out "serious" from "minor" events. Since the cost information contained in the mail survey is much more detailed, we can be more certain about the resulting classification here than we were in Chapter 4.

For purposes of the present chapter, a "serious" event is any reported victimization that caused non-zero total dollar costs (whatever the actual dollar value of the loss), or that injured (or killed) at

---

[3]The correlation was computed by converting the dollar sums involved into logs so that the correlation would not be too affected by the small number of very large damage estimates.

least one member of the household, or, of course, both. This, to be sure, is a lenient definition of "serious." A home fire that destroyed a $5 wastepaper basket would, for example, qualify as "serious" by our definition, as would one that destroyed the whole house.

By this (admittedly lenient) standard, most of the events remaining in the sample at this point qualify as serious (see Table 5.2); earthquake events provide the main exception. The table shows the proportion of events that caused any damages or any injuries. To emphasize, the table shows events, not households, and so the case bases are as shown in Table 5.1 (less those with missing data on appropriate variables).

The results of Table 5.2 are fairly straightforward and require no extended discussion. Most of the fire events reported by our respondents (86%) resulted in at least some dollar damages; the same is true, in lesser degrees, of floods (76%), tornadoes (65%), and hurricanes (55%). Most earthquake events, in contrast, inflict no dollar damages; only 14% of the reported events caused any dollar damage at all. These differences are generally as one would expect given the nature of the events themselves: the more intense and localized hazards types (e.g., fires) show higher proportions inflicting damages, whereas the more diffuse types (e.g., hurricanes, earthquakes and tremors) show lower proportions.

Property damage is by far the more common consequence of a hazard than is personal injury or death. Proportions of reported events causing personal injuries vary from 9% (fires) down to about 2% (tornadoes); and death is even less common, being reported in fewer than 1% of all cases, irrespective of hazard type.

Table 5.2

Proportion of Events Causing Any Damage,[a] and Injury by Type of Hazard

Serious Event	Fires	Floods	Hurricanes	Tornadoes	Earthquakes
Percentage of Events with Damages[a]	85.7%	76.4%	55.2%	64.8%	14.4%
Percentage of Events Resulting in Any Injury	9.3%	7.6%	2.4%	1.8%	2.3%
Percentage of Events Resulting in					
Death	0.4%	0.7%	0.0%	0.3%	0.0%
All other Injury	5.2%	1.3%	0.8%	0.8%	0.6%
Physical Illness	3.0%	4.6%	1.5%	0.3%	1.4%
N =	(267)	(151)	(261)	(581)	(363)

[a]Defined as damages valued by respondents as non-zero dollars.

Injuries and their Monetary Costs

Although injury is not a common consequence of a hazard event, as we have just seen, some injuries do nevertheless occur, and when they occur, the impact on the household can be quite traumatic (and expensive). In the extreme case, the death of a family member, the ensuing costs would include some incalculable grief plus the costs of funeral services, burial, and so on. A serious, even if non-fatal, injury would normally have associated hospitalization or medical care costs, costs resulting from lost wages, etc. For these more or less obvious reasons, the true costs of injuries incurred in natural hazard events are certainly more important than would be indicated by the relatively low percentages reported in Table 5.2. In the present section, then, we explore the costs associated with personal injury more fully.

Table 5.3 reproduces the percentages of reported events that were accompanied by any injury whatever. As noted previously, the hazards most likely to result in injuries are fires and floods (9.3% and 7.6%, respectively) and to a much lesser extent hurricanes, tornadoes, and earthquakes (occurring in approximately 2% of all such events). As can be seen from the table, not all injuries are equally serious or harmful. (Stated more precisely, not all hazard events cause equally serious personal injuries.) In some cases, for example, the injuries involved were not accompanied by any medical expenses whatsoever: the proportions range from about 12% of all fire injuries up to about half the injuries resulting from earthquakes. There is also wide variability in the percentages of injurious events causing injuries sufficiently serious to require a doctor's care or hospitalization. Households sus-

Table 5.3

Selected Characteristics of Injury, Households with Any Injury, Medical Costs,[a] and Insurance Reimbursement by Type of Hazard

	Fire	Flood	Hurricane	Tornado	Earthquake
N of Events	(268)	(152)	(261)	(581)	(363)
Percent with Any Injury	9.3%	7.6%	2.4%	1.8%	2.3%
ONLY EVENTS WITH INJURIES:					
Percent with no Medical Costs	12.5%	18.2%	16.7%	40.0%	50.0%
Percent Requiring Doctor's Care	45.8	27.3	50.0	30.0	12.5
Percent Requiring Hospitalization	33.3	27.3	0.0	30.0	0.0
Average Cost[a] of Medical Care	$300	$41	$105	$48	--*
Median Cost[a] of Medical Care	$ 99	$55	$ 98	$16	--*
N =	(16)	(5)	(5)	(6)	(0)
OF INJURIOUS EVENTS WITH NON-ZERO MEDICAL COSTS:					
% of Households Covered for Injuries by Insurance	67%	33%	20%	83%	25%
N =	(21)	(9)	(5)	(6)	(4)

*N too small.

[a]Expressed in constant 1980 dollars.

taining an injury due to a fire required a doctor's care 45.8% of the time and hospitalization in 33% of the cases. By far, fire related injuries were the most serious with almost 80% of households sustaining such injuries requiring formal medical care for their members. In contrast, injuries sustained in earthquakes and hurricanes never required hospitalization (over the extremely small number of injurious events available for this analysis). The percentages of events causing injuries sufficiently serious to warrant a doctor's attention vary between 12% and 50%. Given the numbers of cases available here, generalizations must of necessity be couched in terms of rough orders of magnitude: Over all hazard events contained in the final sample, roughly 1 in twenty result in personal injury (or death). Among only these injurious events, roughly one in four cause only very minor personal injuries, and the remainder are more serious, requiring hospitalization in the most extreme case, at the least a doctor's attention or inflicting a non-zero medical cost to the victim.

Table 5.3 also reports the average costs of medical care associated with the injuries incurred in the hazard event(s). The averages reported are only for injury events causing non-zero medical costs. For the most part, medical costs were not staggering. Fire related injuries had the highest average medical care cost, $300, but half of the households had costs of $99 or less. The relatively high costs in fire events is likely due to the nature of the injury, usually burns, which require more specialized care. The average medical costs of the remaining hazards were much lower, averaging only $41 for floods and $48 for tornadoes. By and large, the costs of medical care were not very high

and as the median dollar amounts indicate, they do not appear to be serious threats to the finances of the households involved. As shown at the bottom of the table, the burden is further reduced through insurance coverage for all or part of the medical costs incurred, especially for fire- and tornado-related injuries.

In sum, relatively few hazard events involve personal injury, and among those that do, the dollar costs incurred as a result of the injury are relatively modest, especially once coverage by insurance is taken into account. As we see in a later section, the dollar costs incurred through property damage or destruction are substantially greater.

Households that reported any injury resulting from a hazard event were also asked to supply some information on the actual victims. For any given event, data were obtained on up to four victims. For each victim, their age and sex at the time of the incident and a few additional descriptive items were obtained. Data on victim characteristics are shown in Table 5.4.

Overall, there is a slight tendency for females to be overrepresented among the injured. Across all hazard types, women comprise between 50% and 58% of all persons injured. The reasons for this are twofold. Among adults, women outnumber men because of differences in longevity and hence should be over-represented among the victims simply because there are more of them. Moreover, women spend more time in the home then men and are thus exposed more to the risks of hazard events which strike the home.

There are also some differences with respect to age of the victim, as shown in Panel B. Fire victims tend to be fairly young: the average

Table 5.4

Selected Characteristics of Persons with Any Injury by Type of Hazard

Selected Characteristics	Fires	Floods	Hurricanes	Tornadoes	Earthquakes
A. Sex of Victim					
Males	42.9%	47.1%	41.7%	50.0%	41.7%
B. Age of Victim					
Mean	26 yrs.	31 yrs.	47 yrs.	36 yrs.	30 yrs.
Median	15	22	56	27	32
C. Percent of Victims Unable to go to Work or School Because of Injury	70.0%	81.8%	58.3%	20.4%	16.7%
D. Percent of Victims Still Bothered by Injury	24.2%	35.7%	11.1%	20.0%	16.7%
Approximate N[a] =	(35)	(18)	(12)	(12)	(12)

[a] Base fluctuates slightly from row to row due to missing data.

age is 26 years and 50% of the victims are 15 years old or less. Flood and earthquake victims are also relatively young (about 30 years old on average). Tornado victims, in contrast, tend to be somewhat older (36 years on average), while hurricane victims tend to be older (47 years) than victims of all other hazards. In fact, half of the hurricane victims are 56 years or older. Several possible explanations for these age patterns could be advanced. The proclivity of children to play with matches, for example, may in part account for the low average age of fire victims. Households at various stages in the life cycle may also make different kinds of decisions about where to locate their residences, and if, as seems possible, housing located in more hazardous areas (e.g., in the flood plains) tends to be less expensive, then younger families may self-select into relatively more hazardous housing. There is also very probably a regional effect present in these data: to illustrate, earthquakes tend to be experienced mainly in California, where the average age is lower than that for the nation as a whole; in like fashion, hurricanes are most commonly experienced along the Southern coastal areas, where many retirement communities are located.

We also asked respondents two direct questions regarding the seriousness of the injury sustained by the victim. First, was the person unable to work or go to school for any period of time due to the injury? Second, does the injury still bother the person now? By and large, the injuries reported by the respondents were by these standards serious ones. The large majority of fire and flood victims were injured seriously enough to keep them from their normal work or school

routines (70% and 82% respectively). In addition, about one-quarter of fire victims and one-third of flood victims are still bothered by their injuries today. Though 58% of hurricane victims were unable to attend work or school, only 11% sustained injuries which still bother them now. Tornado and earthquake victims tend to be injured less severely: most were able to attend work or school, and relatively few still suffer from their injury.

Injury Rates by Selected Household Characteristics

Given that a household has experienced a disaster of one or another type, what factors influence whether an injury will also be sustained? In other words, are some kinds of households more "injury-prone" than others in a hazard event? Relevant data are shown in Table 5.5. For purposes of this tabulation, a hazard event is injurious if anyone was killed, injured, or made physically ill as a result of the event, no matter how extensive or serious the injuries were. Cells in the table show "injury rates" according to hazard type and selected household characteristics. To illustrate, the first entry in the table, in the upper left-hand corner, shows that there were, all told, 104 fire events in our data registered for households where the oldest member was less than 30 at the time of the event; and of these 104 events, 11.5% by the above definition resulted in injuries.

The general pattern found in Panel A is that for fires, floods and tornadoes, the youngest and oldest households were the most likely to sustain injuries of any kind. In the remaining hazards, hurricanes and earthquakes, households whose oldest members were over 65 years were

Table 5.5

Proportions Injured by Selected Household Characteristics

Selected Characteristic	Proportions Injured: Fire	Flood	Hurricane	Tornado	Earthquake
A. Age of Oldest Person at Time of Event:					
Under 30	11.5%	11.1%	3.9%	3.0%	2.3%
N =	(104)	(72)	(77)	(200)	(131)
30-44	7.6%	0.0%	1.2%	1.1%	4.0%
N =	(79)	(30)	(80)	(182)	(100)
45-64	7.1%	6.2%	3.3%	0.0%	1.2%
N =	(56)	(32)	(61)	(128)	(87)
65 and over	11.8%	11.1%	0.0%	5.4%	0.0%
N =	(17)	(9)	(20)	(37)	(15)
B. Size of Household at Time of Event:					
1 person	7.7%	5.3%	0.0%	4.8%	3.8%
N =	(13)	(19)	(20)	(63)	(52)
2 person	11.3%	2.9%	6.0%	1.6%	2.4%
N =	(53)	(34)	(67)	(121)	(84)
3-5 person	8.7%	8.6%	1.5%	1.3%	1.2%
N =	(150)	(58)	(135)	(300)	(170)
6 or more	3.7%	0.0%	0.0%	0.0%	10.5%
N =	(27)	(14)	(14)	(32)	(19)
C. Tenure:					
Rent	9.2%	4.9%	4.1%	1.1%	2.1%
N =	(65)	(41)	(49)	(92)	(95)
Own	8.1%	7.1%	2.0%	2.0%	2.5%
N =	(186)	(99)	(197)	(445)	(239)
D. Race:					
White	9.0%	7.4%	2.0%	2.0%	2.0%
N =	(210)	(121)	(147)	(488)	(293)
Minority	5.9%	10.0%	2.6%	0.0%	5.4%
N =	(34)	(10)	(39)	(35)	(37)

Table 5.5 Continued

Selected Characteristic	Proportions Injured				
	Fire	Flood	Hurricane	Tornado	Earthquake
E. Household Income at Time of Event:					
Under $10,000	15.0%	12.5%	5.0%	3.3%	3.3%
N =	(60)	(32)	(40)	(90)	(60)
$10-15,000	7.0%	11.4%	2.3%	1.0%	2.0%
N =	(57)	(35)	(43)	(102)	(49)
$15-20,000	12.0%	0.0%	0.0%	3.6%	2.1%
N =	(25)	(21)	(28)	(84)	(48)
$20-25,000	4.8%	0.0%	0.0%	0.0%	2.5%
N =	(21)	(15)	(32)	(66)	(40)
$25-40,000	5.6%	0.0%	0.0%	1.2%	0.0%
N =	(36)	(7)	(42)	(80)	(64)
$40,000 & over	8.3%	0.0%	5.3%	2.6%	0.0%
N =	(12)	(6)	(19)	(39)	(26)
F. Context of Disaster:					
Isolated	8.6%	6.7%	7.8%	1.9%	1.0%
N =	(221)	(30)	(51)	(103)	(210)
Block	23.5%	0.0%	16.7%	0.0%	0.0%
N =	(17)	(8)	(6)	(18)	(4)
Neighborhood	0.0%	7.3%	0.0%	1.3%	17.2%
N =	(3)	(41)	(23)	(155)	(29)
Town or City Wide	0.0%	12.5%	0.0%	3.1%	33.3%
N =	(3)	(48)	(112)	(163)	(3)

the least likely to sustain any injury. Overall, differences in Panel A are quite small across the various age groups.

Panel B considers differences with respect to the size of the household at the time of the event. No consistent patterns emerge: in general, large and small households are about equally likely to suffer an injury.

Panel C considers differentials in injury by tenure. There is a slight tendency for owners in the cases of floods and tornadoes to sustain more injuries than renters. However, renters are more likely than owners to sustain injury as a result of hurricane events (4.1%). Here too, the differences are quite small. The same holds for differences in injury rates by the race of the household head: no significant pattern can be found (Panel D).

Panel E shows differences in injury rates among the various income groups (household income defined as of the time of the event). In general, lower income households experienced higher rates of injuries than more affluent households. The difference is most pronounced in floods and earthquakes, where none of the higher income groups suffered any injury. Fires also showed a slight tendency for lower income households to suffer more injuries, but even here the differences are not overwhelming.

In Panel F we make use of an index that was constructed to measure the context within which the event took place. Respondents were asked whether the damage due to the event was limited to their own homes or whether wider areas (other homes on the block, other homes in the neighborhood, or other homes in the city or town) were also affected.

The index also provides a measure of whether the event was an isolated occurrence or whether damages were spread over a larger area. Note first that "context," as we have defined it, varies dramatically by type of hazard. Almost all fire events in our sample were isolated occurrences involving a single family, with only a very few affecting an entire block, neighborhood, or city. The same pattern holds for "earthquakes and earth tremors."[4] Floods, hurricanes, and tornadoes, in contrast, are much less likely to be single-family events and much more likely to affect whole areas of a community. Substantively, the general pattern is that injury rates are higher when damages occur over larger geographical areas. For example, in Panel F under fires, we see that in isolated or single-family events, 8.6% resulted in injury, whereas in block fires, 23.5% of the events resulted in injury. This pattern holds across hazard types and is especially pronounced for earthquakes: when earthquake damages are spread widely over a city or town, injury occurs at a much higher rate (33%) than when damage is confined to only a single home (1%).

Table 5.6 shows a more sophisticated attempt to account for differences across households in the rate at which hazard-related injuries are sustained. The table shows the results of a multiple regression analysis, where the dependent variable for the analysis is the total number of persons injured per 1000 events and where independent variables are the same household characteristics presented earlier in Table 5.5. The cell entries show the regression coefficients (unstandardized)

---

[4] Earthquakes, of course, actually affect large areas. Respondents apparently are indicating that theirs were the only homes affected to any apparent degree.

Table 5.6

Regression of Total Number of Persons Injured Per 1000 Events
On Selected Household Characteristics

(Dependent Variable is Injuries per 1000 Households)

Independent Variables	Fire b/SE	Flood b/SE	Hurricane b/SE	Tornado b/SE	Earthquake b/SE
Age of Oldest Member in Household	-1.362 (2.40)	2.055 (3.13)	- .9318 (1.64)	1.798 (1.28)	- 2.235 (2.21)
Size of Household	-1.918 (22.6)	34.657 (31.06)	- 2.480 (17.59)	- 7.901 (13.16)	- 4.379 (21.54)
Renter[a]	-72.15 (85.9)	-91.304 (100.3)	-19.908 (66.3)	-24.575 (55.1)	-102.379 (78.2)
White[b]	-6.959 (98.6)	-46.283 (182.1)	-65.577 (67.0)	-45.980 (76.9)	-201.96* (102.5)
Household Income	-1.986 (3.27)	- 9.739 (5.20)	- 1.522 (2.20)	- 1.869 (1.76)	- 2.972 (2.78)
Context of Disaster	94.531 (125)	19.441 (102)	-68.88 (50.8)	25.828 (39.1)	232.42* (106)
Intercept	237.1 (171)	142.8 (253)	220.1 (118)	-26.63 (108)	400.8* (157)
R^2 =	.008	.043	.021	.011	.047*
N =	(209)	(116)	(204)	(470)	(281)

---

*$p < .05$

[a]Dummy Variable: deleted category is owners.

[b]Dummy Variable: deleted category is non-white households.

[c]Dummy Variable: deleted category is "isolated event."

[d]"Injury" includes death, physical illness and "other injuries."

associated with each household characteristic, with their respective standard errors shown in parentheses below. At the bottom of the columns is the respective R^2 for each equation. The R^2 is a measure of the total variation in injuries per 1000 events accounted for by the variables in the equation.

In the first column are coefficients for fires. The coefficient for age of oldest household member indicates that for each one year increase in the age of the oldest member, the number of persons injured per 1000 events decreases by 1.36. Similarly, renters experience 72 fewer injuries per 1000 events than do owners. Magnitudes notwithstanding, neither of these coefficients is statistically different from zero.

In fact, it will be immediately noticed that very few of these regression coefficients are statistically significant. Furthermore, the R^2 values are very low and also not statistically significant (with one exception). Thus, we account for very little of the variation in injury with the household characteristics in these equations. Given that an event has been experienced, all families are about equally likely to incur an injury, regardless of these household characteristics.

Earthquakes provide a partial exception. The R^2 value indicates that we can account for about 5% of the variation in injuries due to earthquakes, but the only significant coefficients are for race (b = -202) and disaster context (b = 232). Thus, non-whites are somewhat more likely to be injured in an earthquake than whites, and wide-area quakes cause more injury than localized events. These minor effects aside, however, the occurrence of injuries among households experiencing hazard

events tends toward randomness. We cannot predict very accurately what kinds of households are likely to experience injuries using the variables in our equation.

"Total Dollar Costs" Resulting from Hazards

Personal injury, of course, is only one of many sources of loss from a hazard event. As we have just seen, most hazard events are not accompanied by any injuries at all, some that are injurious are nonetheless minor, and many of the remainder generate relatively small medical care costs (some portion of which, moreover, is usually defrayed by insurance). Thus, in estimating the total dollar costs associated with natural hazards, the direct medical care costs incurred through personal injuries are, at best, a minor factor. In the present section, we consider the other components of total cost, namely, the components due to loss of or damage to real and personal property.

The concern here is with "total dollar costs" due to the hazard event, as defined earlier in the chapter. These costs include the costs of medical care, damages to one's housing, any loss of valuables, the costs incurred in having to live in other places while repairs were made, wages lost through absence from work, and any and all other expenses incurred as a consequence of the hazard event.

The period between 1970 and 1980 was a highly inflationary one, prices rising almost 250%. Hence in order to make damage experiences earlier in the period comparable with those of the later part of the period, we have adjusted all the damages to 1980 dollars. All of the tables

presented in this section that contain dollar estimates have been so adjusted.

Obviously, total dollar costs can range from the trivial to the astronomical. In order to gauge what, in general, are the total costs which befall a household as the aftermath of an event, we provide in Table 5.7 the average adjusted total dollar costs which result from having experienced a hazard event. As emphasized elsewhere, not all events involve damages or losses. In the first row of the table, we report the percentages of events which were accompanied by no dollar costs whatsoever.[5] At one extreme are earthquake events of which 88% involved no dollar costs at all. At the other extreme are fires and floods, where the majority

---

[5] For purposes of the mail follow-up, hurricane, tornado and earthquake events reported on the telephone screener interview as involving no damages or injuries were sampled at a lower rate than those events which involved either injury or damages (See Chapter III). In order to correct the damage estimates contained in Table 5.7 (and all other tables in this chapter), we would ordinarily have compensated for this differential in sampling by weighting the number of cases reporting no damage or injuries in the mail survey by the inverse of their sampling fraction. For hurricanes and earthquakes the weight to be applied was 1.34 and for tornadoes, 2.06. This weighting procedure would have produced the following results:

	HURRICANES	TORNADOES	EARTHQUAKES
Number of cases in mail survey-UNWEIGHTED	261	581	363
WEIGHTED cases	298	784	469
Percent of Unweighted cases with no damage	43.3%	35.7%	87.6%
Percent of Weighted cases with no damage	50.6%	52.7%	90.5%

The effect of weighting the cases in the analysis of the mail survey then is to slightly reduce the estimates of damage by increasing the number of no damage events. We have not weighted the cases in this analysis because the bias introduced is small and in the direction of over-estimating the damage estimates slightly.

Table 5.7

Adjusted[a] Total Dollar Costs by Type of Hazard[b]

	Fire	Flood	Hurricane	Tornado	Earthquake
A. All Incidents:					
Percentage of Events Resulting in No Dollar Costs	13.5%	23.3%	43.3%	35.7%	87.6%
Average Adjusted Dollar Costs for all Events	$9172	$8008	$1898	$1633	$322
Median Adjusted Dollar Costs for all Events	$1646	$1750	$ 77	$ 218	$ 0
N =	(252)	(146)	(254)	(568)	(355)
B. Incidents with Non-zero Damages:					
Average Adjusted Dollar Costs for Events with Costs	$10,602	$10,439	$3347	$2541	$2001
Median Adjusted Dollar Costs for Events with Costs	$ 2506	$ 3139	$ 795	$ 680	$1000
N =	(218)	(112)	(114)	(365)	(44)

[a]All dollar estimates adjusted to 1980 price levels.

[b]This table is based on the unweighted event data; cf. footnote 5 in this chapter.

of events are accompanied by dollar costs. Approximately 86% of all fire events and 76% of all flood events result in some dollar costs to the household. Hurricanes and tornadoes are similar in the percentage of such events accompanied by no dollar costs (43% and 36%, respectively).

The second row of Panel A shows the adjusted average total dollar costs sustained by households experiencing the various hazard events. Fires result on average in the highest average costs ($9172) of all the hazard types. Floods also have high costs associated with them, $8008 on average. Hurricanes and tornadoes produce similar average costs, $1898 and $1633 respectively. Earthquakes, with average total losses of only $322 were the least serious of all the hazards. These figures indicate that on average, the dollar costs related to these events are by no means trivial. Of course, actual costs vary dramatically around these averages, with a few high-loss families ("outliers") pulling the averages up. For this reason, the median cost figures, also presented in Panel A, are in every case substantially lower. For example, we know that on average fires produce $9172 in total costs, but the median dollar cost figure indicates that 50% of all fire events result in total costs of less than $1646. Half of all flood events result in less than $1250 in losses. Similarly, hurricanes, tornadoes, and earthquakes produce substantially less total losses than the mean amounts indicate. The pattern across hazard types, however, is the same with either measure.

A more informative way of analyzing the total dollar costs is to consider only those events involving at least some dollar costs. In Panel B, we put aside all events that produced no costs at all

and focus on the average and median costs for the remaining events. Of course, these estimates are higher, as expected. Over all fire events for which there were any costs, the average cost was $10,602; for analogous flood events, the average was $10,439. The median figures, also shown in Panel B, indicate that among fire and flood events with any costs, half inflicted losses of less than $2506 and $3139 respectively. Although perhaps not devastating, these figures are assuredly not trivial.

Hurricanes and tornadoes, when they do cause losses, inflict on average about the same amount, $3317 and $2541 respectively. Again, the medians are lower. Fifty percent of hurricane events cause total dollar damages of less than $795; half of tornado events involve losses of less than $650. Although the majority of all experienced earthquake events produce no costs, for those that do, the average amount of loss is $2001, which is still the lowest amount shown for any hazard type. Like hurricanes and tornadoes, the median for cost-producing events is on the order of $1,000.

The evidence in Table 5.7 shows that the distribution of dollar loss from natural hazards is rather sharply skewed in two ways. First, some fraction of all events inflict no dollar costs at all; over hazard types, this fraction ranges from about 13.5% (fires) to 87.6% (earthquakes). And there is a further skew among those events causing at least some dollar damage, with catastrophic losses incurred by a few families raising the overall average substantially. To get a more direct sense of these loss distributions, Table 5.8 reports the distributions of loss over the five hazard types. For purposes of this table, total dollar costs have been classified into loss categories; the table

Table 5.8

Distribution of Adjusted[a] Total Dollar Cost by Type of Hazard
(Total Dollar Cost in corrected for Inflation to 1980 Dollars)

Adjusted Cost	Fires %	Floods %	Hurricanes %	Tornadoes %	Earthquakes %
$0	13.5%	23.3%	43.3%	35.7%	87.6%
$1-100	4.8	0.7	7.9	8.4	1.7
$101-500	11.1	7.5	14.2	18.8	2.8
$501-2,000	23.0	24.0	18.5	21.6	3.9
$2,001-5,000	16.3	15.1	7.5	8.8	2.0
$5,001-10,000	7.1	6.2	3.9	3.5	1.1
$10,001-15,000	4.8	4.8	2.4	1.0	0.6
$15,001-20,000	2.8	4.1	0.0	0.2	0.0
$20,001 or more	16.7	14.4	2.4	1.8	0.3
N =	(252)	(146)	(254)	(568)	(355)

[a]Estimates adjusted to 1980 dollars.

then shows the distributions of events across these categories. These data reveal that 4.8% of fire events resulted in losses between $1 and $100, while less than 1% of flood and 1.7% of earthquake events resulted in total costs of that magnitude. Hurricanes and tornadoes had similar percentages of events within the $1-100 range (7.9% and 8.4% respectively). Table 5.8 also indicates that most of the losses for all hazard events were within the $1-5,000 range. The percentage of catastrophic earthquake events, those resulting in more than $5,000 in costs, is very small, about 2%. The same is true for hurricanes (8.7%) and tornadoes (6.5%). However, such is not the case for fires and floods. One-quarter of these events result in total costs of more than $5,000 (31.4% and 29.5% respectively). Fire events were much more likely to cause catastrophic losses, as indicated by the 16.7% of such events resulting in costs of over $20,000. Floods were less likely to result in such high costs; however, a substantial percentage (14.4%) inflicted losses over $20,000. The high average total dollar costs presented in Table 5.7 for fires and floods is due mainly to the large proportion that cause truly catastrophic damages.

National Estimates of Total Dollar Costs

The design of the research reported permits projections of total dollar costs to the national level. The telephone survey reported in the previous chapter provides estimates of the number of households who have suffered non-trivial losses and the average losses are shown in Table 5.7. Multiplying these two sets of numbers yields the national estimates shown in Table 5.9.

Table 5.9

National Annualized Adjusted[a] Estimates[b] of Total Household Costs Inflicted by Natural Hazard Events

Hazard	Adjusted[a] National Annual Estimates[b]
Household Fires	$4,600,000,000
Floods	2,800,000,000
Hurricanes and Severe Tropical Storms	900,000,000
Tornadoes and Severe Windstorms	2,000,000,000
Earthquakes and Tremors	400,000,000
TOTAL OF ALL FIVE ABOVE	$10.7 Billions
TOTAL OF FOUR NATURAL HAZARDS	$ 6.1 Billions

[a]Adjusted to 1980 dollars.

[b]Computed by projecting adjusted total dollar costs, as obtained from mail survey to incidence rates (See Chapter IV) as obtained from the telephone screening interviews.

Note that these estimates only pertain to the total costs of damages borne by households. Natural hazards also inflict damages on business and public entities, none of which are allocated out to households. Hence the estimates given in Table 5.9 are not inclusive of all damages but only of those borne directly by households through injuries to members or damages to real and personal property held by household members.

In addition, these are adjusted annualized estimates meaning that they have been inflated to 1980 dollars and constitute the average annual household costs for the eleven year period 1970 through 1980.

Household fires are clearly the most costly hazard studied, producing an annual $4.6 billions in damages to households. Floods are next in importance with $2.8 billions, followed rather closely by tornadoes and severe windstorms ($2.0 billions) with hurricanes and earthquakes trailing quite far behind ($.9 and $.4 billions respectively). Added together the five hazard damages total $10.7 billions annually, with the four natural hazards totaling $6.1 billions.

Note that these estimates are close to those given by hazards specialists as discussed in Chapter II (and in Appendix A) for all hazard damages combined, including hazards not studied in this research and including damages to business enterprises and public bodies. Hence the estimates in Table 5.9 appear to be on the high side, possibly expressing the known bias in our surveys towards higher rates of response from households that had experienced greater amounts of damage (as discussed in Chapter III). In addition, these estimates may also reflect the possibility that there are categories of damages that are not reflected

directly in the sources from which other estimates were made. Thus there may be costs that are directly absorbed by households that do not lead to loans from federal sources, gifts from friends and relatives, and so on that cover the losses inflicted by natural hazards. Such sources are explored in some detail in Chapter VI.

In any event, the annual losses from these four natural hazards are considerable, constituting a heavy burden for afflicted households. This assessment stands whether the total annual average burden is $4, $6, or $8 billions.

Damage to Property and Personal Possessions

The data just discussed summarize total dollar costs to households resulting from hazards events. Even at the averages, the total costs are likely to have direct and negative consequences for a family's economic well-being: for households suffering any dollar loss, the average losses will often run into the hundreds, or even thousands, of dollars, and for a sizable fraction of flood and fire victims at least, into the tens of thousands of dollars. These dollar losses, of course, have several components -- medical costs, lost wages, and so on -- but, as we shall see in the present section, the major component by far is damage to homes and personal property.

As every homeowner knows, dollar damages to a home can rapidly mount. A foot or so of flood water in one's basement would not normally constitute a major catastrophe, but if, as is often the case, there is

a furnace, or water heater, or washer and dryer, or other similar appliances located there, the ensuing damages could easily add up to several thousands of dollars. Likewise, a kitchen fire which destroys a major appliance can become a serious expense for the household. Since damages to property and personal possessions are often the major component of total costs, we address the topic of property damages in some detail in this section. Specifically, we examine the kinds of things that get damaged as a result of a hazard event and the costs of replacing or restoring them.

We asked respondents, "Did you or your family or household suffer any damages to your house or apartment or damages to your furniture or personal property as a result of the event?" The findings in this section are limited to only those households who answered "Yes." Households answering "Yes" were then asked whether each of 18 items was damaged as a result of the event and what the amount of damage to the item was. To facilitate the analysis, we have grouped these items into six categories of damage, as follows:

1. STRUCTURAL DAMAGE
   Includes damage to the following:
   1. Roof on building
   2. Basement or foundation
   3. Walls or floors
   4. Windows or doors
   5. Furnace, air conditioners, hot water heater

2. EXTERNAL DAMAGES
   Includes damage to the following:
   1. Yard or landscaping
   2. Garage or other building on property
   3. Other part of building

3. FURNITURE DAMAGE
   Includes damage to the following:
   1. Furniture
   2. Rugs or curtains
   3. Appliances

4. CLOTHING DAMAGE
   Includes damage to the following:
   1. Clothing only

5. PERSONAL ITEMS DAMAGE
   Includes damage to the following:
   1. Books or papers
   2. Radio, TV or stereo
   3. Jewelry

6. ALL OTHER DAMAGE
   Includes damage to the following:
   1. Pets
   2. Cars, trucks, other vehicles
   3. Any other personal property

The original list of 18 items captures most of the kinds of things that can get damaged as a result of a hazard event. The six constructed categories attempt to group together items that constitute similar kinds of damages. For example, damage to structure includes any damage to the roof of the building, the basement or foundation, the walls or floors, windows or door, or to the furnace or hot hot water heater. When we speak of damage to structure, then, we are referring to damages involving any one or some combination of these five items. Also, for each of the six categories, the sum of the dollar damage for each of the items comprising the group gives us a total dollar damage estimate for that category. (If an item in the category was not damaged, we added $0 to the category total when computing that total.) Data are shown in Table 5.10.

The first row of the table shows the percentage of events that caused any damage to property and other personal possessions. The

Table 5.10

Adjusted[a] Dollar Damages by Damage Categories
for Events Causing Any Damages to Property and Possessions

Category of Damage	Fire	Flood	Hurricane	Tornado	Earthquake
Panel A:					
Percentage of Events Causing Damage to Property and Possessions	85.7%	76.4%	55.2%	64.8%	14.4%
N =	(266)	(148)	(259)	(580)	(354)
Panel B:					
Percentage of Events with STRUCTURAL DAMAGE[b]	82.7%	76.1%	71.1%	67.9%	76.5%
Average Adjusted Damage	$2409	$2395	$1447	$1081	$1565
Median Adjusted Damage	$ 442	$ 454	$ 204	$ 148	$ 318
For Those with Structural Damage:					
Average	$3144	$3406	$2170	$1673	$2212
Median	$ 935	$1075	$ 632	$ 555	$ 651

Table 5.10 Continued

Category of Damage	Fire	Flood	Hurricane	Tornado	Earthquake
Panel C:					
Percentage of Events with EXTERNAL DAMAGES[c]	34.7%	56.6%	75.4%	63.6%	31.4%
Average Adjusted Damage	$1139	$ 906	$633	$ 582	$ 315
Median Adjusted Damage	$ 1	$ 0	$225	$ 85	$ 2
For Those with External Damages:					
Average	$5430	$1915	$900	$1007	$1318
Median	$1576	$ 501	$350	$ 300	$ 998
Panel D:					
Percentage of Events with FURNITURE DAMAGE[d]	76.4%	66.4%	24.6%	12.3%	19.6%
Average Adjusted Damage	$2031	$1956	$ 341	$ 46	$ 93
Median Adjusted Damage	$ 334	$ 172	$ 0	$ 0	$ 8
For Those with Furniture Damage:					
Average	$2936	$3237	$1802	$433	$ 511
Median	$ 900	$ 835	$ 507	$292	$ 394

Table 5.10 Continued

Category of Damage	Fire	Flood	Hurricane	Tornado	Earthquake
Panel E:					
Percentage of Events with CLOTHING DAMAGE[e]	46.7%	45.1%	9.9%	2.1%	2.0%
Average Adjusted Damage	$ 696	$ 415	$ 143	$ 2	*
Median Adjusted Damage	$ 0	$ 1	$ 2	$ 0	*
For Those with Clothing Damage:					
Average	$2065	$1171	$2434	$ 186	*
Median	$ 632	$ 569	$ 630	$ 70	*
Panel F:					
Percentage of Events with PERSONAL ITEM DAMAGE[f]	40.0%	48.7%	11.2%	8.6%	17.6%
Average Adjusted Damage	$ 476	$ 456	$ 106	$ 22	$ 48
Median Adjusted Damage	$ 1	$ 2	$ 0	$ 0	$ 3
For Those with Personal Item Damage:					
Average	$1814	$1035	$1589	$305	$338
Median	$ 724	$ 379	$ 253	$170	$376

Table 5.10 Continued

Category of Damage	Fire	Flood	Hurricane	Tornado	Earthquake
Panel G:					
Percentage of Events with OTHER DAMAGE[g]	29.3%	48.7%	26.1%	27.0%	41.2%
Average Adjusted Damage	$ 511	$1059	$ 274	$ 442	$159
Median Adjusted Damage	$ 0	$ 0	$ 0	$ 0	$ 1
For Those with Other Damage:					
Average	$2444	$2488	$1147	$1831	$424
Median	$ 788	$ 632	$ 400	$ 492	$108
Base N[h] =	(225)	(113)	(142)	(374)	(51)

[a]Adjusted to 1980 Dollars.

[b]Components of STRUCTURAL Damage are: Roof on building; basement or foundation; walls or floors; windows or doors; furnace, air conditioner or hot water heater.

[c]Components of EXTERNAL Damage are: Yard or landscaping; garage or other building on property; other part of building.

[d]Components of FURNITURE Damage are: Furniture; rugs or curtains; appliances.

[e]Components of CLOTHING Damage are: Clothing.

[f]Components of PERSONAL ITEM Damage are: Books or papers; radio, TV or stereo; jewelry.

[g]Components of OTHER Damage are: Pets; cars, trucks; any other personal property.

Table 5.10 Continued

Notes (continued):

[b] Base N is the number of events which had damage to property or personal possessions. The base number fluctuates slightly in the calculations due to some missing data.

* Number of cases in cell (N = 1) too small to allow computation of statistics.

percentages mirror those in Table 5.7 showing the percentages of events accompanied by any costs. For example, 85.7% of all fire events involved at least some damage to property and possessions. A little more than three-quarters (76.4%) of all floods and about two-thirds of all tornadoes (64.8%) resulted in property damages. A slight majority of households experiencing hurricane events suffered such damages (55.2%), but only a small minority of earthquake events (14.4%) resulted in any kind of property damage. In all the remaining panels of Table 5.10, the percentages shown are based on only those events which resulted in at least some damage to property or personal possessions. For convenience, we refer to these as "damaging events."

Panel B shows the percentage of "damaging events" which resulted in damage to structural features. By and large, structural damages account for the bulk of total dollar costs, as shown later. A large majority of all damaging events inflicted some structural damage, the proportions ranging upwards of two-thirds for all hazard types.

Although a large majority of damaging hazard events inflict some kind of structural damage, the average amount of damage varies across hazard types. On average, fire and flood events produce the highest average amounts of dollar damage to structure ($2409 and $2395 respectively). Hurricanes, on the other hand, produce less damage on average ($1447) as do tornadoes ($1081) and earthquakes ($1595). Also contained in Panel B are the median damage costs. That figure indicates that for fire and flood events resulting in property damage, 50% of the events produced structural damages of $500 or less, while 50% of the remaining hazard events produced less than $300 in such damages.

The last two rows of Panel B focus on only those "damaging events" which resulted in at least some structural damages. The averages, of course, increase. For structurally-damaging fire and flood events, the average damages were $3144 and $3406 respectively. As in all other cases, the median dollar damages are lower. Structurally-damaging hurricane, tornado and earthquake events caused less damage than either fire or flood events. On average, hurricanes resulted in $2170 in damages, while tornadoes and earthquakes average $1673 and $2212, respectively, in damages, with medians beneath $1,000 in each case.

Panel C shows the percentage of "damaging events" that caused exterior damage. As might be expected, fires and earthquakes are much more likely to cause structural damage than exterior damage, about a third of them resulting in damages to external items. Damages to the exterior are higher for floods (57%) than for either fires or earthquakes, and higher still for tornadoes (64%) and hurricanes (75%). All these patterns are as one would expect given the nature of the hazards.

In general, losses due to exterior damage are considerably less than losses due to structural damage. On average, fire events produced $1139 in damages to external items; floods, $906 hurricanes, $633; tornadoes, $582; and earthquakes, $315. If the analysis is restricted only to "damaging events" causing at least some exterior damage, all the averages go up. To illustrate, over all damaging fires, the average external damage done amounts to about $1100. However, only about 35% of all "damaging fires" cause any exterior damage, and among those that do, the average exterior damage done amounts to nearly $5430.

Similar although less pronounced patterns are evident for the other hazard types.

Panel D shows the percentage of events resulting in damage to household furnishings. Households experiencing damage from fires or floods were very likely to suffer furniture damages, over three-fourths of them in fire events and about two-thirds in flood events. On average the amounts of damage sustained were also quite high. In the case of damaging fires, the average furniture damage was $2031, and for flood events, $1956. About one-quarter of hurricane and 20% of earthquake events cause furniture damage and the average amount of damage is relatively low. Tornadoes were the least likely of the hazards to produce damage to furniture (12.3%) and the average amount of damage is also low.

As indicated in Panel E, damage to clothing is rare in hurricane, tornado and earthquake events, and rather common in fires and floods (about half of these latter causing at least some damage to clothing). In events where clothing was damaged, however, the replacement costs were rather high, averaging (as an example) some $2065 in the case of fire, and $1171 in the case of floods. (The average for hurricane is based on only one or two cases and is therefore unreliable.)

Panel F shows the percentage of "damaging events" that caused damages to personal possessions (other than furniture or clothing). Almost 50% of the damaging flood events and about 40% of the damaging fires resulted in some damage to personal items. The average amounts of damage to such items are small compared to other kinds of losses (about $400-500 on average); however, when singling out only those events

which actually produced damage to personal items, the average amounts again increase markedly. Personal items were damaged infrequently in the remaining types of hazards.

Panel G shows the percentage of events resulting in damages to "other" items, mainly cars and trucks. This appears to be a relatively important source of loss in some hazards, namely, in floods and, to a lesser degree, in tornadoes and hurricanes, and relatively unimportant in the other types of events. To illustrate, about half the damaging floods represented in these data caused damages in the "other" category, and the average loss inflicted as a result was higher than the average loss to either personal possessions or clothing.

Summarizing briefly, Table 5.10 gives estimates of both the types of property that get damaged and the average amounts of such damages. Fires are most likely to cause serious damages to structural items, furniture and clothing. Floods, on the other hand, are likely to result in damage not only to structural, furniture and clothing items but to all other damage categories as well. The lower total dollar costs reported for floods in Table 5.7 obviously does not imply that fewer or different kinds of items get damaged relative to fires, but rather, that fire tends to destroy what floods tend only to damage. Hurricanes and tornadoes show some similarity in the kinds of damages they produce. Both of these hazards involve high winds and rains and the kinds of damages sustained during these events reflect this. For example, both result in damages to a combination of structural and external items much more often than do any of the other hazards; however, they are less likely to cause damage to either clothing or furniture. Also, in

both these hazards, items classified under "other" are likely to be damaged in about one-quarter of such events. Earthquakes, on the other hand, are most likely to produce damages to the structural items and to items classified under "other."

Table 5.10 provides estimates of how frequently various types of damages occur and what the average damages are. However, these findings do not allow us, in any direct fashion, to gauge the importance of property damage in the "total dollar costs" accompanying the event. Specifically, how much of the total cost accompanying an event is represented by property damage? What percentage of the total cost is accounted for by damage to the 18 items which comprise our six damage categories, as well as the six categories themselves?

Table 5.11 shows the percentage of "total dollar costs" accounted for by each of the 18 loss categories. These percentages were calculated by dividing the various amounts of category-specific damage by the total dollar costs of the event. Data are shown for "damaging events" only, as defined earlier.

For example, in the bottom row of Table 5.11, we find that on average, 87.5% of the total dollar costs of a damaging fire event is accounted for by property damage. Overall, the overwhelming bulk of total costs associated with all hazard events is accounted for by property damages. The percentages across hazard types range upwards from 90%. In the case of damaging hurricanes and tornadoes, virtually all costs are due to property damages, while in earthquakes the percentage is 93%, and in floods, 90%. Thus property damage is unquestionably the major source of dollar loss from natural hazards.

Table 5.11

Percentage of "Total Dollar Costs" Accounted for by Components of Property Damage
For Those Events Causing Property Damage by Type of Hazard

Components	Fire	Flood	Hurricane	Tornado	Earthquake
STRUCTURAL ITEMS:					
1. Roof on Building	2.7%	3.4%	22.7%	31.1%	3.7%
2. Basement/Foundation	1.9	8.2	1.9	0.5	14.1
3. Walls or Floors	28.6	9.8	4.2	3.7	25.0
4. Windows or Doors	1 4	1.7	6.0	9.2	8.6
5. Furnace, Air Conditioners, Hot water heater	2.2	6.8	3.3	0.5	1.2
Structural Damages[a]	38.5%	30.8%	39.6%	45.5%	54.8%
EXTERNAL ITEMS:					
6. Yard/Landscaping	1.0	9.4	30.0	31.9	11.3
7. Garage/Other Building	1.9	3.3	4.1	8.9	1.7
8. Other Part of Building	4.9	1.4	5.1	6.1	1.1
External Damages[a]	8.5%	14.9%	40.6%	33.7%	7.9%
FURNITURE ITEMS:					
9. Furniture	9.3	9.3	1.2	0.7	2.2
10. Rugs or Curtains	7.7	5.2	2.6	1.1	0.4
11. Appliances	9.6	6.3	1.1	0.2	0.1
Furniture Damages[a]	28.1%	21.2%	5.1%	2.1%	2.9%

Table 5.11 Continued

Components	Fire	Flood	Hurricane	Tornado	Earthquake
CLOTHING ITEMS:					
12. Clothing	5.1%	4.2%	1.1%	0.1%	0.0%
Clothing Damage	5.1%	4.2%	1.1%	0.1%	0.0%
PERSONAL ITEMS:					
13. Books or Papers	1.0	2.7	0.7	0.1	1.2
14. Radio, TV, stereo	1.6	1.7	0.8	2.6	3.0
15. Jewelry	0.2	0.1	0.1	0.0	0.0
Personal Item Damage[a]	3.1%	4.5%	1.7%	2.8%	4.4%
OTHER ITEMS:					
16. Pets	0.3	0.0	0.0	0.0	0.0
17. Cars, Trucks, Vehicles	0.2	8.0	2.6	7.0	0.0
18. Any other Personal Property	3.6	6.0	6.3	5.8	22.0
Other Item Damage[a]	4.2%	14.6%	9.2%	13.2%	23.0%
Percent of "Total Dollar Cost" Accounted for by Damage to Property	87.5%	90.2%	97.3%	97.4%	93.0%
N[b] =	(225)	(113)	(142)	(374)	(51)

[a]The sum of the percentages of "Total Dollar Costs" accounted for by individual items is not equal to the percentage of "Total Dollar Cost" accounted for by the damage category as a whole. The slight difference is due to the way the percentages were calculated. In calculating the percentage of total dollar costs accounted for by individual items, items with missing were deleted from the calculation; however, the percentage of total dollar cost accounted for by the damage category was calculated even if one or two items contained missing information.

[b]Base fluctuates slightly due to missing data.

There are interesting differences across hazard types in the patterns of damages to property. In terms of percentage shares of the total dollar losses, fire damages tend to be concentrated on floors and walls of the structure, and on household furnishings. No other single category of property damage accounts for more than about 5% of the total dollar loss in damaging fires. Flood damages are, in contrast, far more diffuse, with no single category accounting for a greatly disproportionate share. Hurricane and tornado damages follow a very similar pattern, with over half the total dollar loss from both kinds of events being concentrated in but two categories: the roof and the yard. Like flood damages, earthquake damages tend to be rather diffuse, with structural damages, especially to walls, floor, foundation, or basement accounting for the largest aggregate share.

The Distribution of Dollar Costs by Household Characteristics

Analyses reported to this point give some indication of the magnitude of losses associated with hazard events, but not of how these losses tend to vary as a function of household characteristics. Are some families more prone to suffer property damages in a hazard event than others? As an initial approach to this question, Table 5.12 shows the proportion of families suffering any dollar loss from their hazard event as this proportion varies over (i) hazard types and (ii) characteristics of the household. To illustrate, the first entry in the table shows that there were 99 fire events in our sample occurring to households where the oldest member was less than age 30, and of these 99 events, 81.8% caused at least some dollar damages.

Table 5.12

Percentages of Households by Selected Characteristics Sustaining Any Dollar Costs by Type of Hazard

Selected Characteristic	Fire	Flood	Hurricane	Tornado	Earthquake
Panel A:					
Age of Oldest Person in Household at Time of Event:					
Under 30 years	81.8% (99)	64.8% (71)	46.2% (78)	64.2% (201)	13.8% (138)
31-44 years	88.3% (77)	96.8% (31)	65.1% (86)	65.2% (187)	13.1% (99)
45-64 years	87.7% (57)	88.2% (34)	58.7% (63)	61.5% (135)	13.1% (84)
65 and over	100.0% (16)	71.4% (7)	64.7% (17)	73.7% (38)	6.7% (15)
Panel B:					
Size of Household at Time of Event:					
1 person	91.7% (12)	55.6% (18)	33.3% (21)	61.2% (67)	14.8% (54)
2 person	84.9% (53)	78.1% (32)	45.4% (66)	68.0% (122)	12.0% (83)
3-5 persons	87.1% (147)	90.3% (62)	60.1% (141)	64.1% (309)	9.9% (171)
6+ persons	84.6% (26)	85.7% (14)	100.0% (13)	62.5% (32)	16.7% (18)
Panel C:					
Race					
White	87.3% (205)	80.2% (121)	57.0% (200)	65.9% (501)	12.2% (296)
Minority	85.3% (34)	100.0% (10)	53.7% (41)	41.7% (36)	13.9% (36)

Table 5.12 Continued

Selected Characteristic	Fire	Flood	Hurricane	Tornado	Earthquake
Panel D:					
Tenure					
Rent	79.7% (64)	74.7% (39)	34.7% (49)	47.4% (95)	8.3% (96)
Own	88.5% (182)	79.2% (101)	61.6% (203)	68.9% (456)	14.4% (243)
Panel E:					
Household Income at Time of Event:					
Under $10,000	96.7% (61)	78.1% (32)	40.0% (40)	58.5% (94)	16.4% (61)
$10-15,000	87.5% (56)	85.7% (35)	64.3% (42)	61.5% (104)	12.5% (48)
$15-20,000	88.0% (25)	85.7% (21)	66.7% (30)	66.7% (84)	8.0% (50)
$20-25,000	81.0% (21)	81.2% (16)	72.7% (33)	57.1% (70)	2.5% (40)
$25-40,000	91.7% (12)	100.0% (6)	50.0% (18)	70.0% (40)	21.4% (28)
Panel F:					
Seriousness of Disaster Context:					
Isolated	85.2% (230)	49.0% (49)	22.9% (109)	38.5% (221)	6.2% (320)
Block	100.0% (20)	82.6% (23)	66.7% (36)	69.6% (125)	70.0% (10)
Neighborhood	*	94.9% (39)	80.6% (36)	86.6% (127)	66.7% (24)
City or Town	100.0% (2)	91.4% (35)	90.4% (73)	87.4% (95)	100.0% (1)

*No cases in cell.

Panel A shows differences across households by age of the oldest member. Overall, the youngest households were the least likely to sustain any losses, and households with their oldest members in the 31-44 year old range were generally the most likely. Only in the case of earthquakes were the very youngest households more likely to suffer losses (13.8%) than other age groups. For fires, about 82% of households with the oldest member under 30 years incurred any losses; in contrast, households in the 31-44 age group had 88% suffering losses and for those in the 65 and over category, 100% suffered losses. The same pattern held true in the cases of hurricanes and tornadoes, that is, households in the 31-44 and the 65 and over groups had the highest loss rates. In floods, however, it was the two middle-age groups which most often suffered losses.

Panel B shows differences with respect to the size of the household at the time of the event. There are no sharp patterns that hold across disaster types. Hurricane loss tends to increase with household size, rather sharply. Single-person households are distinctly less likely than others to incur loss in a flood, whereas the same households are more likely than others to sustain a loss in fires. With the exception of the hurricane result, none of these patterns is pronounced.

Panel C shows differences according to race of the household head. Floods show a marked difference in the rates of sustaining costs between whites (80%) and minorities (100%), but the non-white N is very small. An equally sharp difference is also evident in the case of tornadoes, but in the opposite direction. For the remaining hazards, there are no real differences between white and minority households.

Panel D shows differences by tenure. Overall, renters were less likely than owners to suffer any costs, across all hazard types. The difference between renters and owners is more pronounced for hurricanes, tornadoes, and earthquakes than for the remaining hazard types.

Differences among income groups are mixed and generally weak (Panel E). In fires, the lowest income groups suffered losses most often (96.7%), followed by those in the over $40,000 group (91.7%); however, the loss rate was quite high across all income categories. In the case of floods, the lowest income groups had the lowest rate (78.1%), while those in the over $40,000 group had the highest rate (100%). In both hurricanes and tornadoes, the lowest income groups were the least likely to have had any costs, while in earthquakes, the lowest and highest income groups had the highest loss rates.

Panel F shows loss rates by disaster context, as defined earlier. The general pattern is that if damages were widespread, the likelihood that a household would incur losses increases. This pattern is most pronounced in the case of earthquakes.

Table 5.12 treats loss as an "either-or" condition: either a family suffered at least some dollar loss, or it did not. The "total dollar loss" is obviously a more sensitive measure. Table 5.13 shows the mutiple regression of total dollar loss on selected household characteristics. As in the earlier regression, the entries give the unstandardized regression coefficients associated with each independent variable; these are readily interpreted as the increase (or decrease) in predicted total dollar losses due to a unit increase in the corresponding independent variable. The standard errors of estimate are

Table 5.13

Regression of Adjusted[a] Total Dollar Costs on
Selected Household Characteristics

(Dependent Variable is Adjusted[a] Total Dollar Cost)

	Fires b/SE	Floods b/SE	Hurricanes b/SE	Tornadoes b/SE	Earthquakes b/SE
Age of Oldest Person in Household	-35.49 (73.5)	63.54 (70.2)	2.44 (27.2)	-36.44* (17.4)	-9.59 (6.1)
Size of Household	1093 (688)	1565* (695)	587* (296)	277 (179)	-.89 (59)
White[b]	-3630 (3006)	745 (4073)	128 (1107)	840 (1045)	107 (281)
Renter[c]	-6427* (2594)	-6048* (2486)	472 (1099)	-1482 (751)	-210 (214)
Household Income (thousands of dollars)	-102 (83)	-529*** (117)	-26 (36)	-53 (24)	-8 (8)
Seriousness of Disaster Context	3336 (2887)	5228*** (919)	1310*** (333)	703** (232)	1680*** (163)
Intercept	12906* (5184)	2526 (5528)	-1472 (1956)	1851 (1475)	529 (431)
R^2 =	.061*	.314***	.110***	.044**	.305***
N =	(209)	(116)	(204)	(470)	(281)

***p < .001

**p < .01

*p < .05

[a]Adjusted to 1980 dollars.

[b]Dummy variable. Omitted category is non-white.

[c]Dummy variable. Omitted category is Owners.

reported in parentheses beneath each coefficient; the R^2 values are shown at the bottom of the table.

The high R^2 values for floods (R^2 = .314 and earthquakes (R^2 = .305) indicate that we do best in predicting total dollar costs for these two events. In the case of floods, household size, tenure, household income and disaster context are the significant predictors of total dollar costs. Knowing that a household rents its home would lead us to predict total losses of $6048 less than if they were owners. Similarly, for every $1000 increase in household income we would predict approximately $529 less in total costs. Every unit increase in our context variable (knowing damage was not an isolated occurrence) leads to a $5228 expected increase in total costs.

Though the R^2 is almost as high in the case of earthquakes, the only significant predictor of total cost is the context within which the event took place. For every one unit increase in our context index, we would expect an $168 increase in total dollar losses.

The R^2's for the remaining hazards are all statistically significant but also relatively small, ranging from .04 to about .11. In the case of fires, tenure is the only significant predictor of total loss. There are no differences in total loss by age, race, or income. For hurricanes, with every additional person in the household we expect a $587 increase in total costs. In addition, knowing that damage was not limited to their home alone leads us to predict an increase of $1310 in losses. Finally, we do best in predicting losses from tornadoes when we know the age of the oldest person in the household, tenure, household income and the disaster context.

Summary

The untoward sequelae of natural hazards include, but are assuredly not limited to, deaths, injuries, and dollar damages incurred. In general, as others have remarked, death has become a rather uncommon consequence of natural hazards, no doubt owing in large measure to the very impressive improvements in warning systems that have developed over the past few decades, and perhaps to improvements in emergency medical care and in the hazard-safety of dwellings as well. In our data, personal injury is also relatively rare, occurring in fewer than a tenth of all events. Further, most of the medical care costs incurred as a result of these events were modest in dollar terms.

Measured in terms of direct dollar cost, property loss is by far the most common source of loss from a hazard event, with average dollar costs running into the hundreds and even thousands of dollars. Most of these costs are accounted for by damage to residences or to their contents, as would be expected. The numbers reported in this chapter strongly suggest that many families would find it extremely difficult to cope with the economic consequences of a hazard event were they left entirely to their own devices. But it is also well-known that many, perhaps most, hazard victimized families are not "left to their own devices." To the contrary, many sources of external aid often become available to them, whether this aid comes in the form of insurance coverage, governmental relief and rehabilitation funds, local community support, or the generously shared resources of family and friends. Indeed, the "cost accounting" provided in this chapter

only totes up the loss side of the ledger; a complete accounting would have to include not only the losses incurred but also the assistance received. And that, as it happens, is the topic of the following chapter.

CHAPTER SIX

PATTERNS OF AID TO HAZARD VICTIMS

Introduction

Although no amount of aid, financial or otherwise, can completely compensate for all the consequences of a major trauma, the restoration of the status quo ante can be aided considerably by various kinds of help. The sources of help and the extent to which they affect the household's return to normalcy are the subjects of this chapter. We consider such diverse sources of aid as insurance payments, gifts and loans, as well as help in goods or services rendered by relatives, friends and neighbors.

A critical issue in the analysis is the extent to which aid reaches impacted households in an equitable way. In this connection, there are two main questions to be raised: First, how large a proportion of the households in need are reached by the agencies that provide aid to stricken households? Secondly, is aid distributed equally among households that vary by socio-economic level, tenure, age and race (and other characteristics)? A final topic dealt with here concerns the speed with which households are restored to their "normal" pre-hazard condition. What affects the time to the restoration of normalcy?

A Technical Note

Throughout this chapter, we distinguish usually between "serious" events and "minor" ones, based mainly on the amount of damages or injuries suffered by households. However, this distinction, for good

reasons, is not always followed, with all events regardless of amount of damage or injuries being considered as one group for some analyses. The reader is urged to note the headings of tables in which the kinds of households used in the tabulations are described.

Insurance Coverage and Claims

Although almost all homeowners' insurance policies cover losses from fires and most would cover damages from windstorms, coverage of flood and earthquake hazards is neither usual or frequent. In addition, a large proportion of renters and some owners do not have property insurance at all.[1] Even in communities in which flood insurance subsidized under the National Flood Insurance Program is available, coverage is voluntary and many opt not to be covered. In states such as California where earthquake risk coverage is available and offered routinely by insurors, only small proportions elect to be covered (Kunreuther, 1977).

In Table 6.1, the insurance experiences of all households that had suffered damages of any magnitude are shown. Panel A shows the percentages of households who believed (at the time of the event) that they had insurance to cover the losses sustained. Percentages are shown separately for events that caused $50 or more in damages

[1] Among renters who had experienced some dollar damages, 31% thought that their insurance covered their losses. In contrast, 81% of owning households believed they had insurance coverage for their losses. Of course, perceived insurance coverage varied widely by type of hazard experience: At the one extreme 92% of the homeowners believed their insurance covered damages received from fires; at the other extreme, 70% of the renters believed that their insurance did not cover earthquake damages.

Table 6.1

Insurance Experiences Connected With Hazard Victimization[d]
(Only Households With Non-Zero Dollar Damages Hazard Event)

Hazard Seriousness[a]	Fire	Flood	Hurricane	Tornado	Earthquake
A. Believed Damage was Covered by Insurance (%)					
Serious	83%	45%	82%	81%	35%
N =	(213)	(108)	(125)	(324)	(37)
Minor	30%	#	88%	53%	60%
N =	(10)	(1)	(16)	(32)	(5)
B. Filed a Claim for Damage (%)[e]					
Serious	93%	65%	77%	80%	38%
N =	(178)	(49)	(102)	(264)	(13)
Minor	67%	#	7%	12%	0%
N =	(3)	(1)	(14)	(17)	(3)
C. Claim Honored (%)[b]					
Serious	99%	77%	89%	94%	60%
N =	(165)	(31)	(78)	(210)	(5)
Minor	#	#	#	#	#
N =	(2)	(1)	(1)	(1)	(1)
D. Treated Fairly by Insurance Company (%)[b]					
Very Fair	67%	39%	56%	71%	20%
Somewhat Fair	15	29	13	18	40
Somewhat Unfair	11	16	23	7	0
Very Unfair	6	15	8	3	40
N =	(164)	(31)	(75)	(207)	(5)

Table 6.1 (continued)

Hazard Seriousness[a]	Fire	Flood	Hurricane	Tornado	Earthquake
E. Complaints About Insurance Company (%)[c]					
Payment Slow	39%	33%	52%	20%	0%
Disallow Unfairly	27%	56%	48%	43%	50%
Payment Too Small	67%	40%	68%	60%	0%
Bad Manners	15%	11%	22%	18%	0%
N =	(33)	(9)	(23)	(28)	(12)

#Number answering too small (under 4) to compute percentages.

[a]Minor events involve neither damages over $50, nor medical expenses. Serious events include all others (damages over $50 and/or injuries and/or evacuation). Damages are not corrected for inflation.

[b]Asked only of persons submitting claims.

[c]Asked only of persons claiming to have been treated unfairly. Percentages do not add up to 100% because of multiple complaints.

[d]See questionnaire Appendix B for exact wording of questions. Table covers only households with non-zero dollar damages (property losses or medical expenses).

[e]Asked only of those who believed they had insurance coverage.

(serious experiences) and those with less than that amount (minor experiences). As might be expected, strong majorities of households experiencing serious fires (83%), hurricane damage (82%), and tornado damage (81%) expected that their insurance would cover at least some portion of their losses. The corresponding proportions for floods and earthquakes were much lower (45% and 35% respectively). Note that since some of the damage losses were incurred through injuries and might have been covered by medical and/or surgical policies, the inflicted costs might well have been covered even though property insurance policies excluded property damages from the hazard in question.

The percentages filing claims (as shown in Panel B) tend to follow the same pattern noted above. Claim filings were more frequent among those suffering from serious fires (93%), hurricanes (77%) and tornadoes (80%). Fewer claims were filed for floods (65% or for earthquakes (38%). In addition claims were less frequently filed for minor (less than $50) losses under all hazard conditions.

The patterning of differences among hazard types is again repeated when we consider whether or not a claim was honored (Panel C). Virtually all serious fire claims were honored (99%), and close to all of the tornado (94%) and hurricane claims (89%) were also honored. Three out of four (77%) flood claims and a little more than one out of three (38%) earthquake claims were met with some payment.

If we multiply through the various probabilities displayed in Table 6.1, we obtain the following proportions of serious hazard

events for which some kind of insurance payment was made:[2]

Proportions of Serious Events in which Insurance Payments were Received

Fires	76%
Tornadoes	61%
Hurricanes	56%
Floods	22%
Earthquakes	8%

Clearly, losses from fire hazards are covered most completely by insurance and those from earthquake damage, least covered.

By and large, those who filed claims were satisfied with the outcomes, as indicated in Panels D and E. In every hazard type, a majority of those who filed claims were satisfied that they had been treated fairly by the insurance company involved (Panel D). As one might expect, satisfaction was greatest in connection with hazard claims in which the probability of having claims honored was highest -- fires, tornadoes and hurricanes as contrasted to floods and earthquakes.

The major specific complaint made by those claiming unfair treatment concerned the size of the payment, two-thirds or more of the dissatisfied indicating that the payment was too small. For the hazards in which coverage was slight, complaints were registered that claims were disallowed. Few claimed that payments were too slow in coming or that insurance personnel acted impolitely.

In Table 6.2 we consider the amounts paid by insurance companies

---

[2] For example, the percentage of all serious fires receiving payment is the product of the proportion believing they were covered, the proportion who submitted claims and the proportion receiving claims (.83 x .93 x .99 = .76 or 76%). No calculations for minor hazard events were made because of the small numbers of such events.

Table 6.2

Adjusted Insurance Claims Reimbursed by Hazard Type[a]
(Cases With Damage Amounts Greater Than Zero, N = 884)

Damage Type	Fire (N=218)	Flood (N=112)	Hurricane (N=144)	Tornado (N=365)	Earthquake (N=44)
A. Damage to Buildings					
No Payment[a]	57%	94%	62%	64%	96%
Average Amount Reimbursed[b]	$3637	$367	$1022	$693	$88
Average Payment[c]	$8434	$5865	$2675	$1916	$1935
B. Injuries and Illnesses					
No Payment[a]	98%	100%	100%	99.5%	100%
Average Amount[b]	$5	0	0	$3	0
Average Payment[c]	$267	0	0	$624	0
C. Personal Property					
No Payment[a]	62%	92%	92%	95%	96%
Average Amount[b]	$1857	$157	$184	$158	$30
Average Payment[c]	$4549	$1958	$2420	$3042	$678
D. Cars and Trucks					
No Payment[a]	98%	95%	97%	90%	100%
Average Amount[b]	$72	$124	$35	$143	0
Average Payment[c]	$317	$2327	$1011	$1456	0
E. Other Damages					
No Payment[a]	95%	95%	83%	86%	98%
Average Amount[b]	$248	$27	$129	$292	$60
Average Payment[c]	$4519	$504	$778	$2138	$2645

Table 6.2 (continued)

Damage Type	Fire (N=218)	Flood (N=112)	Hurricane (N=144)	Tornado (N=365)	Earthquake (N=44)
F. Total Damages					
No Payment[a]	43%	81%	56%	53%	93%
Average Amount[b]	$5820	$675	$1371	$1291	$178
Average Payment[c]	$10150	$3603	$3085	$2756	$2624

[a]Includes cases with missing values on amounts, or types of coverage as zero payment.

[b]Average Amount defined as average over all cases, including those with zero payments, adjusted to 1980 dollars.

[c]Average Payment defined only over cases receiving non-zero payments and adjusted to 1980 dollars.

for damages of various kinds. Note that all hazard events with non-zero damages are grouped together in this table with no distinctions made among serious and minor events. Each of the panels from A to E consider the sources of the damages involved, with the final panel F considering all damages summed together.

Fire insurance payments are made in more than half of the cases of fires (57%), with average payment being close to $6,700. Payments for damages to real property were most frequent (43% of the fires)[3] with average p- more than $8,400. Claims for personal property damage were honored in 38% of the cases, with average payments amounting to almost $4,500. Other categories of payments were received by only a very small minority of cases, in all cases under 5%.

In most of the flood damage cases, no insurance payments were made (81%) and average payments when received were about $3,600. The most frequent category of payment was for damages to buildings, with average payments for that purpose being a bit more than $5,800.

Greater insurance coverage was obtained for hurricane and tornado damages, in which payments were received in 44% and 47% of such cases. Damages to buildings were most often covered.

Earthquakes, as we learned earlier, are the least well covered hazard event, with claims being paid in only about 7% of such events.

As shown in Tables 6.1 and 6.2, the extent to which insurance payments can help a household recover from the ill effects of a hazard event varies by the kind of event experienced and the kinds of damages

---

[3]Note that this proportion is less than that calculated on page VI-6 since cases with missing information on amounts paid and on specific categories of coverage were counted in Table 6.2 as zero payments.

inflicted. There are additional variations by the characteristics of households, as Table 6.3 shows. An item in the mailed questionnaire asked respondents to estimate the proportion of their total dollar losses that was covered by insurance claim payments.[4] Using these responses as a dependent variable, Table 6.3 presents a regression in which independent variables include features of the hazard event and household characteristics.

As we have shown, if the hazard event was a fire, hurricane or tornado, the proportions of losses reimbursed through insurance coverage were considerably greater than in floods and earthquakes. The enhancement was greatest in the case of fire hazards, with 41% more of the losses being reimbursed in such events.

The greater the damage, the larger the proportion reimbursed, a finding that reflects the fact that damages to building structures were usually a large part of the losses reported in high loss events (see Chapter V). The context of the event had little or no effect on the losses reimbursed. Damages to other buildings on the block

---

[4]The responses were as follows (for those with any damages reported):

No claim payments	49%
1% to 9%	2
10 to 29%	3
30 to 49%	4
50 to 69%	7
70 to 89%	12
90 to 100%	21
100% =	(860)
Don't know and no answer	3%

Since these replies are respondent estimates, they are not necessarily accurate reflections of what might be computed if exact damages and insurance payments were known from records. Indeed, the percentage estimates may reflect respondent satisfaction as much as actual payments.

Table 6.3

Regression of Percentage of Loss Reimbursed by Insurance on Hazard Characteristics and Household Characteristics (Serious Events Only: N = 883)

Independent Variables	(Dependent Variable is Respondents' Estimates of Percent of Reported Loss Reimbursed Through Insurance) b	SE
A. Hazard Type[a]		
Fire	41.14***	(6.56)
Flood	-2.016	(6.99)
Hurricane	25.17***	(6.77)
Tornado	30.94***	(6.18)
B. Hazard Characteristics		
Damage to Household[b]	11.92***	(1.09)
Community Damage Seriousness[c]	1.227	(1.43)
Public Services Disruption[d]	-2.730**	(.884)
C. Household Characteristics		
Age of Oldest Person	.1309	(.091)
White[e]	15.06***	(3.80)
Household Income ($000's)[f]	-15.16	(12.5)
Number of Persons	.4109	(.869)
Education (Years)	.4311	(.557)
Renter	-16.95***	(3.72)
D. Intercept	-50.08***	(12.1)
R^2 =	.308***	
N =	(718)	

*p is .05 or smaller.
**p is .01 or smaller.
***p is .001 or smaller.

Table 6.3 (continued)

[a]Dummy variables: omitted category is "earthquake."

[b]Reported total dollar loss to household coded into five categories: 0 = no damage, 1 = $1-$50, 2 = $51-$100, 3 = $101-$200, 4 = $201-$500, 5 = over $500.

[c]Index measuring reported damage to homes on block, neighborhood and community (see questionnaire Item 34).

[d]Number of public services disrupted as a consequence of event (Item 33 on questionnaire).

[e]Dummy variable: omitted category is all non-white.

[f]Reported household income in the year the event occurred.

or in the neighborhood or larger community affected the proportion reimbursed little or not at all. Loss reimbursement was affected slightly by the disruption of public services: for each public service that was disrupted, almost 3 percent less insurance reimbursement was experienced. It is difficult to interpret this finding: possibly, it reflects the greater likelihood of such interruptions in earthquakes and floods, as compared to the other hazard events.[5]

The main differences among households concern tenure and race. Renters are not as likely to be reimbursed as much (17% less) through payments and whites are more likely to get a higher proportion of losses reimbursed (by about 15%). These differences are likely reflections of the differences in insurance coverage: Almost all homeowners are required by their mortgagors to have insurance covering real property, while many renters carry little or no insurance to cover their personal possessions. The racial differences also may reflect differences in insurance purchases, but this is mainly speculative.

Other Financial Aid Received

Although insurance claims are a major source of financial aid to households experiencing hazard losses, there are many other agencies that also provide financial help to victims. In addition, neighbors,

---

[5]Another possibility: Disruptions of local community services are one explicit reason for a Federal disaster declaration. Thus, events where community services are disrupted are more likely to be Federally declared. In consequence, victims of such events are more likely to be eligible for various Federal disaster relief funds, which would in turn tend to reduce the proportion of total loss for which insurance reimbursements would be made.

friends, and especially relatives may provide gifts and loans. Indeed, for hazard events that are not ordinarily covered by homeowners' insurance policies, loans and gifts may be the only financial help available.

Table 6.4 presents tabulations of those who received loans and gifts or grants from all sources (excluding, of course, any insurance claim payments). Loans were received in proportions ranging from 13% (in the case of flood hazards) down to 5% in tornado events. The amounts (corrected for inflation) obtained tended to be fairly large, especially in the case of fires and floods where the average loan was $8,615 and $16,604, respectively, likely for the reconstruction of real property damaged in the event.

Gifts and grants were more frequently received but were usually of a smaller magnitude. Gifts and grants were received by 28% of the households experiencing a flood, with the average grant being slightly over $7,000, but by only 6% of the tornado victims, the average grant in such cases being slightly more than $600.

Grants and loans combined were quite frequent. More than a third of all the flood households (34%) received some sort of financial help of this sort, with the average amount being over $12,000. In contrast only 9% of tornado victim households received any financial help, with the average amount being slightly more than $8,000.

The sources providing financial aid are shown in Table 6.5. As might be expected, only small minorities of households receive aid from any one of the sources, the largest percentage in the table (19%) representing the proportion of flood hazard events in which support was received from the American Red Cross. Most of the proportions in the table are close to zero.

Table 6.4

Loans, Gifts, and Grants Received From All Sources[a]
(Events With Non-Zero Damages Only: N = 883)[b]

Type of Aid[c]	(N=218)	(N=112)	Hurricanes (N=144)	Tornadoes (N=365)	Earthquakes (N=44)	All Combined (N=883)
A. All Loans						
% Receiving Loan(s)	6%	13%	7%	5%	9%	8%
Average ($)[d]	$553	$2223	$423	$496	$615	$724
Average Loan[e]	$8615	$16604	$6094	$10665	$6765	$10650
B. All Grants and Gifts						
% Receiving Grant(s) or Gift(s)	7%	28%	7%	6%	14%	10%
Average[d]	$162	$1942	$253	$35	$661	$375
Average Grant[e]	$986	$7015	$3643	$623	$4802	$3189
C. Combined Loans and Grants						
% Receiving Loans and/or Grants	20%	34%	12%	9%	16%	14%
Average[d]	$716	$4165	$676	$532	$1276	$1099
Average Loan and/or Grant[e]	$3630	$12277	$5728	$6075	$8024	$7084

[a]Adjusted to 1980 dollars and outlying values trimmed.

[b]Includes only events with non-zero damages.

[c]Includes loans, gifts, and grants received from all sources indicated in Table 6.5 and excludes insurance payments.

[d]Averaged over all events, including those with no grants or loans.

[e]Average for those receiving grants (or loans).

Table 6.5

Financial Aid Received From Various Sources[a]
(Events With Non-Zero Damage Only: N = 883)

Source of Financial Aid	Proportions Receiving Aid[b]				
	Fires	Floods	Hurricanes	Tornadoes	Earthquakes
A. Federal Agencies					
SBA Business Loan	0%	10%	9%	0%	0%
SBA Personal Loan	0%	15%	4%	1%	9%
Farmers Home Administration	0.5%	1%	0%	0.7%	0%
FDAA	0%	8%	3%	0.7%	3%
FEMA	0%	0%	3%	0.3%	0%
Veterans' Administration	0%	0%	0.9%	0.3%	0%
Unemployment Payments	0%	2%	0.9%	0.3%	0%
Other Federal Agency	1%	5%	3%	0.3%	0%
B. American Red Cross	5%	19%	0.9%	1%	3%
C. State and Local Government					
State Agency	2%	3%	0.9%	0%	0%
Local Agency	1%	0%	0%	0%	0%
D. Other Local Sources					
Local Bank	4%	3%	0%	3%	0%
Local Community Organization	4%	1%	0%	0%	0%
Church or Synagogue	7%	3%	0.9%	1%	0%
Labor Union	1%	1%	0%	0%	0%
Employer	6%	5%	3%	0.3%	0%
E. Relatives	10%	15%	5%	5%	9%

[a]Includes only events with non-zero dollar damages.

[b]Includes all aid: grants, gifts, loans.

In the case of fires, the most frequent sources of financial help are local ones, relatives helping out in one out of ten such events, with the next most frequent source (7%) being local churches and synagogues. Of the national level agencies, only the Red Cross makes a significant (5%) showing as a source of financial aid, mainly in the form of grants and gifts to victims.

The victims of floods are more likely to be helped by almost every source. Fifteen percent have been helped by relatives, 19% by the Red Cross and 15% by the Small Business Administration personal loan program, with an additional 10% aided by that agency's business loan program. Indeed, the level of help overall given in flood events is high enough to reach one out of three victimized households.

Hurricane events also activate many agencies but not at as high a level as in the case of floods. The Small Business Administration, FEMA and FDAA are all sources of financial help used by up to 9% of the victimized families.

Tornado events are responded to by fewer sources and less frequently than in other hazards by those who do respond. Only relatives reach as many as 5% of the victimized households, local bank loans being the nearest competitor with a 3% coverage. The remainder of the sources are all 1% or below.

Finally, earthquakes are even more eclectic in terms of sources from which financial aid comes. The Small Business Administration's personal loan program reached 9% of the victimized households. Relatives responded at about the same level (9%) but the remaining sources are mainly at zero. Of course, there were few (44) earthquake events with

non-zero damage in the sample and hence these estimates are subject to a considerable amount of small sample fluctuation.

Although it is difficult to discern an overall patterning in the sources of non-insurance financial aid to victims of natural hazards, important roles appear to be played by the federal agencies that have disaster relief as major missions. In addition, the American Red Cross is present to a significant degree in almost all serious events. Finally, kinship ties appear to be always important.

If there is an overall pattern, it is that gifts and loans are most important when traditional insurance coverage is absent. The complementary roles played by insurance payments and gifts and loans are perhaps best seen in Table 6.6, in which the total dollar loss has been regressed on insurance payments received, grants and gifts, and loans, separately for each of the hazard event types and for combinations of hazard events. Note that these regressions are not intended to imply that the dollar losses experienced by households are in some way determined by the claims honored or by loans and gifts received. Rather, the interpretation of the findings should be in non-causal terms: a coefficient for insurance claims, for example, should be interpreted as the coverage of each dollar of damage loss by each insurance claim payment dollar. Thus, a coefficient of 2.0 means that a dollar of insurance payment covers 2 dollars of loss, net of the coverage provided by gifts and loans. Correspondingly, the R^2 for each of the equations expresses the extent to which the financial aid given is sensitive to the amount of loss experienced by households. A high R^2 therefore means that the combined financial aid is sensitive to

Table 6.6

Regressions of Damages[a] ($) on Insurance Payments, Grants, and Loans by Disaster Types
(Non-Zero Damage Events Only: N = 883)

(Dependent Variable is Damages ($) Estimated as Result of Hazard Event)

Hazard Type	R^2	Insurance Payments ($) b/SE	Grants/ Gifts ($) b/SE	Loans ($) b/SE	Intercept b/SE	N=
A. All Hazards Combined	.09***	1.363*** (.175)	1.330* (.525)	.7224** (.269)	3915** (1306)	(883)
B. Fire	.45***	1.281*** (.112)	3.684** (1.51)	.7018* (.323)	5433*** (1362)	(218)
C. Flood	.01	1.363 (3.51)	.7772 (1.59)	.5874 (1.085)	16218 (10394)	(112)
D. Hurricane	.83***	1.471*** (.066)	-.3414 (.374)	1.397*** (.206)	998.4* (326)	(144)
E. Tornado	.56***	1.585*** (.097)	4.237* (2.06)	.4655 (.133)	947.5* (467)	(365)
F. Earthquake	.70***	.6904 (.507)	1.060*** (.171)	1.204*** (.178)	1035* (409)	(44)
G. Fires, Hurricanes and Tornadoes Combined	.52***	1.419*** (.059)	1.748** (.530)	.5993*** (.124)	2290*** (467)	(727)

*p is .05 or less.
**p is .01 or less
***p is .001 or less

[a]Dollars are unadjusted for inflation.

dollar loss, rising as the loss is great and declining otherwise.

First it should be noted that the R^2 for the combined hazards (as shown in Panel A) is relatively low, .09, indicating that there is no particularly strong patterning of financial aid for all the natural hazards combined. The individual R^2's in the remaining equations, however, are quite diverse, indicating that the patterning is different for each of the disasters. Especially striking is the R^2 of essentially zero for floods, indicating that the financial aid sources are not at all sensitive to the amount of loss experienced by the households in question. Insurance coverage, loans and gifts appear to be arbitrarily or capriciously given in flood events, responding perhaps to other factors besides how much damage or loss had been experienced by households.

The remaining disaster types each present somewhat different patterns. As we have seen previously, insurance payments play an important role in fire hazard events, each dollar of insurance payments covering \$1.28 of fire loss (b = 1.281), net of gifts and loans. Each dollar of grants and gifts covers about \$3.68 of losses and the role of loans appears to be not structured at all. All told, the equation accounts for 45% of the variance in dollar damage, indicating some degree of indeterminateness in financial help for fire victimization.

In contrast, the equation for hurricane events is more highly structured (R^2 = .83) with insurance payments and loans being strongly related to total damage. Each dollar of insurance payment covers \$1.47 and each dollar of loans covers \$1.39 of the total damage.

Tornado events also appear to be fairly well structured as well, the equation accounting for 56% of the variation in dollar loss. Here

insurance payments and grants or gifts are the main sources that vary with the amount of damage. In contrast, for earthquake events, slightly more structured than tornadoes (R^2 = .70), the main factors appear to be loans and gifts.

The final Panel (G) of Table 6.6 considers the three disasters -- fires, hurricanes and tornadoes -- in which insurance coverage plays an important role. In that equation, all three sources of financial help are important, each dollar of insurance payment covering $1.42 of loss, each grant dollar, $1.75, and each loan dollar $0.60 of loss.[6]

Over all events, a little more than half (52%) of the households received some financial aid from one or more sources. As shown in Table 6.7, proportions receiving any financial aid ranged from two out of three households experiencing fires to about one out of four earthquake victimized households. The amounts received were not trivial, ranging from $5,653 for the average fire victimized household to $1,455 for the average earthquake victim. Of course, average payments (money received by those who received some money) were even higher: $10,112 for flood victims and $3,008 for tornado victims with the average payment overall being $5,758.[7]

---

[6] A coefficient of less than 1.00 suggests that the source in question provided more financial aid than the dollar losses would appear to warrant. However, this particular interpretation is not warranted when other sources of aid are considerably above 1.00. Indeed, in the case of the last equation in Table 6.6 (Equation G), the coefficient for loans (.5993) simply means that loans were more sensitive to the total amount of damages, net of the contribution of other sources. Thus loans were used to cover more of the losses than gifts or insurance payments.

[7] Taken in conjunction with the findings of Table 6.4, it is clear that insurance payments pay an extremely important role, with two out of every three dollars received coming to the households in the form of insurance payments. Of course, for those risks not normally covered by insurance, financial aid is largely in the form of loans.

Table 6.7

Total[a] Financial Aid Received and Amounts of Uncovered Losses by Hazard

(Only households with non-zero losses = 883)

	Fire (218)	Flood (112)	Hurricane (144)	Tornado (365)	Earthquake (44)	All Combined (883)
A. Total Aid Received						
Percent Receiving Some Aid	67%	46%	49%	51%	23%	50%
Average Aid Received	$5653	$ 4,695	$2034	$1524	$1455	$3026
Average Amount Received	$8383	$10,112	$4186	$3008	$6404	$5758
B. Financial Gap (Total Loss Minus All Financial Aid[b])						
Average Gap	$5403	$ 5,618	$1473	$ 940	$1145	$2732
C. Increased Liabilities (Uncovered Losses + Loans)						
Average Increased Liabilities	$6711	$ 8,105	$1897	$1601	$1760	$3749
D. Increased Debt Burden (Loans as Proportion of Annual Household Income[a])						
Percent	7.3%	17.2%	3.1%	8.6%	6.9%	8.5%

[a]All dollar amounts adjusted to 1980 dollars. Outlying values have been trimmed.

[b]"All financial aid" includes insurance payments, loans, gifts, and grants.

The financial aid received typically did not cover the full amount of the losses incurred. On the average, financial aid fell some $2,732 short of covering the total losses inflicted. For many households such amounts are non-trivial. The gap between financial aid and total losses was especially high for fires and floods, being around $5,500 in those events.

Disaster events can be regarded as increasing a family's liabilities, some of which are alleviated by grants and gifts. Although loans may help to restore a household to normal functioning, a loan represents a financial obligation that has to be repaid along with interest charges. The sum of uncovered losses plus loans can be regarded as a household's increased financial liabilities, as in Panel C of Table 6.7. On the average households incurred almost $4,000 in increased liabilities, with fires and floods inflicting liabilities of close to $7,000 and $8,000 respectively. In short the average fire or flood event saddles a household with liabilities that amount to the cost of a medium-sized car, or about one-fourth to one-third of annual household income.

Panel D looks at financial liabilities in still another way. In that panel the amounts of loans received are expressed as percentages of current annual household income.[8] This measure of increased debt burden amounts to 8.5%, varying from a high of 17.2% for flood victims to a low of 3.1% for hurricane victims. Although these proportions do not appear to be very high, they do not take into account carrying charges nor existing debts. Hence the actual impact of the increased debt burden occasioned by hazard victimization may be considerable. A

---

[8] Household income is measured as of the year in which the event occurred.

household that dedicated 30% of its income to paying off a home mortgage may find an additional 10% needed to pay off a home repair loan a severe burden that eats into income budgeted for education, food, or other necessities. Especially onorous appear to be the debt burdens imposed by flood events.

Table 6.8 looks at how the financial burdens, unrelieved by insurance payments and gifts, are distributed among households and among disaster types. The first column contains the results of regressing the gap between total loss incurred and monies received from insurance payments, gifts and loans on household and hazard event characteristics. Presumably these are the sums that households would have to raise out of their current income or savings to replace or repair damaged property. Of the household characteristics, only race seems to count: Whites have about $2400 less of a financial gap than non-whites and Hispanics. The more widespread the disaster the less the gap, possibly because of the grant and loan programs that are triggered by the size of the hazard event. But, the more public services are disrupted the bigger the gap, an outcome that is not easily explained.

The second column of Table 6.8 is concerned with increased liabilities (uncovered losses plus loans). Increased liabilities are smaller for renters and for whites and for more affluent families. Liabilities increase with the number of public services that are disrupted and fire and flood events leave households with greater financial liabilities than other hazard events.

The third column concerns debt burden, the proportion of household income that loans constitute. Virtually nothing predicts debt burden,

Table 6.8

Regressions of Gap Measures[a] on Household and Disaster Characteristics (N = 712)

Independent Variables	Dependent Variable[b] is ... Total Loss - Financial Aid b/SE	Increase in Liabilities b/SE	Debt Burden b/SE
A. Household Characteristics			
Household Size	70.21 (209)	227.0 (201)	.0148 (.019)
Education (Years)	-173.6 (134)	-165.7 (129)	-.0154 (.012)
Renter	-637.1 (891)	-1859* (857)	-.0453 (.083)
White	-2370** (913)	-2209* (878)	-.9425 (.086)
Age of Oldest Person (Years)	-18.05 (22.0)	-27.59 (24.2)	-.0022 (.002)
Household Income ($000) at Time of Event	1.494 (22.2)	-41.56* (21.3)	Not Applicable
B. Hazard Event Characteristics			
1975 or later	945.7 (715)	-132.1 (638)	-.0046 (.067)
Context Seriousness	-813.9* (343)	-323.4 (330)	.0418 (.032)
Public Service Disruptions	1554*** (212)	2244*** (204)	.0475* (.020)
C. Hazard Types			
Flood	3069 (1693)	3451* (1621)	-.0061 (.159)
Hurricane	-777.1 (1665)	-208.3 (1602)	-.1445 (.568)
Fire	3904* (1589)	5149** (1465)	.0469 (.149)

Table 6.8 Continued

Independent Variables	Total Loss - Financial Aid b/SE	Increase in Liabilities b/SE	Debt Burden b/SE
C. Hazard Types (Cont.)			
Tornado	-185.5 (1523)	-581.4 (1465)	-.0278 (.143)
D. Intercept	4605*** (273)	5676* (2631)	.2670 (.258)
R^2 =	.139***	.253***	.025

***p is less than .001.

**p is less than .01.

*p is less than .05.

[a]All dollars adjusted to 1980 dollars. Outliers are trimmed.

[b]See Table 6.8 for definition of dependent variables.

except for disruptions of public services, a marginally significant finding that indicates that burdens increase the more public services are disrupted.

None of the regressions shown in Table 6.8 account for much of the variances involved. By and large it appears that financial liabilities resulting from hazard events impact more strongly on non-whites and Hispanics and are more likely to arise out of severe fires and floods, but no other strong findings appear.

Equity in Financial Help

Since the three kinds of financial help so far considered tend to complement one another depending mainly on the patterns of insurance coverage associated with the different hazard types, it makes some sense to consider who gets any financial help from all of the three sources considered together. Table 6.9 shows the percentages receiving any help from any source, separately for each of the disaster types. In that table we consider serious events separately from the minor ones, a factor that sharply conditions whether a household will receive any financial help.

Only small minorities of the households experiencing minor losses receive any financial help. In 7% of minor household fires, some financial help is received, but none of the minor flood, hurricane or earthquake households received any help at all. In addition, 2% of minor tornado events are accompanied by some financial help. Given the results

Table 6.9

Proportions Receiving Any Financial Help by Hazard Type and Hazard Event Seriousness

Hazard Seriousness[b]	Fires	Floods	Hurricanes	Tornadoes	Earthquakes
Serious	77%	48%	55%	57%	17%
N =	(223)	(152)	(144)	(316)	(59)
Minor	7%	0	0	2%	0
N =	(45)	(27)	(117)	(225)	(304)

[a]Any financial help means insurance payments, and/or gifts and/or loans from any of the sources considered in Tables 6.1 to 6.5.

[b]A serious hazard event is one in which the household claimed damages of $50 or more. A minor event is one in which reported damages are under $50.

of the previous sections, it is primarily insurance payments that are involved in the minor hazard events.

Proportions ranging between 77% (serious fires) and 17% (earthquakes) of the households experiencing major hazard events received some financial help. Note that in each case that help is made up of different combinations of insurance payments, gifts and loans.

The issue of who gets any financial help is addressed in Table 6.10. A dummy variable that takes on the value of 1 if a household received any financial help and 0 if the household received none at all is the dependent variable in each of the regression equations of that table. The coefficients are therefore interpretable in terms of changes in the probability of receiving any financial help. Thus a coefficient of -.2260 for renters indicates that renters, net of any other characteristics, are about .23 less likely to receive any financial help compared to owners.

The R^2 for each of the equations represents the extent to which the characteristics shown in the equations determine the probability of receiving any financial help. It should be noted that these coefficients are fairly large, the smallest being .44 and the largest .64, indicating that the independent variables account for between 44% and 64% of the variation among households in the probability of receiving any financial help.

A consistent finding in each of the equations concerns the effects of the amount of damage on the probability of receiving financial help of some sort. For each of the disaster types, the greater the damage amount, the more likely the household is to receive some aid. The

Table 6.10

Regressions of Any Financial Help on Household Characteristics
(All Households Included: N = 1296)[a]

(Dependent Variable is Receiving Any Financial Help From Insurance, Grants and/or Loans)

Independent Variables	Fires b/SE	Floods b/SE	Hurricanes b/SE	Tornadoes b/SE	Earthquakes b/SE	All Hazards Combined b/SE
A. Household Characteristics						
Age of Oldest Person in House	.0039* (.002)	-.0035 (.002)	.0007 (.015)	-.0004 (.001)	.0001 (.001)	.0004 (.001)
Household Income (00's)[b]	-.0491** (.020)	-.0927* (.045)	-.0387 (.036)	-.0347* (.015)	-.0114 (.010)	-.0372*** (.010)
White	-.1005 (.064)	.1906 (.103)	-.0893 (.057)	.1005* (.052)	.0085 (.020)	.0676** (.025)
Renter	-.2260*** (.062)	-.1331 (.088)	-.0551 (.057)	-.0758 (.048)	.0090 (.018)	-.0884*** (.024)
Education (years)	.0040 (.011)	-.0034 (.016)	.0076 (.010)	-.0081 (.007)	-.0018 (.003)	-.0047 (.004)
Household Size	-.0729 (.0167)	.0246 (.025)	.0051 (.014)	-.0042 (.011)	.0046 (.005)	-.0018 (.006)
B. Hazard Characteristics						
Community Seriousness[c]	-.0591 (.071)	.0632 (.041)	.0103 (.022)	.0182 (.018)	.0279 (.019)	-.0197 (.011)
Public Service Interruptions[d]	.0146 (.019)	.0590** (.021)	.0060 (.017)	-.0271* (.014)	.0567*** (.011)	.0091 (.007)
Property Damage[e]	.1493*** (.014)	.0742*** (.020)	.1597*** (.013)	.1456*** (.009)	.0433*** (.007)	.1305*** (.053)
C. Hazard Type[f]						
Fire						.1587*** (.035)
Flood						-.1119** (.039)
Hurricane						.0008 (.032)
Tornado						.0099 (.027)

Table 6.10 (continued)

	Independent Variables	Fires b/SE	Floods b/SE	Hurricanes b/SE	Tornadoes b/SE	Earthquakes b/SE	All Hazards Combined b/SE
D.	Intercept	.0632 (.197)	.0239 (.250)	-.1952 (.167)	.1269 (.128)	.0096 (.058)	.0607 (.051)
	R^2 =	.48	.44	.64	.46	.44	.53
	N =	(208)	(116)	(196)	(473)	(282)	(1296)

*p is .05 or less.
**p is .01 or less.
***p is .001 or less.

[a]All households, whether or not they experienced any damages, are included in these equations. Missing values on any of the independent variables account for N's being smaller than those reported in Table 5.1.

[b]Household income is measured as of the year of the hazard event.

[c]An index consisting of whether damages were sustained by other households on the same block in the same neighborhood and in the same community.

[d]Consists of a count of the number of public services interrupted as a consequence of the hazard event.

[e]Measured in categories (see Table 6.2 for codes used), unadjusted for inflation.

[f]Dummy variables: omitted category is "earthquakes."

probability differences for damage range from .16 for hurricanes to .04 for earthquakes, but in every case are statistically significant.[9]

For the remaining factors considered in Table 6.10, no consistent pattern can be detected across hazard types. With regard to fires, the higher a family's income, the less the probability of receiving financial help, possibly reflecting that the available financial resources of more affluent families allow them to avoid the necessity of asking for loans or receiving gifts. Renters, compared to owners, have a much lower probability of receiving any financial help, at least partially because fewer renters carry fire insurance coverage on their personal possessions. No other factor appears to be significant for fire hazards.

Flood hazards occurring to higher income families are also less likely to be accompanied by financial help. Flood events that involve the interruptions of public utilities and services are also more likely to be met with financial assistance. Since such interruptions would be more likely to occur with widespread flooding, this finding suggests that the relief activities of the federal government and such national organizations as the Red Cross are more likely to be triggered when the event involves larger areas. None of the other factors have significant coefficients.

Nothing besides amount of damage determines whether financial

---

[9]The total amount of damage is coded into five categories, each encompassing a different range in dollars. The coefficients indicate shifts in probability associated with a shift from one of the coded categories to another, an amount that may be as little as 50 dollars in the first category and many thousands of dollars in the last (and highest) category. See Table 6.2 for description of the coded categories.

help is obtained in the case of hurricane events. Apparently, insurance coverage is universal enough for this hazard event to produce rough equity among households.

Financial aid in the case of tornado events also appears to be related to income, with the more affluent households less likely to receive any financial help. (Incidentally, receiving financial help is not an unmitigated blessing since loans may add to the financial burdens of a household, as we see later in this chapter.) Tornado events that are accompanied by disruption of public services and utilities are less likely to be met with financial help, a pattern that appears counter-intuitive and hence resists reasonable interpretation.

Finally, earthquake assistance is affected only by the interruption of public services, the more such interruptions, the more likely outside financial aid is to be rendered.

Finally, in the last column of Table 6.10, all hazard types have been combined. Across all types, higher income families are less likely to receive (or solicit) financial aid, and renters are less likely to receive such help than owners, while whites are more likely to be financial aid recipients. But the most important patterns in the last column are the effects of disaster types. Fires are much more likely to be accompanied by financial aid and floods are less likely (as compared to earthquakes). Neither hurricanes nor tornadoes are distinguishable statistically from earthquakes.

Overall, the patterning of financial aid does not spell out a serious degree of inequity through the lack of access to financial help. The major pattern that emerges is that the probability of financial

help rises with the amount of damage experienced. We have a bit of a hint that such help is not always an unmitigated blessing since more affluent families appear less likely to receive financial aid (or ask for it). Perhaps the major bias is against renting families, possibly through the more usual lack of insurance coverage among that group.

It should be noted that the data presented in this section do not contradict those of the previous section. The size of the gap between financial aid and the losses experienced apparently is not affected by the same factors as whether or not one received any financial aid. The gap is influenced mainly by the size of the losses incurred, while the probability of receiving aid is influenced by losses and other factors having to do with the insurability of the hazard risk and the kinds of government programs available, factors which in turn are influenced by the type of hazard involved and the geographical extent of the hazard.

Informal Sources of Help

Although financial help is certainly important, especially in the cases of events in which critical household resources have been damaged or destroyed, other types of help may also be of considerable use and indeed may substitute for financial help in some cases. A family may have need of temporary shelter and an offer of a place to stay for a short period may be crucial to the comfort of a household in the immediate aftermath of any of the hazard events under study. Or, some donated labor may be even more useful than funds, if, for example, all that is needed to restore some degree of livability to a home is removal of debris left by the event, or perhaps, the clearing of a driveway.

As previous studies of the immediate aftermath of natural hazard events have shown, a great deal of help is provided to victimized households by neighbors, friends, relatives, co-workers, local churches and employers. Indeed, as Table 6.11 shows, large proportions of the households in the study report some help from one or more of these sources. Especially in serious events, more than a third of the families reported receiving help from friends, relatives and neighbors. Smaller proportions received help from churches, employers and co-workers, but these proportions in no case were less than 5% (employers). Households experiencing minor hazard events reported correspondingly less help from such sources, in all cases less than 6%.

The forms of help emphasized services or goods in kind. In a majority of cases, labor services were the main form of aid rendered. More than four out of five (84%) of the instances of neighbors giving help consisted of labor. Another large category of aid was the offer of shelter. About two out of five (38%) cases of help from relatives involved shelter. Much less frequent were loans and gifts, some in the form of money and others in the form of goods or services.

As can be seen in Panel G, on the average, households experiencing serious hazard events received help from slightly more than one source (1.24), while those in minor events received help from .28 sources, on the average. In short, when in need, some form of help is available: whether that help is sufficient, however, is another story.

Many of the organizations that provide financial help also provide other kinds of aid. For example, on the sites of major disasters, federal agencies often will set up disaster aid stations that provide information to victims about many of the problems that face them, from

Table 6.11

Forms of Aid From Informal Sources by Hazard Type and Seriousness

Source of Aid	Proportions Giving Aid						Types of Aid Given[a]				
	Fire	Flood	Hurri-cane	Torn-ado	Earth-quake	Com bined	Shel-ter	Loans	Gifts	Labor	N=[b]
A. Friends											
Serious	36%	46%	41%	32%	14%	35%	21%	2%	18%	78%	(315)
Minor	9%	11%	4%	5%	*	3%					
B. Relatives											
Serious	41%	56%	30%	32%	16%	36%	38%	9%	21%	66%	(342)
Minor	12%	33%	8%	7%	1%	6%					
C. Neighbors											
Serious	30%	32%	38%	28%	10%	30%	10%	1%	18%	84%	(265)
Minor	5%	11%	4%	6%	0%	3%					
D. Church or Synagogue											
Serious	13%	11%	3%	4%	2%	7%	8%	2%	73%	35%	(60)
Minor	0	0	0	1%	0	*					
E. Co-Workers											
Serious	10%	11%	8%	6%	4%	8%	4%	1%	37%	66%	(73)
Minor	0	0	0	1%	*	1%					
F. Employers											
Serious	5%	9%	7%	4%	0	5%	10%	13%	55%	35%	(40)
Minor	2%	0	0	*	0	*					
G. Help From All Sources											
Serious	1.34	1.57	1.26	1.02	.39	1.23					
Minor	.27	.56	.15	.20	.01	.28					
Approximate N for Above[c]											
Serious	(222)	(119)	(142)	(342)	(50)	(875)					
Minor	(43)	(27)	(111)	(206)	(285)	(687)					

Table 6.11 (continued)

* = less than 0.5% but larger than zero.

[a]All hazard events combined in these tabulations.

[b]N shown is number of families receiving some aid from the source in question.

[c]N's shown are for the classes directly above each entry. Actual N's vary by one or two cases, depending on missing data.

advice on how to file insurance claims to places where one can obtain emergency food supplies. Voluntary organizations, such as the Red Cross or the Mennonite Relief Organization, also set up on-site, providing a wide spectrum of help and aid. The extent of such contact between agencies and victims is shown in Table 6.12.

Contacts with FDAA were claimed by 4% of the households in all serious hazard events, with another 1% claiming contacts with FEMA. Note that none of the families that were involved in minor hazard events claimed contacts with either federal agency. As one can expect from the earlier parts of this chapter, contacts with FDAA and FEMA were especially prevalent for serious flood events and virtually non-existent for fires.

About the same level of contact frequency was claimed with the Small Business Administration, about 5% -- distributed in much the same way as contacts with FEMA and FDAA. About one in four of the serious flood households had some contact with the SBA and virtually none who were in serious fires. The Farmers Home Administration, Veterans' Administration and units of Regular Army contact were relatively rare, each showing contact with about 1% of the households in serious hazard events.

The American Red Cross apparently earns its high reputation for responsiveness to natural hazard events, registering high levels of contact in connection with each type of event. Indeed, one in four of the households experiencing a serious flood event claimed they were contacted by the Red Cross. The lowest level of contact (4%) is registered in connection with earthquakes. The Salvation Army registers about half the level of contact of the American Red Cross but enough

Table 6.12

Contacts With Relief and Rescue Organizations by Hazard Type and Seriousness of Event

Organization		Percent Contacted By: Fire	Flood	Hurricane	Tornado	Earthquake	All Hazards	% Highly Satisfied	N=[a]	% Helped By Organization	N=[a]
A. Federal Agencies											
FDAA	Serious	*	11%	7%	2%	2%	4%	55%	(29)	50%	(30)
	Minor	0	0	0	0	0	0	---		---	
SBA	Serious	*	23%	5%	2%	8%	5%	55%	(38)	81%	(41)
	Minor	0	0	0	0	0	0	---		---	
Farmers' Home	Serious	1%	1%	2%	1%	0	1%	29%	(7)	75%	(9)
	Minor	0	0	0	0	0	0	---		---	
FEMA	Serious	0	1%	5%	1%	0	1%	78%	(9)	100%	(9)
	Minor	0	0	0	0	0	0	---		---	
Veterans' Admin.	Serious	*	2%	2%	*	0	1%	60%	(5)	60%	(5)
		0	0	0	0	0	0	---		---	
Regular Army	Serious	0	0	4%	*	0	1%	60%	(5)	67%	(6)
	Minor	0	0	1%	1%	0	*	33%	(3)	33%	(3)
B. Private National Organizations											
Red Cross	Serious	7%	25%	8%	5%	4%	8%	67%	(67)	76%	(67)
	Minor	0	0	1%	1%	0	*	100%	(3)	33%	(3)
Salvation Army	Serious	2%	14%	6%	2%	0	4%	77%	(30)	72%	(30)
	Minor	0	0	0	0	0	0	---		---	
Mennonite Relief	Serious	0	5%	2%	2%	0	2%	92%	(13)	50%	(16)
	Minor	0	0	0	*	0	*	---		---	

Table 6.12 (continued)

Organization		Percent Contacted By: Fire	Flood	Hurricane	Tornado	Earthquake	All Hazards	% Highly Satisfied N=[a]	% Helped By Organization N=[a]
C. State and Local Government Agencies									
Civil Defense	Serious	0	9%	5%	4%	0	4%	71% (28)	67% (27)
	Minor	0	0	4%	*	0	1%	33% (6)	17% (6)
Fire Dept.	Serious	48%	25%	7%	5%	6%	19%	76% (151)	77% (146)
	Minor	23%	4%	4%	3%	*	3%	71% (21)	57% (21)
Police and Sheriff	Serious	12%	16%	10%	10%	10%	11%	60% (83)	45% (80)
	Minor	8%	0	2%	3%	1%	2%	54% (13)	25% (12)
National Guard	Serious	1%	13%	5%	3%	2%	4%	73% (30)	71% (31)
	Minor	0	0	1%	*	0	*	50% (2)	0% (2)
Welfare Dept.	Serious	5%	6%	4%	1%	0	3%	39% (63)	91% (22)
	Minor	0	0	0	*	0	*	---	---
Public Works Dept.	Serious	1%	13%	7%	9%	8%	7%	51% (57)	77% (57)
	Minor	0	0	3%	2%	*	1%	62% (8)	67% (9)
D. Local Private Organizations									
Local Hospital[b]	Serious	3%	3%	2%	2%	2%	2%	82% (17)	79% (19)
	Minor	0	0	0	*	0	*	---	---
Labor Union	Serious	*	2%	2%	*	0	1%	100% (5)	100% (5)
	Minor	0	0	0	0	0	0	---	---
Civic Organ.	Serious	2%	0	1%	*	0	*	80% (10)	73% (11)
	Minor	0	0	1%	*	0	*	---	---
Local Church	Serious	9%	14%	4%	6%	2%	7%	80% (54)	79% (53)
	Minor	0	0	4%	2%	0	1%	75% (8)	0% (9)

Table 6.12 (continued)

		Fire	Flood	Hurri-cane	Torn-ado	Earth-quake	All Hazards
Approx. N's	Serious	(213)	(109)	(136)	(333)	(52)	(843)
	Minor	(40)	(27)	(136)	(216)	(286)	(685)

*Non-zero but less than 0.5%.

[a]Based only on persons who had been contacted by the agency in question.

[b]Local hospitals are often run by municipalities and states and hence are not always private, as their classification here suggests.

to show for every type of hazard event, save earthquakes. Finally, the Mennonite Relief Organization contacted about half the proportions that claimed contact with the Salvation Army relief workers. These three private relief organizations are especially likely to be present during floods and hurricanes and together represent as much presence on site as all of the federal government agencies considered together. This is not to say that their roles in providing relief are as important or more important, since the services rendered are not the same as those provided by the federal agencies. Indeed, as we have seen in the last section, the financial aid represented by federal grants and loans is not at all duplicated by the private relief organizations.

As might be expected, state and especially local government agencies are important presences on site during and in the aftermath of hazard events. Especially important are local fire and police departments, contacts with whom are registered by 19% and 11% of all the respondents experiencing serious hazard events. Obviously, the highest contact rate of all the agencies considered in Table 6.12, 48%, was registered for fire department contacts in connection with serious fires. If anything, one may question why this frequency of contact with fire departments is not considerably higher, say at the level of 80% to 95%! Fire departments are a frequent presence in all hazard events, contacting one in four of families experiencing serious flood events, and proportions ranging from 5% to 7% in hurricanes, tornadoes and earthquakes.

The police are present almost equally frequently in each of the hazard types. Contact levels of 16% were claimed by flood victims

at the one extreme, and by 10% of the earthquake victims at the other. Together fire and police clearly represent the first line of local community response to hazard events.

The remainder of state and local government agencies are comparatively infrequent sources of contact. Civil Defense is less frequently (4%) present than public works departments (7%). The National Guard (4%) is more frequently acknowledged as a point of contact than the local welfare departments.

Finally, Table 6.12 considers local private organizations, all of whom have low levels of contact, with the exception of local churches and synagogues, registering 7% contacts with victimized households in serious events. Especially surprising was the low level of contact with local hospitals, 2%.[10]

The last two columns of Table 6.12 show the proportions of persons experiencing contacts with the agencies in question who reported themselves to be highly satisfied and the proportions who received "help" from such agencies. Note that the respondents were offered a choice among "high," "medium" and "low" as ways of expressing their degree of satisfaction. The proportions shown in Table 6.12 therefore represent the highest level permitted in the questionnaire. By and large, the majority of persons experiencing contact registered the highest degree of satisfaction with the agency in question. Especially high levels of satisfaction were registered for contacts with national private relief organ-

---

[10] We have classified hospitals as private organizations, although it is likely that in many communities such hospitals are at least partially if not entirely incorporated into local, county or state government.

izations and local agencies, especially where the numbers of contacts were large enough to produce stable percentages.

Levels of satisfaction with federal agencies are not as high, being 55% for both the FDAA and SBA (where the numbers of households having contacts with those agencies are high enough to warrant paying attention to the results).

In sum, clear pluralities, upwards of two in three, were highly satisfied with their contacts with the national relief organizations and local agencies. About one in two registered the same high degree of satisfaction with federal agencies. In no case were there large proportions who claimed to have a low level of statisfaction with their contacts with any of the agencies.

The proportions who received any "help" as a consequence of their contacts with each of the agencies is shown in the last column of Table 6.12. Majorities in almost every case claim to have received help, the notable exception being contacts with the police departments.

Despite the low levels of contact with any one of the agencies shown in Table 6.12, the cumulative effect of all the agencies taken together is to insure that the majority of households experiencing serious hazard events are contacted by one or another agency. As shown in Table 6.13, where contacts are cumulated, the average number of contacts received by a household experiencing a serious hazard event is .85 (see Panel D of Table 6.13). Indeed, for serious flood hazards, the average rises to 1.81, indicating that the typical flood victim household is approached by close to two agencies.

Table 6.13

Summary of Contacts with Federal Agencies, National Relief Organizations and Local Agencies

Average Number of Contacts with	Number of Contacts (Average)					
	Fire	Flood	Hurricane	Tornado	Earthquake	Combined
A. All Federal Agencies:						
Serious	.02	.38	.24	.07	.10	.13
Minor	.00	.00	.00*	.01	.00	.01
B. All Local or State Agencies (Private & Government):						
Serious	.81	1.00	.46	.41	.29	.59
Minor	.30	.04	.19	.12	.01	.09
C. All National Relief Organizations:						
Serious	.08	.43	.16	.08	.04	.14
Minor	.00	.00	.01	.01	.00	.01
D. All Agencies Combined:						
Serious	.92	1.81	.87	.56	.42	.85
Minor	.30	.04	.21	.14	.01	.10

NOTE: See Table 6.12 for classification of specific agencies into each of the classifications used. Approximate N's for Table 6.12 also apply to this table.

*p is .05 or less.

Local and state public and private agencies (see Panel B) are most active in contacting victimized households, generating an average of .59 contacts in serious events. National relief organizations and federal agencies have about the same average number of contacts, .14 and .13, respectively.

Looking across hazard events, it is clear that the victims of serious flood events are given the most attention by all agencies. Local and state agencies give almost as much attention to serious fires, representing the fact that most such events are regarded as local matters. Serious hurricane events receive the next most frequent amount of attention, with tornadoes and earthquakes trailing behind in attention.

Table 6.14 provides another way to summarize the findings of this section. The amount of contact with each of the groupings of agencies shown in Table 6.13 is considered a dependent variable in Table 6.14, with the characteristics of hazard events and households as independent variables. These regression analyses provide some clues as to whether contacts with agencies are being distributed equitably among households.

The findings can be easily summarized: First of all, characteristics of households play almost no role in the number of contacts with any of the agency groupings. Indeed, if anything there appears to be a slight bias against the more affluent, the number of contacts overall and with federal agencies declining slightly as income increases. Otherwise, whites as compared to non-whites, renters compared to owners, large households compared to smaller households and older households compared to younger ones are all about equally likely to have been contacted by federal, local and relief agencies.

Table 6.14

Regression of Contacts with Agencies on Hazard and Household Characteristics: All Mail Survey Households (N = 1268)

(Dependent variables are counts of contacts with the agencies designated)

Independent Variables	Federal Agencies b/SE	Local Agencies b/SE	Private Agencies b/SE	All Agencies Combined b/SE
A. Disaster Type[a]				
Fire	-.0936*** (.039)	.4739*** (.091)	-.0106 (.035)	.3703** (.136)
Flood	.0984* (.043)	.1941* (.102)	.1534*** (.049)	.4467** (.152)
Hurricane	-.0117 (.035)	-.1016 (.082)	-.0404 (.032)	-.1537 (.122)
Tornado	-.0810** (.029)	-.0501 (.069)	-.0433 (.027)	-.1745 (.103)
B. Disaster Characteristics				
Damage to Household[b]	.0120 (.007)	.0330* (.016)	.0092 (.006)	.0538* (.023)
Percent Damage Reimbursed Through Insurance[c]	.0004 (.001)	-.0003 (.000)	.0001 (.000)	.0002 (.001)
Disaster Community Seriousness[d]	.0234* (.019)	.0660* (.008)	.0173 (.007)	.1069* (.028)
Public Service Disruption[e]	.0549*** (.008)	.1925*** (.019)	.0658*** (.007)	.3134*** (.028)
C. Household Characteristics				
Age of Oldest Person[f]	.0011 (.001)	-.0008 (.002)	.0005 (.001)	.0008 (.002)
Number of Persons	.0123 (.007)	.0277 (.015)	.0084 (.006)	.0481* (.023)

Table 6.14 Continued

Independent Variables	Federal Agencies b/SE	Local Agencies b/SE	Private Agencies b/SE	All Agencies Combined b/SE
C. Household Characteristics				
Renter	-.0182 (.026)	.0166 (.061)	.0145 (.024)	.0131 (.092)
Household Income ($000's)[f]	-.0250** (.009)	-.0334 (.022)	-.0167 (.009)	-.0750* (.030)
Education (Years)	-.0034 (.004)	.0020 (.010)	-.0042 (.004)	-.0057 (.015)
D. Intercept	.0294 (.078)	-.0410 (.183)	.0485 (.072)	.0386 (.276)
R^2 =	.21	.14	.17	.23

[a]Dummy variables: Omitted hazard is "earthquake."

[b]Damage coded into five categories. See Table 6.2 for definitions.

[c]Respondent estimate of extent of loss covered by insurance claim payments.

[d]Rating of damages to other homes on block, neighborhood and community.

[e]Number of public services and utilities interrupted as consequence of event.

[f]Measured as of the year of the event.

*** p is .001 or smaller.

** p is .01 or smaller.

* p is .05 or smaller.

The main determinants of numbers of contacts are characteristics of the hazard event and the type of hazard involved. All agencies are more likely to make contacts when the hazard event produces widespread damage and when public services and utilities are disrupted.

Federal agencies are more likely to make contacts during flood hazards but less likely to be available for fires and tornadoes. Local agencies are more available for fires and for floods and private relief organizations are especially available for floods. (All these findings are in comparison to earthquake events.)

Help from All Sources

The separate sources of help and assistance reviewed so far in this chapter do not necessarily compete with one another. As we have seen, some sources are complementary and others specialize, to some degree, especially the somewhat separate spheres of local and national agencies. Indeed, while any one source may reach a very small minority of affected households, the combined coverage of all sources of aid may be quite large.

In Table 6.15, we present two measures of combined coverage. The first measure (Panel A) is based on all the sources of help and contact with the exception of insurance; a household is counted as having received help if it acknowledged contact with any of the agencies discussed in the last section or received loans or gifts or help from informal sources. The coverage of this measure is 63% for all serious hazard events and 13% for the minor events, with an overall coverage

Table 6.15

Total Help Received from All Sources

	Fire	Flood	Hurricane	Tornado	Earthquake	Combined Hazards
A. Percent Receiving Help from at Least One Source[a]						
Serious	72%	85%	65%	55%	30%	63%
Minor	33%	46%	20%	16%	2%	13%
B. Percent Receiving Help from at Least One Source and/or Insurance Payment[b]						
Serious	94%	89%	79%	77%	36%	80%
Minor	36%	46%	20%	17%	2%	13%
N's for Above:						
Serious	(184)	(102)	(126)	(302)	(50)	(764)
Minor	(39)	(26)	(113)	(215)	(284)	(677)

[a]Receiving help from agencies in the form of loans or gifts, or help from informal sources of contact with federal, local, or relief agencies. Counted as "1" if help received from any source; "0" if otherwise.

[b]Same as above adding insurance payment.

of 40%. Help coverage ranges considerably from one hazard type to another: 85% of the serious flood victimized households received some help from some source, but only 2% of the minor earthquake events involved help.

The bottom panel of Table 6.15 presents a measure of help which counts insurance payments as an additional source of help. This more inclusive measure produces a markedly higher coverage: 80% of the serious hazard events are reached either by insurance payments or some form of help, with 13% of the minor events so covered. The overall coverage percentage is 49%. In short, most (four out of five) of the serious hazard events (damages of $50 or more) are reached by some form of help, with only small minorities of households suffering serious fire or flood events not being reached by one or another source.

The only hazard event that is not well-covered is earthquakes. This finding may simply reflect that the historical period under study contained only one earthquake experience that involved a lot of concentrated damage -- the San Fernando quake of 1971 -- and that most of the earthquake experiences were generated by less serious events.

The two coverage measures of Table 6.15 are considered again in Table 6.16, this time as dependent variables in regression equations. Note that the two equations account for a relatively large amount of variation in help coverage, 41% and 56% respectively, indicating that the independent variables account for a great deal of the variation in receiving help.

This analysis shows rather clearly that the major determinants of receiving help are the type of hazard event experienced and the

Table 6.16

Regressions of Any Help and Any Help plus Insurance Payments on Hazard and Household Characteristics (N = 1192)

Independent Variables	Dependent Variable is: ANY HELP[a] b	SE	ANY HELP OR INSURANCE[b] b	SE
A. Hazard Type[c]				
Fire	.3531***	(.043)	.3927***	(.037)
Hurriance	.1480***	(.039)	.1702***	(.034)
Flood	.3204***	(.048)	.2639***	(.042)
Tornado	.1180***	(.033)	.1684***	(.028)
B. Hazard Characteristics				
Damage to Household[d]	.0622***	(.007)	.1068***	(.006)
Hazard Community Seriousness[e]	.0389***	(.014)	.0485***	(.012)
Public Service Interruptions[f]	.0765***	(.009)	.0397***	(.008)
Percent Loss Reimbursed by Insurance	-.0001	(.0004)	(Not Applicable)	
C. Household Characteristics				
Age of Oldest Person[g]	-.0026**	(.001)	-.0019**	(.007)
Household Income[g]	-.0028**	(.001)	-.0024**	(.000)
Number of Persons	-.0024	(.007)	-.0007	(.006)
Renter	-.0201	(.029)	-.0377	(.025)
White	-.0086	(.030)	.0239	(.0265)
Education (years)	-.0002	(.005)	.0006	(.004)
D. Intercept	.1466	(.087)	.0850	(.076)
R^2 =	.41		.56	

Table 6.16 Continued

Notes:

[a]Dummy variable: coded "1" if respondent received help from any source or had contact with any agency (except insurance payments).

[b]Dummy variables coded "1" if respondent received help from any source, including insurance payments or had contact with any agency.

[c]Dummy variables: omitted category is "earthquakes."

[d]Damage amounts coded into intervals. See Table 6.2 for intervals.

[e]Measure of community seriousness consisting of damages to homes on block, neighborhood or community.

[f]Number of interruptions to public services and utilities.

[g]Measured as of the time of the hazard event.

*** p is .001 or less.
** p is .01 or less.
* p is .05 or less.

seriousness of the event for the community or for the household. Earthquake victims (the omitted category in the analysis) are, as seen elsewhere, less likely to receive assistance than victims of other hazard types. The more loss a household experienced, and the more widespread the damage was throughout the community, the more likely was help to be given. Clearly, the relief agencies and local sources are very sensitive to the need represented by the household's condition and the scope of the hazard event.

Household characteristics do not account for very much in affecting the probability of being contacted or receiving aid. Older households are less likely to receive aid, but the coefficient is so small, despite its significance, that a difference of 30 years between two households results only in a corresponding difference in the probability of receiving any help of .08. More affluent households are also less likely to be contacted or receive aid. In this case as well, the differences are not very large: a difference of $30,000 in annual household income results in an accompanying difference in the probability of receiving aid of .08. The other coefficients are not significant, indicating that renters as compared to owners, whites as compared to blacks, the highly educated compared to the less well educated all have about the same probability of receiving aid.

The differences at the extremes, taking into account hazard type and other characteristics, however, are quite large. For example, a household struck by a fire that causes $5,000 worth of damage, headed by a 25 year old earning $15,000 a year has a probability of .93 of receiving some aid or being contacted by an agency or receiving insur-

ance payments. In contrast a household headed by a 70 year old who earns $40,000 a year that received $200 damage in an earthquake has a probability of .07 of receiving aid.

The non-findings shown in the regression analysis are at least as important as the statistically significant ones. For many years, there has been a concern expressed in the disaster relief community that existing relief mechanisms may be so sporadic or stochastic in their coverage that whole classes of the victimized population simply "fall through the cracks." To avoid this problem, for example, the Red Cross will frequently undertaken door-to-door canvassing, in the hopes of finding individuals in need who would otherwise go unassisted. Many of the expressed concerns involve social inequities: it is sometimes maintained, for example, that only a relatively sophisticated individual could successfully navigate the "red tape" of receiving disaster relief assistance. This line of concern appears, on the basis of our data, to be completely unfounded. While it is true that some victims of serious events (on the order of 15%) are never contacted by any help-giving agency, by far the largest bulk of them differ from those who are, mainly in the amount of damages incurred. Given the circumstances in which these agencies must operate (generalized chaos would not be an inappropriate description of the conditions obtaining in the immediate aftermath of a serious disaster), the coverage achieved is at worst commendable, and perhaps remarkable.

Hazard Aftermaths

No matter how slight the experience or trivial the event, a hazard event is at least important enough to be remembered. Even the most trivial occurrence can have its effects for a short time as the household cleans up the debris of damage or waits for utilities to be restored. For more serious events, the aftermath can be more extended, requiring in some cases extensive repairs to property and persons. Where a household has had to borrow funds for repairs, the aftermath may be an increased debt burden or prolonged discomfort.

Some of the aftermath effects of hazard experiences are shown in Table 6.17. As Panel A indicates, one in four of the households experiencing serious events claimed to suffer from an increased debt burden. The proportion claiming such increases varies from 45% of those involved in a serious flood event to none who were involved in minor earthquakes. Undoubtedly, the high damages inflicted by floods in conjunction with the low level of insurance coverage produces the experienced increase in debt burden for flood victims.

A slightly higher proportion (29%) reported that they felt "depressed" after the event, as Panel B indicates.[11] Again serious flood victims were more likely to claim this effect (45%) while at the other extreme few (1%) of the minor earthquake events were accompanied by feelings of being "depressed." Judged by the incidence of "depressed" feelings, the most serious hazard events are serious floods, followed by serious

---

[11] Clearly this is not a clinical diagnosis, based on skillful observation but rather the response to one item and, at best, a self diagnosis. Nor are the intensity or duration of the "depressed" feelings indicated.

Table 6.17

Hazard Event Aftermath Effects by
Hazard Type and Seriousness

Aftermath Measure	Fire	Flood	Hurricane	Tornado	Earthquake	Combined Hazards
A. Debt Burden Score[a]						
Serious Events						
0	75%	55%	77%	83%	81%	76%
1-2	17	35	19	14	15	18
3+	8	10	4	3	4	6
Minor Events						
0	100%	93%	100%	99%	100%	99%
1+	0	7	0	1	0	1
B. Felt Depressed in Aftermath[b]						
Serious Events	39%	45%	22%	22%	20%	29%
Minor Events	11%	11%	0%	3%	4%	4%
C. Time to Complete Repairs[c]						
Serious Events						
Up to One Day (%)	20%	26%	40%	40%	67%	35%
Average # Days	40	46	28	19	10	31
Minor Events						
Up to One Day (%)	92%	96%	95%	94%	99%	96%
Average # Days	1	1	0	2	1	1
D. Time to Restoration of Status Quo[d]						
Serious Events						
Up to One Day	18%	7%	23%	36%	36%	26%
1 to 7 Days	15	22	19	23	14	20

Table 6.17 Continued

Aftermath Measure	Fire	Flood	Hurricane	Tornado	Earthquake	Combined Hazards
D. Time to Restoration of Status Quo[d]						
Serious Events						
8 to 28 Days	19%	27%	24%	18%	20%	21%
More than 28 Days	47	44	33	23	30	34
Minor Events						
Up to One Day	78%	89%	69%	69%	75%	73%
1 to 7 Days	7	7	14	8	2	6
8 to 28 Days	2	0	4	4	*	2
More than 28 Days	13	4	13	19	23	19
Approximate N's						
Serious	(223)	(125)	(144)	(356)	(59)	(907)
Minor	(45)	(27)	(117)	(225)	(304)	(718)

Notes:

[a]Based on a count of the number of positive ("yes") answers to the following set of questions:

"As a result of event, did any of the following happen to you or your family?
Went into debt borrowing money to pay for medical bills
Went into debt to pay bills for repair to property or replacement of things destroyed
Was unemployed for more than a week because of damage to the place where you worked
Had to use up our savings to pay for losses and expenses
Had to get an additional mortgage (or bigger mortgage) to finance repairs to my house
Went into debt so deeply to pay for damages and/or injuries that we had to go without a lot of necessities to pay back our debts."

[b]Based on positive answers to the following question (in the same series as those in footnote a above):

"Became depressed over the event."

[c]Based on how long it took family to repair damaged to property.

Table 6.17 Continued

Notes (Continued):

[d]Based on answers to question "All told how long did it take for you and your family to settle back into your routine, after the event -- how many days?"

*Less than 1%.

fires (39%) with the remaining hazards showing levels of "depression" around 20%. None of the minor events show an incidence level higher than 11% and then only for fires and floods.

Disaccommodation of one sort or another may be regarded as another aftermath problem. Damage to a home or apartment may require going some time without the full set of household amenities to which one has become accustomed. Indeed, repairs to housing as an aftermath of a serious hazard event quite often involve a number of days to complete, the average for serious events being 31 days (or one month). Minor hazard events express that status by requiring only minimal amounts of time to complete repairs, 96% requiring less than a day for repairs.

Of course, making repairs is only part of the upset of an aftermath. Employment may be interrupted, replacements for lost articles need to be made, and so on. We asked each of the respondents how long it took for their household to return to its ordinary routine of living, with answers as shown in Panel D. For one out of three households suffering a serious event, the restoration of the status quo took four weeks or more, varying with the type of event from almost half of the fire victims to less than one in four of the tornado victims. Most (almost three out of four) of the victims of minor events took less than a day to recover the routines of everyday life.

The regression equations in Table 6.18 explore the issue of what causes felt debt burdens and feelings of depression. The debt burden index and depressed feelings measures of Table 6.17 are used as dependent variables with independent variables being hazard event and household

Table 6.18

Regressions of Hazard Aftermath Effects on
Hazard and Household Characteristics
(N = 1268)

	Dependent Variable is			
	Debt Burden Index[a]		Depression[b]	
Independent Variables	b	SE	b	SE
A. Hazard Type[c]				
Fire	-.0632	(.073)	.0160	(.035)
Flood	-.0023	(.081)	-.0064	(.034)
Hurricane	-.0946	(.065)	-.0850**	(.032)
Tornado	-.0671	(.055)	-.0329	(.027)
B. Hazard Characteristics				
Damage to Household[d]	.0771***	(.014)	.0350***	(.006)
Percent Reimbursed by Insurance	-.0042***	(.001)	-.0013***	(.000)
Community Seriousness[e]	-.0966***	(.023)	-.0219*	(.011)
Public Service Disruption[f]	.1186***	(.016)	.0132	(.008)
Repairs to Home[g]	-.0110	(.051)	.0681**	(.025)
Restoration Time[h]	.1342***	(.025)	.0876***	(.012)
Contacts with Agencies[i]	.0749***	(.017)	.0322***	(.008)
Informal Help[j]	.0554**	(.020)	.0267**	(.010)
Gifts/Grants ($000)	.0085	(.017)	.0085	(.008)
Loans ($000)	.0077***	(.002)	-.0004	(.001)
C. Household Characteristics				
Age of Oldest Person	-.0005	(.013)	-.0002	(.001)
Household Income[k]	-.0074***	(.002)	-.0019*	(.001)
Renter	-.1502**	(.048)	.0264	(.024)
Number of Persons	.0093	(.012)	.0008	(.006)
Education (Years)	.0057	(.008)	.0001	(.004)
White	-.0045	(.051)	.0120	(.025)

Table 6.18 (continued)

	Dependent Variable is			
	Debt Burden Index[a]		Depression[b]	
	b	SE	b	SE
D. Intercept	.1254	(.146)	.0531	(.071)
R^2 =	.35		.32	

[a]Index consisting of items on felt debt burden as aftermath of Hazard Event (see Table 6.17 for wording of questions).

[b]Answers to item "felt depressed as a consequence of the event."

[c]Dummy variables: omitted category is "earthquake."

[d]Coded in categories (see Table 6.2 for brackets used).

[e]Seriousness of event to community, consisting of amount of damage to other homes on block, in neighborhood and in community.

[f]Number of interruptions to public services and utilities.

[g]Whether repair to home took up to one day to accomplish or greater.

[h]Length of time to restoration of "normal" activities of household.

[i]Number of agencies that contacted household.

[j]Number of informal sources providing help to household.

[k]Income measured as of year of the hazard event.

characteristics. Note that a positive coefficient means that the variable in question increases the sense of debt burden (or of feelings of depression).

Turning first to the debt burden equation, it is fairly obvious that the kind of hazard involved is not as important as the consequences of the hazards and the concomitant events. None of the coefficients for hazard types are significant, indicating that the hazards are not sufficiently different one from the other in the net effects that they have on felt debt burden. However, the next set of variables do have important effects: First of all, the greater the dollar value of the damage inflicted, the greater the debt burden. Second, as to be expected, the larger the proportion of the damage reimbursed by insurance, the lesser the debt burden. Thirdly, community wide disasters lead to less of a sense of debt burden. It may well be the case that when many face the same problems, one's own problems are reduced in magnitude. Or, an alternative explanation is that in such widespread disasters some of the burdens are assumed by others. In any event, it appears that the hazard event in which a household is one of a small number of victims leads to worse consequences than when there are many who share the same problems.

Fourth, it appears that events involving the disruption of services and utilities lead to greater debt burden. It is difficult to give a completely satisfactory explanation for this finding. Perhaps it means that when public services and utilities are disrupted, other economic side-effects occur, including interruptions in employment[12] or reduced

[12]Note that one of the items that make up the debt burden index concerns whether or not the household has experienced unemployment of more than one week's duration.

economic well being for the community that makes it difficult for the household to sustain its debt payments.

Sixth, although whether repairs to the home take more than a minimal amount of time does not seem to matter to the feeling of debt burden, the length of time taken to restore the routines of the status quo ante does. The longer it takes for a household to return to its regular ways of life, the greater the debt burden that is felt.

Seventh, contacts with relief agencies and receiving help from informal sources both increase the sense of debt burden. It is also difficult to explain these findings away. One might more easily assimilate the opposite findings; namely that the more help received and the more contacts with relief agencies the more easily a household can carry the aftermath economic effects. However, the findings indicate the exact opposite. Of course, the formulation may misspecify the causal direction. Perhaps, it is the debt burden (or its prospect) that leads a family to seek information about aid and to seek help from friends, neighbors and relatives. In any event, it is not possible[13] to unravel what is undoubtedly a very entangled web of cause and effect in the relationships between felt debt burden and these two variables.

Eighth, the larger the loans taken out by a household, the greater the debt burden felt, an obvious relationship. Note that gifts and grants do not have an discernible effect on debt burden.

---

[13]Under some circumstances it might have been possible to separate out the mutual effects of being in trouble and seeking aid, but this data set severely limits those possibilities. Several formulations of mutually interacting simultaneous equation models were tried but the problems of endogeneity could not be overcome.

Among the characteristics of households, only two turn out to be significant: The higher a household's income the lower the felt debt burden, also a quite understandable finding. Renters also have a lesser felt debt burden than owners.

The entire equation has a rather high R^2, .35, indicating that more than a third of the variation in felt debt burden is explained by the variables included in the equation.

The pattern of coefficients for feelings of depression is somewhat different. First, one of the hazard types is accompanied by a lowered level of depression: Hurricanes apparently significantly lower the sense of depression (in comparison to earthquakes), although the reasons for this effect are not apparent. This remains a mystery, especially when it is kept in mind that many things about the hazard experience are being held constant in the equation.

Second, as in the case of debt burden, the greater the damage and and the smaller the insurance reimbursement, the more likely are depressed feelings. Thirdly, indicators of disruption also affect depressed feelings: Household repairs that take more than a minimal time, and the time to restoration of the status quo ante, are both related to depressed feelings.

Fourth, contacts with agencies and receiving help from informal sources increase the probability of claiming depressed feelings. Again, we are confronted with a finding that is difficult to interpret. Of course, as before, the causal direction may be mistaken with depressed persons seeking out agencies and aid from friends and neighbors.

Among the characteristics of households, only income seems to affect feelings of being depressed. The greater the income at the time of the

event, the less likely is a household to claim having been depressed by the event.

All told a little less than a third of the variation in depressed feelings is explained by the equation (R^2 is .32). From the patterning of the coefficients it is obvious that the characteristics of the disaster event are the main determinants of depression. When the event was traumatic and had serious effects on the household, it admits to being depressed by the event.

Summary

The large average losses sustained in damaging hazard events, as discussed in the previous chapter, are clearly offset to an important extent by patterns of aid and financial relief. For hazards other than flood and earthquake, private insurance is, assuredly, the first line of defense. In the case of floods and earthquakes (and in the other hazards types to a lesser extent), various Federal and private relief agencies are an important secondary presence, and many state and local groups and agencies also get involved. Finally, when all else fails, most victims can fall back on family and friends for needed moral and financial support.

Although no single agency or group makes contact with a large share of the total victim population, the aggregate contact for all groups considered together is indeed quite large. Most victims of serious hazard events are contacted by at least one help-giving agency; and most of the victims contacted report a high degree of satisfaction with the services

received. The various sources of aid available appear to play quite complementary roles: households whose losses are not covered by insurance, for example, will usually find other sources of assistance to which they can turn. In most cases, the amount of help received is correlated with the amount of loss incurred, and with little else. There is no evidence anywhere in the chapter to suggest gross inequities in the distribution of hazard relief services.

Beyond the immediate losses, hazards events have various other aftermath consequences, some of which have been examined here. A fairly substantial fraction of the victims of serious events claim an increased debt burden as a result, and many (about a third) also report being depressed. On the average, home repairs following serious events took about a month to complete. These sequelae notwithstanding, most households claim to have returned to their normal routines in a matter of a few weeks, even households victimized by serious events. The relatively short "recovery time" reported by our respondents may be a direct consequence of the coverage achieved by the various help-giving groups and agencies, but it is assuredly a testament of the resiliency of the American population.

APPENDIX A

ESTIMATES OF VICTIMIZATION AND LOSSES BASED ON PRE-1980 DATA

In order to properly design the national survey described in this volume, it was necessary to develop the best possible estimates of the proportions of households experiencing each of the hazards studied and of the accompanying damages. The estimates were to be used in calculating the necessary sample size for the contemplated telephone survey. Constructing the estimates was a laborious task which had the surprising (at least to the investigators) outcome of converging on a relatively firm set of numbers. Although we did not have any a priori expectation that these estimates would be close to those arising from the survey later conducted, the convergence was close enough to raise the level of confidence in both sets of estimates.

We reproduce the design estimates in this Appendix because we believe that readers may want to verify for themselves that the survey estimates are not far afield from what other data lead one to expect. It should be noted that these estimates were computed in 1979 and based in some cases on data that were collected in earlier years. Hence the monetary estimates are in deflated dollars and would need to be corrected to some constant dollar base to be comparable to our own survey findings. However, dollar estimates were not as important for survey design purposes as incidence estimates: hence the numbers given below are in uninflated dollars.

Hazard Victimization by Agent: Existing (as of 1979) Estimates

In order to design and budget the victimization survey, it was essential to know, as precisely as possible, how many screening interviews would be required to produce "enough" victims of the various hazards to sustain a meaningful analysis. Using the loose criterion of "non-trivial" losses and a time-frame of ten years, what did the existing information base (as of 1979) suggest about victimization rates?

Fire

So far as we could determine, there were three existing estimates of the rate of victimization by fire. The first was contained in survey data generated by the Social and Demographic Research Institute in California in the summer of 1977 (call this the "California survey;" see Rossi et al., 1982: Ch. 5, for results from the survey); the second was contained in the American National Red Cross Annual Summaries of Disaster Services Activities for the years 1970 through 1977; the third was the National Household Fire Survey conducted for the National Fire Prevention and Control Administration.

The California survey asked respondents, "Have you ever personally experienced a serious forest or brush fire, either in your present community or elsewhere?" In all, 18.2% of the respondents answered "yes." As an estimate of the national rate of victimization from fires, this number was judged as probably too high for at least four reasons. (i) The question asked whether the respondent ever experienced a fire and thus posed no specific time frame for the response. As "ever" presumably

means "in your lifetime," and as the average age of respondents in this survey is about 40 years, the 18.2% figure should therefore be divided by about 4 to obtain an estimate of fire victimization in any ten-year period. Thus corrected, a more reasonable incidence figure of about 4.5% resulted. (ii) Further, the question asked whether respondents ever experienced a fire, not whether they actually suffered loss. The proportion who suffered a loss presumably would have been smaller than the proportion ever experiencing. (iii) The survey in question was conducted in California, where forest and brush fires were more common than in the nation at large. And finally, (iv) the survey had been conducted in the summer of 1977, when much of California was ablaze. On the other hand, the estimate from the California survey was probably too low for at least one reason: it asked only about forest and brush fires, not about other kinds of fires (home fires, arson, electrical fires, etc.). Assuming that under-estimation due to this last point approximately would have offset the over-estimation due to points (ii) through (iv), we arrived at an estimated fire victimization rate for the nation at large over a ten year period of roughly 5%.

Data from the National Household Fire Survey suggested a very similar victimization rate. The survey was based on a very large sample of about 33,000 households, among which a total of 2,463 "fire incidents" were reported. Assuming one fire incident per household (a liberal assumption, obviously), this translated into an estimated victimization rate of 7.5% (2463/33000 = .075). However, only 1,070 of the reported incidents actually resulted in material losses to the victims, a non-trivial victimization rate on the order of 3.2%, which was respectably close to the estimate

generated from the California survey data. Unfortunately, we were not able to determine the time-frame of the incident question used on the National Household Fire Survey: hence the comparison of results with other sources was very loose, at best.

The ANRC (American National Red Cross) annual summary data were more cumbersome to work with. The summaries provide disaster-specific detail (essential for our purposes) only for those affecting five or more families, a relatively small subset of the disasters to which Red Cross responds. For example, in FY 1972-73, ANRC responded to a total of 25,273 disasters, of which 24,647 (97.5%) each involved fewer than five families. Thus, we had to make inferences about the characteristics of the vast majority of ANRC responses on the basis of the relatively few of them for which detailed disaster-specific data are available.

Defining the ANRC disasters involving more than five families as "big hits," we found that for the years 1970 to 1977, the average annual number of big hits was 841, of which 645 were fire disasters. Thus, roughly three-quarters of all big hits represented fire disasters (the average proportion over the 7 year period was actually 76.03%). During the same period, the average annual number of little hits was 28,597. Assuming that similar proportionalities held for both big and little hits, the resulting estimate was thus that in the average years, 21,742 of ANRC's "little hits" involved fire disasters (28,597 x .7603 = 21,742). Note that, if anything, this estimate was likely to be low, since it can be assumed that most fire disasters are likely to be little hits (i.e., that the proportion of fire disasters among the little hits may be higher than 76%).

How many fire victims were represented in each of the big and little hits? For the big hits, an estimate could be extracted directly from the Annual Summaries data, which contained, among other pieces of information, an estimate (or more accurately, a "ballpark guess") of the "total number of families suffering loss" from the event in question. For the years 1970-1977, the annual average number of families suffering loss from fire in big hits was, according to ANRC, 8,884 families (see Table A.1). To this figure must be added the number of families suffering loss in the little hits. A little hit was defined as involving five or fewer families: we assumed that the average little hit involves two families. The average annual number of families suffering fire losses in ANRC little hits could therefore be estimated at 2 x 21,742, or 43,484 families. The total number of families suffering loss in an average year from big and little hits combined was thus estimated to be 43,484 + 8,884, or 52,368 families. As this estimate was an average for a year, it could be multiplied by ten to produce an estimate for the average decade; our best estimate from the ANRC data is thus that roughly 523,700 families were victimized by fire in the average decade.

This figure could be expected to be too low for at least one reason, namely, that it represented families affected by fires responded to by ANRC, which must have been somewhat less than the total number of fires that occurred. How much less, of course, could not be precisely determined.

There are approximately 251,000 residential fires in the United States according to the Statistical Abstract of the United States, 1973: 467, or about five times more residential fires than the estimated number of families affected as determined from ANRC data (251,000/52,368 = 4.79).

Table A.1

Victimization by Fire Hazard as Estimated from ANRC
Annual Summaries of Disaster Services Activities, 1970-1977

Year	N of "Big Hits"	N of "Big" Fire Hits	Per Cent	N of "Little Hits"	N of "Big Hit" Family Victims
76-77	963	800	83.1	35,971	12,075
75-76	1005	774	77.0	31,017	10,933
74-75	1023	801	78.3	30,968	9,740
73-74	963	743	77.2	28,890	8,344
72-73	626	450	71.9	24,647	6,059
71-72	633	436	68.9	24,294	5,922
70-71	675	512	75.8	24,395	9,118
Mean	841	645	76.0	28,597	8,884

Calculation of Final Estimate

1. Average number of families victimized by "big hit" fires in any year 8,884

2. Average number of "little hit" fires in any year = .76 x 28,597 = 21,742

3. Average number of families affected by each "little hit" = 2 (by assumption)

4. Average number of families victimized by "little hit" fires in any year (2) x (3). 43,484

5. Total number of families victimized by fire in any given year (1) + (4). 52,368

6. Total number of families victimized by fire in any given decade (5) x 10 523,680

Thus, perhaps no more than one in every five fire victims appears in the ANRC report data.

Ignoring for the moment the preceeding point, recall that ANRC data suggest about 523,700 family fire victims in an average decade. To transform this into a percentage, we divided by the number of households in the country, approximately 54,070,000 families during the period represented by the ANRC data. The resulting estimated victimization rate is therefore 523,700/54,070,000 = 0.97%, or one percent for all practical purposes. As data from the preceeding paragraph suggest that ANRC data underestimated the true number of victims by a factor of as much as five, and as the estimated rates from available survey data were in the range of three to five percent, we felt reasonably confident in concluding that the "true" rate of victimization by fire hazard was on the order of 3-5% for any given ten year period. We chose 4% as the design estimate; i.e., the estimate on which to base our survey sample design.

Flood

Victimization rates for floods can be calculated from four sources: the SADRI California survey, the ANRC Annual Summaries data, from national survey data generated by us in the summer of 1977 (Wright et al., 1979b), and from the ANRC chapter report data for 1960-1970 as discussed in Wright et al., 1979a.

The California survey asked, "Have you ever personally experienced a serious flood, either in your present community or elsewhere?" The proportion responding "yes" was 25.0%. Correcting for average age, produced an estimate of about 6.25% per decade (25%/4 = 6.25%). As above,

this estimate can be assumed to be too high (relative to the true national flood victimization rate) for three reasons: (i) As in the case of fires, "experienced" is not the same as "victimized." (ii) Flood risk is higher in California than for the nation as a whole. And (iii) the nine communities sampled in the California survey were sampled with probabilities proportionate to total population at risk (PPPR) from floods, hurricanes, tornadoes, and earthquakes (see Rossi et al, 1982, for a discussion of the sampling rationale); as a result, the resulting flood (and earthquake) victimization estimates are somewhat high relative to the true victimization rate even in California, let alone in the nation at large. Of these, (i) is probably the most serious; on its account alone, we can reduce the net estimate to perhaps 4%.

The national "key persons" survey (KPS) (Rossi et al., 1982) asks, "Have you ever personally experienced a flood, either here or elsewhere?" The proportion responding "yes" to this question was 56.4%. The mean age of respondents in the KPS survey was 48.2 years; the ensuing correction thus produced a figure of 12.2% victimized by flood in any given decade (56.4%/4.82 = 12.2%).

For those reporting a flood experience, a KPS follow-up question asked, "During what year did you experience that flood?" With this question, it was therefore possible to generate decade-by-decade experience rates. In all, 12.2% of the sample reported a flood experience during the 1950's, 12.8% during the 1960's, and 16.8% during the 1970's. (Reported experiences for decades prior to the 1950's were substantially lower.) The average of these three figures is 13.9%, very close to the 12.2% figure produced by the age correction in the previous paragraph.

The close agreement between estimates therefore increased confidence in the meaningfulness of the age corrections required in the California survey.

As in the California survey, the KPS question asked about "experience," not directly about victimization. However, for respondents reporting a flood experience, a second follow-up question asked, "Did you or your family suffer any property losses or personal injuries as a result of the flood?" In all, 27.8% of those reporting a flood experience answered "yes" to the follow-up question. Our best estimate of the proportion truly victimized by flood is therefore 13.9% (the mean percentage experiencing a flood in any decade) times .278 (the proportion of those experiencing who actually suffer loss), or 3.86%. For convenience, we rounded off to a simple 4% flood victimization rate, or about the same rate suggested in the California data.

As an estimate of the national flood victimization rate, the KPS estimate of 4% per decade could be assumed to be too high for at least two reasons. First, the states and local communities surveyed in KPS were again sampled PPPR; flood victimization among respondents from these states and communities was therefore probably higher than would be observed in a simple probability sample of the nation. And secondly, the persons interviewed in KPS were drawn disproportionally from positions having direct hazard-related interests or responsibilities, which might suggest that they were also more likely to have had disaster experiences.

As for the second of these problems, little or nothing could be done; as for the first, however, it was possible to weight the KPS sample by the inverse of the sampling fraction for each state and reconstruct

the victimization estimates. The resulting weighted KPS data yielded results very similar to those from the unweighted data reported above. Specifically, the gross "experience" rate for the total weighted sample was 54.0% (vs. 56.4%); the average rate of flood experience by decade was 13.0% (vs. 13.9%); the proportion of those experiencing who suffered loss was 28.2% (vs. 27.8%); and the resulting "best guess" estimate of true flood victimization in any decade was 3.67% (vs. 3.86% for the unweighted data). Both weighted and unweighted data thus suggest about 4% as the correct flood victimization rate.

Following the procedures discussed earlier regarding fires, the ANRC Annual Summaries data also produced estimates of flood victimization. The data and arithmetic are shown in Table A.2. Our best estimate from these data was that 655,750 families were victimized by flood in the average decade; dividing by 54,070,000, the total number of families, produced an estimated victimization rate of 1.21%. As above, this number was probably too low for at least two reasons: first it reflected only the floods to which ANRC responded, which must be a subset of all floods; secondly, the victimization count was based only on the victims known to ANRC, which in turn must be a subset of all victims.

A final estimate, also based on Red Cross data, was derived from data reported in Wright et al., 1979a. These data consist of machine-readable information coded from ANRC chapter reports for the years 1960 through 1970. Rather than the cumbersome estimations required for the Annual Summaries data, these data can be manipulated more directly, i.e., one simply sums the total number of families affected by floods across all reports for all ten years, then divides by the total number of families

Table A.2

Victimization by Flood as Estimated from ANRC
Annual Summaries of Disaster Services Activities, 1970-1977

Year	N of "Big Hits"	N of "Big" Fire Hits	Per Cent	N of "Little Hits"	N of "Big Hit" Family Victims
76-77	963	58	6.0	35,971	45,690
75-76	1005	70	7.0	31,017	34,968
74-75	1023	90	8.8	30,968	26,700
73-74	963	83	8.6	28,890	35,189
72-73	626	78	12.5	24,647	99,245
71-72	633	77	12.2	24,294	156,541
70-71	675	49	7.3	24,395	25,018
Mean	841	72	8.9	28,597	60,479

Calculation of Final Estimate

1. Average number of families victimized by "big hit" floods in any year 60,479

2. Average number of "little" hit floods in any year = .0891 3,597 = 2,548

3. Average number of families affected by each "little hit" = 2 (by assumption)

4. Average number of families victimized by "little hit" floods in any year (2) x (3). 5,096

5. Total number of families victimized by flood in any given year (1) + (4). 65,575

6. Total number of families victimized by flood in any given decade (5) x 10 655,750

in the country. Using the 1960 value for total number of families, the resulting victimization estimate was 1.12%; using the 1970 value, the estimate was 1.08%. Note that both values were very close to the Annual Summaries estimate of 1.21%.

Thus, ANRC data coverged on an estimated flood victimization rate per decade of about 1% and the survey data converged on an estimate of about 4%. We gave more weight to the survey data for two reasons: first, like all agency data, the ANRC data were known to be incomplete; secondly, the "victimization" questions from the two surveys were prototypes of questions to be asked in the proposed research. Still, as an estimate of the national flood rate, the 4% figure was proabaly somewhat high, we thus chose 3% as the design estimate.

Hurricanes

Three sources of data were available to estimate victimization by hurricane: The KPS national survey data, the 1960-1970 ANRC Chapter Report data, and some inferential estimates supplied by Hebert and Taylor (1975: 4). The California survey did not include a question on hurricanes; likewise, the ANRC Annual Summaries data cannot be used because in some years there was no separate tally of hurricane data.

The KPS survey asked, "Have you ever personally experienced a hurricane, either here or elsewhere?" The proportion responding "yes" was 60.0% for the unweighted data and 57.7% for the weighted data. Correcting both these estimates for the average age of the sample gives values of 12.4% and 12.0% respectively. For the last three decades, the average percent experiencing a hurricane per decade was 13.9% and 13.5% for un-

weighted and weighted data. Thus, all KPS estimates of the rate of hurricane experience converged on values in the range of 12-14%.

The percentage of those experiencing a hurricane who actually suffered losses is 37.8% for the unweighted data and 39.1% for the weighted data. Our best unweighted estimate of the rate of hurricane victimization was therefore 13.9% times .378 = 5.25%. The corresponding value for weighted data was 5.27%. Rounding down, we arrived at a value of about 5% of the nation suffering loss from hurricane in any given decade.

The 1960-1970 ANRC Chapter Report data, as always, produced lower estimates than those produced by KPS. Using the 1960 value for total number of families in the denominator, the ANRC estimate of hurricane victimization was 1.52% per decade; using the 1970 value, the estimate was 1.36%. For all the usual reasons, it could be assumed that these figures were somewhat lower than the true hurricane victimization rate.

Since not all parts of the nation were equally susceptible to hurricane hazard, a revised set of estimates can be made on the basis of data just for the coastal states (Texas to Maine). Since 13 of the 20 states sampled in KPS were coastal states, the resulting victimization estimate was reasonably close to that shown in the total. For respondents just in the coastal states, 74.4% said they had experienced a hurricane sometime during their lives (unweighted data), which corrects to 15.44% in any decade. The average "percent experiencing" by decade, likewise, was 18.3%, 40% of whom report having suffered at least some loss because of the hurricane. Among the coastal states, then, the resulting "best guess" estimate for hurricane victimization in any decade was 7.32% (18.3% x .400 = 7.32%), or roughly seven percent, for convenience.

The ANRC Chapter Report data can also be decomposed by state; using the 1970 estimate of total number of families in the coastal states, the resulting hurricane victimization estimate for families in coastal states was 4.22% per decade.

Hebert and Taylor, via indirect and inferential methods, calculate that 77.5% of the population currently residents in coastal states have never experienced a direct hurricane "hit." Thus, 22.5% of the population presumably has. Assuming that the average age of the adult population of coastal states was about 45 years, the estimated per decade victimization by hurricane based on the Hebert-Taylor figure was therefore 5.0% (22.5%/4.5 = 5.0%).

Overall, then, the high estimate for hurricane victimization per decade in the nation at large was about 5% (KPS) and the low estimate was about 1.5% (ANRC). Thus, our "best guess" estimate of the true national hurricane victimization rate was on the order of 3%. Just for coastal states, we had estimates of about 4% (ANRC), about 5% (Hebert and Taylor) and about 7% (KPS); a reasonable guess is thus that the true value for coastal states was about 5%.

Tornadoes

There were three sources of data that could be used to estimate the rate of victimization by tornado: the KPS survey, the ANRC Annual Summaries, and the ANRC Chapter Report data.

The KPS survey asked, "Have you ever personally experienced a tornado, either here or elsewhere?" The proportion responding "yes" was 35.6%, or roughly 7% for any given decade. (The weighted data give virtually

identical results.) For the last three decades, the average percentage of the sample experiencing a torando was 9.0%. Of those who had experienced a tornado, the proportion reporting that they had suffered some loss was 26.3%. Our best estimate of the true victimization rate for tornadoes is thus 9.0% times .263, or 2.36% overall.

Using the 1960 value for the total number of families in the country, the ANRC Chapter Report data showed an overall tornado victimization rate of 0.34%. When the 1970 value was substituted, the rate was 0.33%. Data for 1970-1977, taken from the Annual Summaries and manipulated as indicated in previous sections, produced a final estimate of victimization by tornado of 0.29%. Thus, all ANRC data converged on a rate of about one-third of one percent as the true rate of victimization by tornado per decade.

For all the usual reasons, the KPS estimate is probably somewhat high and the ANRC-based estimates are probably somewhat low. We chose 1% as the design estimate.

Earthquake

Since earthquakes, unlike the other disaster agents so far discussed, are not regular occurrences and since earthquake risk is not proportionally distributed throughout the United States, it is very difficult to provide a meaningful estimate of the rate of victimization by earthquakes for the nation as a whole. The best data exist for the state of California, and it may well be that the rate of earthquake victimization can only be calculated for that state (no other state producing enough victims in any typical time-span to allow for the calculation of a rate).

The California survey asked, "Have you ever personally experienced a serious earthquake either in your present community or elsewhere?" The proportion responding "yes" to this question was 39.2%, or roughly 10% per decade. The proportion actually victimized by earthquake would, of course, be less.

The KPS survey asked all respondents, "Have you ever personally experienced an earthquake, either here or elsewhere?" In the total sample, 29.3% responded "yes," while among California respondents the proportion was 87.9%. The average percentage experiencing an earthquake in any decade (computed over the last three decades) was 7.33% for the total sample and 23.0% for the California respondents. The follow-up question revealed that about 9.0% of those experiencing an earthquake were actually victimized by one (total sample); in California, the corresponding percentage was 14.8%. Thus, the best estimate for earthquake victimization in the nation at large is 7.33% times .090 or 0.6% overall.

Other Hazard Agents

Data on victimization by hazard agents other than the five so far discussed are so sparse and imprecise as to preclude any firm estimates of victimization rates; thus, the numbers discussed in the next several paragraphs were regarded with considerable suspicion.

Four of the remaining hazard agents -- hail, lightning, drought, and frost -- are primarily, although not exclusively, problems in the agricultural sector. For convenience (and as a conservative assumption), then, we may simply assume that victimization by these four agents is restricted to the nation's farm population, which in turn represents

about 4% of the total labor force of the country.

Regarding hail: It has been estimated that approximately 2% of the annual crop production of the United States is destroyed by hail every year; total dollar losses from hail (all sources combined) average about $700,000,000 annually (Brinkmann, 1975: 69-75). Remote inferences from other data presented by Brinkmann (1975: 72) further suggested that losses to the typical hail-victimized farmer would amount to about 10% of that farmer's total crops. If so, then the implication is that about 20% of the American farm population was victimized by hail in any given year (20% each losing about 10% adds up to total losses of about 2% of total production). Taken to their extremes, these numbers also suggest that roughly 200% of the farm population is victimized by hail in any ten year period (i.e., that the typical farmer is stricken twice by hail every ten years). On the surface, this figure seemed implausibly high; let us therefore further assume that the "20% victimized" figure represents the total victimization for any typical decade. If 20% of the nation's farmers were in fact victimized by hail in any typical decade, and if farmers represented roughly 4% of the total population, then the resulting "best guess" estimate for hail victimization in the nation at large was therefore 4% x .20 = 0.8%. We chose 0.5% as the "best guess" design estimate.

Regarding drought: Warrick (1975: xiv) suggested that $700,000,000 annually "can be considered reasonable" as the average crop losses due to drought in any "typical" year. This is the same average loss figure as Brinkmann suggests for hail (see previous paragraph). Assuming that victimization from each hazard is proportional to loss, the inference was

drawn that victimization by drought was roughly equal to victimization by hail; we therefore took the 0.5% figure as a reasonable overall estimate of the rate of drought victimization. Note that because of the Great Western Drought of 1976-77, this figure was likely to have been somewhat low.[1]

Annual crop losses from frost and freezing were estimated at about $1.1 billion (White and Haas, 1975: 305). As this was about the same figure as shown above for hail and drought, the assumption was made that victimization was proportional to loss, producing an estimate of the rate of victimization by frost and freezing of roughly one-half of one percent.

Finally, in regard to lightning: Brinkmann (1975: 106) reported that "two out of every 100 farms are struck by lightning or have a fire (which may be lightning-caused) each year." The implication is that 20 farms in every 100 are victimized by lightning in any decade; thus, a reasonable guess about overall lightning victimization was 20% x 4% (the proportion of farmers), or 0.8%. Here too, then, we may assume that the true rate of lightning victimization is on the order of one-half of one percent of the nation's families in any typical decade.

---

[1]The KPS survey asked respondents whether "within the last ten years" drought had been a problem in their respective states or local communities. Overall, 54.4% responded "yes" to this question. This suggests at least the possibility that the drought victimization estimate provided in this paragraph is much too low. The same question sequence also asked about "hailstorms;" the proportion saying this had been a problem in their states or communities in the last ten years was 22.5%. Assuming constant proportionalities, this suggests that drought victimization may average twice that of victimization by hail -- i.e., the correct figure for drought may be closer to 1.0% than to 0.5%.

Taking these four hazard agents combined, then, we arrive at an overall victimization rate of about 2%. This suggests that approximately one-half the nation's farms suffer some non-trivial loss either from hail, drought, frost, or lightning in the average decade, and this did not seem to be an unreasonably high estimate. Further, our estimate for at least one hazard, drought, could have been substantially too low; and also, it was clearly not the case that victimization from these four hazards was exclusively restricted to the agricultural sector. Thus, an overall rate of about 2% per decade for these four agents combined seems at least plausible.

The remaining hazards agents enumerated above are coastal erosion, severe windstorm (other than tornado or hurricane), landslide, and blizzard. Available numerical data on these four agents consisted primarily of order-of-magnitude estimates of the total annual dollar losses. In the cases of hail, drought, and frost, we have assumed (implicitly) that annual losses of about $1 billion translate into a victimization rate over a decade of about 0.5%. We took the simple assumption that this ratio also held for the remaining four agents. White and Haas estimated that losses from coastal erosion average about $300 million per year (White and Haas, 1975: 361), yielding an estimated victimization rate of 0.15%. Losses from severe windstorms (other than tornadoes and hurricanes) were estimated at between $30 and $300 million annually (White and Haas, 1975: 299); the mid-point of this interval is $165 million, which translated into a victimization rate of roughly 0.08%. The annual loss from landslides was estimated at "hundreds of millions of dollars annually" (White and Haas, 1975: 339). Assuming that loss from landslide

did not exceed loss from erosion and windstorm combined, i.e., that the loss was on the order of $500 million annually, in turn suggested a victimization rate of roughly 0.25%.

As for "urban snow," no cost figures are provided. The combined victimization from erosion, severe windstorm, and landslide was now estimated at 0.15% + 0.08% + 0.25%, or 0.48% overall; simply asserting (on the basis of no evidence whatsoever) that victimization by urban blizzard runs to about 0.5%, which has the convenient effect of producing an overall estimate of about one percent as the proportion of the nation's families victimized either by erosion, landslide, severe windstorm, or blizzard in any typical decade.[2]

At the point of drawing up the actual design of the telephone survey, we reviewed these estimates and came to the conclusion that those pertaining to coastal erosion, windstorms, landslides and blizzards were simply too conjectural to use. In addition, even the highest estimates yielded proportions that indicated that finding sufficient numbers of households that were victimized to the point of suffering non-trivial losses was going to be extremely expensive. As a consequence we dropped these hazard events from our study and concentrated mainly on household fires, floods, hurricanes, tornadoes, and earthquakes, being fully confident only that

---

[2]The KPS survey included "snowfall" in the question sequence discussed in the previous footnote. In all, 31.4% of the respondents said that this had been a problem, a slightly higher proportion than responded yes to the question on hail. Assuming constant proportionalities once again, and assuming further that our guess on hail victimization is not totally unreasonable, the true rate of victimization by blizzard may be as high as 1.0%. The very severe blizzards of the past two winters (1976-77 and 1977-78) may mean that the actual rate over the previous decade is substantially higher than even this one percent figure.

we could obtain sufficient numbers of victims from the first four to sustain the kinds of analyses we contemplated. We included earthquakes (broadening the definition to include tremors) without much confidence that we would be able to carry through a meaningful analyses. As the reader of the preceding chapters may have noted, often the analysis of earthquake victims rests on precariously small case bases, as we had feared.

Summary

Table A.3 summarizes the victimization estimates generated in previous pages. Our design estimate for the overall rate of individual or family victimization from all agents combined for the typical decade was 14.5%, or roughly 15% for convenience. As Chapter IV of the preceding monograph indicates, the design estimates were quite close to the actual yields of victims in the national telephone survey, the differences being mainly generated by slightly changed definitions of the hazards involved. For example, we included windstorms along with tornadoes, tremors with earthquakes and severe tropical storms with hurricanes, all threshold changes that tended to obtain more instances in our victimization survey than predicted in the design estimates.

Table A.3

Summary of Disaster Victimization Estimates
for Total U.S. Population

DISASTER AGENT	HIGH ESTIMATE	LOW ESTIMATE	DESIGN ESTIMATE
Fire	5%	1.0%	4%
Flood	4%	1.1%	3%
Hurricane	5%	1.5%	3%
Tornado	2%	0.3%	1%
Earthquake	0.7%	----	0.5%
Hail Drought Frost Lightning	----	----	2%
Blizzard Severe Windstorm Landslide Erosion	----	----	1%

TOTAL = 14.5%

APPENDIX B

QUESTIONNAIRES USED IN THE NATIONAL TELEPHONE SURVEY AND THE MAILED SURVEY OF HAZARD VICTIMS

RESPONDENT'S NAME _____

ADDRESS _____ _____ _____ _____
STREET CITY STATE ZIP

TELEPHONE # (_____) _____ ____
AREA CODE

AUDITS & SURVEYS, INC.
One Park Avenue
New York, N.Y. 10016

PROJECT #4278
November, 1980

NATURAL HAZARDS STUDY

SCREENER

INTERVIEWER'S NAME (PRINT) _____

TIME OF CALL _____ DATE ____/____/____

INTRODUCTION

Hello, I'm _____ of Audits & Surveys, a national market research firm located in New York City. May I speak to the male or female head of household.

IF HEAD OF HOUSEHOLD IS UNAVAILABLE, MAKE APPOINTMENT FOR CALLBACK ON CALL RECORD FORM.

IF HEAD OF HOUSEHOLD IS THEN PUT ON THE PHONE, REPEAT:

Hello, I'm _____ of Audits & Surveys, a national market research firm located in New York City.

CONTINUED INTRODUCTION TO HEAD OF HOUSEHOLD

At the request of the University of Massachusetts, we are conducting a survey to obtain information on damages to individuals and families from events such as fires, floods and other natural disasters. We would like to ask you a few questions regarding your family's experiences with such events during the past ten years, since 1970.

1. Since 1970, has your family or household experienced a fire in a house or apartment in which you were living as a group?

YES ( ) ASK Q.2
NO ( ) SKIP TO Q.7

IF "YES" IN Q.1, ASK:

2. In which year or years did the fire or fires occur? CHECK ALL YEARS THAT APPLY IN COLUMN UNDER Q.2 BELOW

FOR EACH YEAR CHECKED IN Q.2, ASK:

3. Now, thinking about (INSERT 1ST YEAR MENTIONED IN Q.2) how many fires did your family or household experience during that year? ENTER NUMBER OF FIRES IN COLUMN UNDER Q.3 BELOW.

4. Was anyone in your family or household killed as a result of injuries due to fire? ENTER "YES" OR "NO" IN COLUMN UNDER Q.4 BELOW.

5. Was anyone (else) in your family or household injured seriously enough to be treated medically? ENTER "YES" OR "NO" IN COLUMN UNDER Q.5 BELOW.

6. Please estimate the total dollar amount of fire damage. ENTER DOLLAR DAMAGE IN COLUMN UNDER Q.6 BELOW.

REPEAT Q.3,4,5 AND 6 FOR ALL OTHER YEARS IN WHICH FIRES OCCURRED.

Q.2	Q.3	Q.4 KILLED		Q.5 INJURED		Q.6
YEAR	NO. FIRES	YES	NO	YES	NO	$ DAMAGE
1970( )	____	( )	( )	( )	( )	_____
1971( )	____	( )	( )	( )	( )	_____
1972( )	____	( )	( )	( )	( )	_____
1973( )	____	( )	( )	( )	( )	_____
1974( )	____	( )	( )	( )	( )	_____
1975( )	____	( )	( )	( )	( )	_____
1976( )	____	( )	( )	( )	( )	_____
1977( )	____	( )	( )	( )	( )	_____
1978( )	____	( )	( )	( )	( )	_____
1979( )	____	( )	( )	( )	( )	_____
1980( )	____	( )	( )	( )	( )	_____

7. Since 1970, has your family or household experienced a flood caused by the overflowing of a river or stream in a house or apartment in which you were living as a group?

YES ( ) ASK Q.8
NO ( ) SKIP TO Q.13

IF "YES" IN Q.7, ASK:

8. In which year or years did the flood or floods occur? CHECK ALL YEARS THAT APPLY IN COLUMN UNDER Q.8 BELOW.

FOR EACH YEAR CHECKED IN Q.8, ASK:

9. Now, thinking about (INSERT 1ST YEAR MENTIONED IN Q.8), how many floods did your family or household experience during that year? ENTER NUMBER OF FLOODS IN COLUMN UNDER Q.9 BELOW.

10. Was anyone in your family or household killed as a result of injuries due to flood? ENTER "YES" OR "NO" IN COLUMN UNDER Q.10 BELOW.

11. Was anyone (else) in your family or household injured seriously enough to be treated medically? ENTER "YES" OR "NO" IN COLUMN UNDER Q.11 BELOW.

12. Please estimate the total dollar amount of flood damage. ENTER DOLLAR DAMAGE IN COLUMN UNDER Q.12 BELOW.

REPEAT Q.9,10,11 AND 12 FOR ALL OTHER YEARS IN WHICH FLOODS OCCURRED.

Q.8 YEAR	Q.9 NO. FLOODS	Q.10 KILLED YES	Q.10 KILLED NO	Q.11 INJURED YES	Q.11 INJURED NO	Q.12 $ DAMAGE
1970( )	____	( )	( )	( )	( )	_____
1971( )	____	( )	( )	( )	( )	_____
1972( )	____	( )	( )	( )	( )	_____
1973( )	____	( )	( )	( )	( )	_____
1974( )	____	( )	( )	( )	( )	_____
1975( )	____	( )	( )	( )	( )	_____
1976( )	____	( )	( )	( )	( )	_____
1977( )	____	( )	( )	( )	( )	_____
1978( )	____	( )	( )	( )	( )	_____
1979( )	____	( )	( )	( )	( )	_____
1980( )	____	( )	( )	( )	( )	_____

13. Since 1970, has your family or household experienced a hurricane or severe tropical storm in a house or apartment in which you were living as a group?

YES ( ) ASK Q.14
NO ( ) SKIP TO Q.19

IF "YES" IN Q.13, ASK:

14. In which year or years did the hurricane or hurricanes, storm or storms occur? CHECK ALL YEARS THAT APPLY IN COLUMN UNDER Q.14 BELOW.

FOR EACH YEAR CHECKED IN Q.14, ASK:

15. Now, thinking about (INSERT 1ST YEAR MENTIONED IN Q.14), how many hurricanes or tropical storms did your family or household experience during that year? ENTER NUMBER OF HURRICANES/STORMS IN COLUMN UNDER Q.15 BELOW.

16. Was anyone in your family or household killed as a result of injuries due to hurricane or storm? ENTER "YES" OR "NO" IN COLUMN UNDER Q.16 BELOW.

17. Was anyone (else) in your family or household injured seriously enough to be treated medically? ENTER "YES" OR "NO" IN COLUMN UNDER Q.17 BELOW.

18. Please estimate the total dollar amount of hurricane or storm damage. ENTER DOLLAR DAMAGE IN COLUMN UNDER Q.18 BELOW.

REPEAT Q.15,16,17 AND 18 FOR ALL YEARS IN WHICH HURRICANES/STORMS OCCURRED.

Q.14 YEAR	Q.15 HURRICANES/STORMS	Q.16 KILLED YES	Q.16 KILLED NO	Q.17 INJURED YES	Q.17 INJURED NO	Q.18 $ DAMAGE
1970 ( )	_____	( )	( )	( )	( )	_____
1971 ( )	_____	( )	( )	( )	( )	_____
1972 ( )	_____	( )	( )	( )	( )	_____
1973 ( )	_____	( )	( )	( )	( )	_____
1974 ( )	_____	( )	( )	( )	( )	_____
1975 ( )	_____	( )	( )	( )	( )	_____
1976 ( )	_____	( )	( )	( )	( )	_____
1977 ( )	_____	( )	( )	( )	( )	_____
1978 ( )	_____	( )	( )	( )	( )	_____
1979 ( )	_____	( )	( )	( )	( )	_____
1980 ( )	_____	( )	( )	( )	( )	_____

19. Since 1970, has your family or household experienced a tornado or severe windstorm in a house or apartment in which you were living as a group?

YES ( ) ASK Q.20
NO ( ) SKIP TO Q.25

IF "YES" IN Q.19, ASK:

20. In which year or years did the tornado or tornados, windstorm or windstorms occur? CHECK ALL YEARS THAT APPLY IN COLUMN UNDER Q.20 BELOW.

FOR EACH YEAR CHECKED IN Q.20, ASK:

21. Now, thinking about (INSERT 1ST YEAR MENTIONED IN Q.20), how many tornados or windstorms did your family or household experience during that year? ENTER NUMBER OF TORNADOS/WINDSTORMS IN COLUMN UNDER Q.21 BELOW.

22. Was anyone in your family or household killed as a result of injuries due to tornado or windstorm? ENTER "YES" OR "NO" IN COLUMN UNDER Q.22 BELOW.

23. Was anyone (else) in your family or household injured seriously enough to be treated medically? ENTER "YES" OR "NO" IN COLUMN UNDER Q.23 BELOW.

24. Please estimate the total dollar amount of tornado or windstorm damage. ENTER DOLLAR DAMAGE IN COLUMN UNDER Q.24 BELOW.

REPEAT Q.21,22,23 AND 24 FOR ALL OTHER YEARS IN WHICH TORNADOS OR WINDSTORMS OCCURRED.

Q.20	Q.21	Q.22 KILLED		Q.23 INJURED		Q.24
YEAR	NO. TORNADOS/WINDSTORMS	YES	NO	YES	NO	$ DAMAGE
1970( )	_____	( )	( )	( )	( )	_____
1971( )	_____	( )	( )	( )	( )	_____
1972( )	_____	( )	( )	( )	( )	_____
1973( )	_____	( )	( )	( )	( )	_____
1974( )	_____	( )	( )	( )	( )	_____
1975( )	_____	( )	( )	( )	( )	_____
1976( )	_____	( )	( )	( )	( )	_____
1977( )	_____	( )	( )	( )	( )	_____
1978( )	_____	( )	( )	( )	( )	_____
1979( )	_____	( )	( )	( )	( )	_____
1980( )	_____	( )	( )	( )	( )	_____

25. Since 1970, has your family or household experienced an earthquake or tremor in a house or apartment in which you were living as a group?

YES ( ) ASK Q.26
NO ( ) SKIP TO Q.31

IF "YES" IN Q.25, ASK:

26. In which year or years did the earthquake or quakes, tremor or tremors occur? CHECK ALL YEARS THAT APPLY IN COLUMN UNDER Q.26 BELOW.

FOR EACH YEAR CHECKED IN Q.26, ASK:

27. Now, thinking about (INSERT 1ST YEAR MENTIONED IN Q.26), how many earthquakes or tremors did your family or household experience during that year? ENTER NUMBER OF EARTHQUAKES/TREMORS IN COLUMN UNDER Q.27 BELOW.

28. Was anyone in your family or household killed as a result of injuries due to earthquake or tremor? ENTER "YES" OR "NO" IN COLUMN UNDER Q.28 BELOW.

29. Was anyone (else) in your family or household injured seriously enough to be treated medically? ENTER "YES" OR "NO" IN COLUMN UNDER Q.29 BELOW.

30. Please estimate the total dollar amount of earthquake or tremor damage? ENTER DOLLAR DAMAGE IN COLUMN UNDER Q.30 BELOW.

REPEAT Q.27,28,29 AND 30 FOR ALL OTHER YEARS IN WHICH EARTHQUAKES OR TREMORS OCCURED

Q.26 YEAR		Q.27 NO.QUAKES/TREMORS	Q.28 KILLED YES	Q.28 KILLED NO	Q.29 INJURED YES	Q.29 INJURED NO	Q.30 $ DAMAGE
1970	( )	_____	( )	( )	( )	( )	_____
1971	( )	_____	( )	( )	( )	( )	_____
1972	( )	_____	( )	( )	( )	( )	_____
1973	( )	_____	( )	( )	( )	( )	_____
1974	( )	_____	( )	( )	( )	( )	_____
1975	( )	_____	( )	( )	( )	( )	_____
1976	( )	_____	( )	( )	( )	( )	_____
1977	( )	_____	( )	( )	( )	( )	_____
1978	( )	_____	( )	( )	( )	( )	_____
1979	( )	_____	( )	( )	( )	( )	_____
1980	( )	_____	( )	( )	( )	( )	_____

ASK EVERYONE:

31. In order to present our findings separately for different kinds of families it is important that we obtain some additional information.

    How many persons over 16 years of age are living in your household? _____

32. How many persons 16 years of age or younger are living in your household? _____

33. What is the age of the main wage earner in the household? _____

34. Do you own or rent your house or apartment? _____

35. How would you describe the community in which you are living?

    ( ) Rural area
    ( ) Small town under 25,000 population
    ( ) Suburban residential area of a city over 25,000 population
    ( ) Medium size city with a population between 25,000 and 250,000
    ( ) Large city over 250,000 population

36. In what year was your household started? That is, when did you begin living together as a family? _____ YEAR

37. In 1979, was your total household income above or below $12,000?
    ABOVE $12,000 ( ) ASK Q.38
    BELOW $12,000 ( ) SKIP TO Q.41

IF ABOVE $12,000 IN Q.37, ASK:

38. Was your total household income above or below $15,000?
    ABOVE $15,000 ( ) ASK Q.39
    BELOW $15,000 ( ) SKIP TO Q.42

IF ABOVE $15,000 IN Q.38,

39. Was your total household income above or below $20,000?
    ABOVE $20,000 ( ) ASK Q.40
    BELOW $20,000 ( ) SKIP TO Q.42

IF ABOVE $20,000 IN Q.39, ASK:

40. Was your total household income above or below $30,000?
    ABOVE $30,000 ( ) SKIP TO Q.42
    BELOW $30,000 ( )

IF "BELOW $12,000" IN Q.37, ASK:

41. Was your total household income above or below $6,000?
    ABOVE $6,000 ( )
    BELOW $6,000 ( )

ASK EVERYONE:

42. What is the race of persons living in the household? Are they ... READ LIST.
White ( )
Black ( )
Other ( )

43. SEX OF RESPONDENT. DO NOT READ
MALE ( )
FEMALE ( )

IF "YES" TO Q.1,7,13,19 OR 25, ASK:

44. We are interested in learning more about your household's experiences with natural disasters -- kinds of damage, injuries, insurance experience and so on. We will send you a short questionnaire to complete, and for this we need the name and address of someone in your family who has such information.

NAME _____

STREET ADDRESS _____

TOWN OR CITY _____

STATE _____

ZIP CODE _____

PROGRAMMER: INSERT "Thank you very much for your cooperation" FOR HOUSEHOLDS NOT REQUIRING Q.45-61.

SPECIAL INSTRUCTIONS FOR PROGRAMMER:

THE FOLLOWING QUESTIONS (45-61) ARE TO BE ASKED IN EVERY TENTH HOUSEHOLD

Now I will read a list of acts of nature or other serious events that sometimes happen to people. For each event, please tell me whether or not your family or household has had any experiences of that sort since 1970. Let's start with "lightening strikes". IF THE ANSWER TO AN EVENT IS "YES", ASK IMMEDIATELY WHETHER THERE WERE DAMAGES OR INJURIES.

		HAPPENED		DAMAGES/INJURIES	
		NO	YES	NO	YES
45.	Lightening strikes	( )	( )	( )	( )
46.	Landslides or cave-ins	( )	( )	( )	( )
47.	Severe hailstorms	( )	( )	( )	( )
48.	Serious auto accident	( )	( )	( )	( )
49.	Victim of burglary, robbery or assault	( )	( )	( )	( )
50.	Arrest or imprisonment	( )	( )	( )	( )
51.	Severe snowstorms	( )	( )	( )	( )
52.	Ground around house subsiding	( )	( )	( )	( )
53.	Drug or alcohol addiction	( )	( )	( )	( )
54.	Victim of shooting	( )	( )	( )	( )

Has your family or household experienced any of the following events since 1970?

		HAPPENED	
		NO	YES
55.	Being unemployed and seeking employment for over six months	( )	( )
56.	Personal bankruptcy	( )	( )
57.	Severe mental depression	( )	( )
58.	Children having trouble in school	( )	( )
59.	Unexpected death of household member	( )	( )
60.	Marital break-up	( )	( )
61.	Birth of defective child	( )	( )

Thank you very much for your cooperation.

CALL RECORD FORM FOR DISASTER VICTIMIZATION SCREENER

DISPOSITION	INITIAL CALL	1ST CALLBACK	2ND CALLBACK
1. NON-WORKING/ WRONG NUMBER	( )	( )	( )
2. NO ANSWER/BUSY (CALLBACK)	( )	( )	( )
3. HOUSEHOLD HEAD REFUSED INTERVIEW	( )	( )	( )
4. HOUSEHOLD HEAD TERMINATED INTERVIEW	( )	( )	( )
5. HOUSEHOLD HEAD NOT AVAILABLE (MAKE APPOINTMENT FOR CALLBACK)	( )	( )	( )
6. OTHER (SPECIFY) _____ _____	( )	( )	( )

TO MAKE APPOINTMENT FOR CALLBACK, SAY:

When would it be convenient for me to call back and speak with you (him/her)? RECORD DAY, DATE AND TIME FOR CALLBACK.

	DAY	DATE	TIME
1.	_____	_____	_____
2.	_____	_____	_____
3.	_____	_____	_____

NATIONAL STUDY OF HOUSEHOLD EXPERIENCES WITH ACTS OF NATURE AND HOUSEHOLD FIRES

PETER H. ROSSI
JAMES D. WRIGHT

Social and Demographic Research Institute
University of Massachusetts
Amherst, Massachusetts 01003

CONDUCTED BY:

AUDITS & SURVEYS, INC.
One Park Avenue
New York, New York 10016

WHAT IS THIS SURVEY ABOUT?

- Your family's or household group's EXPERIENCES WITH DAMAGES AND INJURIES FROM SUCH HAZARDS AS A HURRICANE OR TROPICAL STORM during the last decade (1970-1980).
- We are especially concerned with THE COSTS AND FINANCIAL IMPACTS ON YOUR FAMILY OR HOUSEHOLD GROUP.

WHAT WILL BE DONE WITH THE INFORMATION?

- Summaries of your experiences and those of other families will be put together in a report that will be presented to CONGRESS, FEDERAL, STATE AND LOCAL AGENCIES that are responsible for programs designed to help the victims of fires and natural hazards.
- NO INFORMATION YOU GIVE US WILL BE REVEALED TO ANYONE IN A WAY THAT CAN IDENTIFY YOU OR YOUR FAMILY OR HOUSEHOLD GROUP.

HOW WERE YOU CHOSEN TO FILL OUT THIS QUESTIONNAIRE?

- We telephoned a representative sample of private, residential telephone numbers in the continental United States. YOUR NUMBER WAS PICKED BY CHANCE.
- When we called, someone in your household (perhaps yourself) told us that during the period 1970 to 1980, a hurricane or tropical storm injured someone in your household or damaged your property or personal possessions. Our interviewer said we were interested in learning more about your family's or household's experience with such hazards and your name was given as a knowledgeable person who could complete a short questionnaire on injuries or damages.

WHAT IF YOU HAVE RECEIVED MORE THAN ONE QUESTIONNAIRE?

- This means that the person we spoke to in your family or household reported several hazard events. For example, if you had a fire in 1971 and a flood in 1978, you have received two questionnaires. Please complete a separate questionnaire for each hazard event. The type of hazard and year it happened is printed at the top of the first page of the questionnaire.

HOW TO FILL OUT THE QUESTIONNAIRE.

- Most of the questions can be answered by circling a number that corresponds to your answer, as follows:

  What is your marital status?

  1 Married

  (2) Single and never married

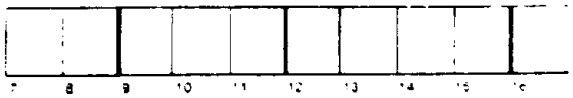
  3 Married but separated

  4 Widowed or divorced

PLEASE ANSWER EVERY QUESTION THAT APPLIES TO YOUR EXPERIENCES.

IF YOU HAVE ANY QUESTIONS ABOUT THE SURVEY CALL DR. ROSSI OR DR. WRIGHT COLLECT 413-545-3418.

(1-4) 5-A 6-0



(17-18) **This questionnaire concerns a(n)** HURRICANE OR TROPICAL STORM

(19-20) **experienced by your family or household in your house or apartment in 19___.**

1. Is the above event correctly described as to type of hazard and year?
PLEASE CIRCLE THE NUMBER WHICH CORRESPONDS TO YOUR ANSWER AND FOLLOW THE INSTRUCTION BELOW YOUR ANSWER.

(21)

1 Yes → SKIP TO QUESTION 3

2 No → PLEASE ANSWER QUESTION 2

2. Please indicate what is wrong with the description of the event.
CIRCLE THE NUMBER WHICH CORRESPONDS TO YOUR ANSWER AND FOLLOW THE INSTRUCTION BELOW YOUR ANSWER.

(22)

1 This hazard never happened to us between 1970 and 1980 → SORRY, WE HAVE MADE A MISTAKE. PLEASE DO NOT ANSWER ANY MORE QUESTIONS AND MAIL THIS QUESTIONNAIRE BACK TO US

2 The type of hazard is right but the year is wrong → THE CORRECT YEAR IS (23-24) → GO ON TO QUESTION 3

3 The type of hazard is wrong but the year is right → THE CORRECT HAZARD IS (25) → GO ON TO QUESTION 3

4 Both the year and hazard are wrong → THE CORRECT HAZARD IS (26) AND THE YEAR IS (27-28) → GO ON TO QUESTION 3

(29-30) **3. In what month did the event happen?** _____

4. Where were you and your family living at that time?
PLEASE CIRCLE ONE RESPONSE BELOW AND FOLLOW THE INSTRUCTION.

(31)

1 Same address as at present

2 Same city or town but a different house or apartment

→ SKIP TO QUESTION 7

3 Different city/ town or county → PLEASE ANSWER QUESTIONS 5 AND 6

5. In what city were you living?

(32-35) _____

6. In which state was this?

(36-37) _____

7. Before the hazard event happened, did you have any warning that the event was going to happen?

(38) 1 Yes → PLEASE ANSWER QUESTIONS 8 AND 9

2 No → SKIP TO QUESTION 10

8. What kind or kinds of warning(s) did you get?
PLEASE CIRCLE "YES" OR "NO" TO EACH TYPE OF WARNING.

	Yes	No	
(39)	1	2	Weather or news reports on radio or TV
(40)	1	2	Neighbors
(41)	1	2	Friend or relative
(42)	1	2	Smoke detection or some other device in the home
(43)	1	2	Siren
(44)	1	2	Police, civil defense or firemen coming to the house
(45)	1	2	Some other way — PLEASE DESCRIBE
			(46-47)

9. What did you and your family or household do in response to the warning?
PLEASE CIRCLE "YES" OR "NO" TO EACH TYPE OF RESPONSE.

	Yes	No	
(48)	1	2	Nothing, thought it was a false alarm
(49)	1	2	Nothing, did not know what to do
(50)	1	2	Nothing, thought it did not apply to us
(51)	1	2	Nothing, but tried to get more information
(52)	1	2	Nothing, did not think the coming event would be serious enough to do anything about it
(53)	1	2	Left the house as quickly as we could
(54)	1	2	Tried to find a safe place in the house
(55)	1	2	We did something else: PLEASE DESCRIBE
			(56-57)

10. Was anyone in your family or household injured or killed or did anyone become physically sick as a result of the event?

(58) 1 Yes → PLEASE ANSWER QUESTIONS 11 AND 12

2 No → SKIP TO QUESTION 13

11. How many people were injured, killed or became physically sick?

(59-60)

GO ON TO QUESTION 12 ON THE NEXT PAGE

12. For each person injured, killed or made physically sick, please answer the following questions in the grid below.
WE HAVE PROVIDED SPACE FOR FOUR (4) PERSONS IF THE NUMBER WAS GREATER THAN FOUR INCLUDE ONLY THE MOST SERIOUS CASES
PLEASE ANSWER EACH QUESTION FOR EACH PERSON

	PERSON A	PERSON B	PERSON C	PERSON D
Age		5-6 6-C		
WRITE AGE IN HERE →	_____ YEARS (61-62)	_____ YEARS (7-8)	_____ YEARS (23-24)	_____ YEARS (39-40)
Sex				
Male	1	1	1	1
Female	2 (63)	2 (9)	2 (25)	2 (41)
Result?				
Injured	1	1	1	1
Killed	2	2	2	2
Physically ill	3 (64)	3 (10)	3 (26)	3 (42)
Treated by Doctor?				
Yes	1	1	1	1
No	2 (65)	2 (11)	2 (27)	2 (43)
Hospitalized?				
Yes	1	1	1	1
No	2 (66)	2 (12)	2 (28)	2 (44)
Unable to Work or go to School for Any Period?				
Yes	1	1	1	1
No	2 (67)	2 (13)	2 (29)	2 (45)
Injury Still Bother Person Now?				
Yes	1	1	1	1
No	2 (68)	2 (14)	2 (30)	2 (46)
Cost of Medical Care (Doctors, Hospital, Medicine) Before Insurance?	$_____ (69-74)	$_____ (15-20)	$_____ (31-36)	$_____ (47-52)
Insurance Paid Any of the Cost?				
Yes	1	1	1	1
No	2 (75)	2 (21)	2 (37)	2 (53)
Anyone Else Pay for the Medical Care?				
Yes	1	1	1	1
No	2 (76)	2 (22)	2 (38)	2 (54)

13. **Did you and your family or household suffer any damage to your house or apartment or damages to your furniture or personal property as a result of the event?**

(56) 1 Yes → PLEASE ANSWER QUESTION 14

2 No → SKIP TO QUESTION 15

14. **What kind of damage or damages did you suffer?**
PLEASE CIRCLE "NO" OR "YES" FOR EACH KIND OF DAMAGE IN THE LIST BELOW
IF YOU ANSWER "YES," FILL IN THE AMOUNT OF DAMAGE.
USE YOUR BEST ESTIMATE IF YOU DON'T REMEMBER THE EXACT AMOUNT

	DAMAGED? No	Yes	AMOUNT OF DAMAGE	
Roof on building?	2	1 →	$	(56, 57-62)
Basement or foundation?	2	1 →	$	(63, 64-69)
Walls or floors?	2	1 →	$	(70, 71-76)
Windows or doors?	2	1 →	$	(7, 8-13) 5-C 6-O
Yard and landscaping?	2	1 →	$	(14, 15-20)
Garage or other building on property?	2	1 →	$	(21, 22-27)
Furnace, air conditioner or hot water heater?	2	1 →	$	(28, 29-34)
Other part of building?	2	1 →	$	(35, 36-41)
Furniture?	2	1 →	$	(42, 43-48)
Clothes?	2	1 →	$	(49, 50-55)
Rugs or curtains?	2	1 →	$	(56, 57-62)
Appliances (stoves, refrigerators, washing machines, etc.)?	2	1 →	$	(7, 8-13) 5-D 6-O
Books or papers?	2	1 →	$	(14, 15-20)
Pets?	2	1 →	$	(21, 22-27)
Radio, TV or stereo?	2	1 →	$	(28, 29-34)
Jewelry?	2	1 →	$	(35, 36-41)
Cars, trucks or other vehicles?	2	1 →	$	(42, 43-48)
Any other personal property?	2	1 →	$	(49, 50-55)

15. **Did you lose any things that were especially valuable because of their sentimental associations and that would be difficult or impossible to replace?**

(56) 1 Yes → PLEASE ANSWER QUESTION 16

2 No → SKIP TO QUESTION 17

16. **Please indicate the kinds of things you lost.**
CIRCLE AS MANY AS APPLY.

(57)	1	Jewelry or personal clothing with sentimental value
(58)	1	Important documents such as diplomas, passports, birth certificates, etc.
(59)	1	Letters and photographs
(60)	1	Heirlooms, antiques and one-of-a-kind furniture
(61)	1	Something else that was irreplaceable PLEASE DESCRIBE _____ (62-63)

17. **Did you have to leave your house or apartment either before or after the event for any period of time?**

(64) 1 Yes, before the event to avoid injuries → PLEASE ANSWER QUESTIONS 18 AND 19

2 Yes, after the event because of damages or injuries → PLEASE ANSWER QUESTIONS 18 AND 19

3 No → SKIP TO QUESTION 20

(65-67) 18. **How long did you have to live somewhere else — how many days?** _____

19. **Where did you stay?**
PLEASE ANSWER "YES" OR "NO" TO EACH TYPE OF PLACE.

	Yes	No	
(68)	1	2	Emergency shelter provided by community or by disaster services
(69)	1	2	Motel or hotel
(70)	1	2	With friends
(71)	1	2	With relatives
(72)	1	2	Someplace else

20. What were the total dollar costs to you and your family that resulted from the event?
PLEASE INCLUDE THE COSTS THAT RESULTED FROM THE INJURIES AND DAMAGES YOU LISTED IN QUESTIONS 12 AND 14, ANY LOSSES OF VALUABLES IN QUESTION 16, COSTS OF LIVING IN OTHER PLACES IN QUESTION 18 AND ANY OTHER EXPENSES YOU HAD AS A RESULT OF THE EVENT

INCLUDE ALL COSTS EVEN IF THEY WERE PAID BY SOMEONE ELSE

PLEASE ESTIMATE IF YOU CAN'T RECALL EXACT COSTS

DO NOT INCLUDE DAMAGES TO FARM BUILDINGS, CROPS OR TO BUSINESSES OR ANY OTHER INCOME PRODUCING PROPERTY

JUST INCLUDE THE DAMAGES TO YOUR HOME, APARTMENT OR HOUSE AND PERSONAL PROPERTY

(73-78) **Total dollar cost:** $_____

5-E
6-O

IF YOU HAD ANY COSTS AT ALL, PLEASE ANSWER QUESTION 21 BELOW

IF YOU HAD NO COSTS AT ALL DUE TO THE EVENT, SKIP TO QUESTION 33 ON PAGE 10

21. At the time the event occurred, did you have any insurance on your property or personal possessions that you thought would cover any of the losses and expenses connected with the event?

(7) 1 Yes — PLEASE ANSWER QUESTION 22

2 No — SKIP TO QUESTION 30

22. Did you file any claims with your insurance company?

(8) 1 Yes — PLEASE ANSWER QUESTION 23

2 No — PLEASE ANSWER QUESTION 24

23. Was the claim honored?

(9) 1 Yes 2 No

PLEASE ANSWER QUESTION 25

24. Why didn't you file a claim?

_____

(10-11) _____

(12-13) _____

SKIP TO QUESTION 30

IF YOU FILED A CLAIM PLEASE ANSWER QUESTION 25 BELOW

25. On the whole, how fairly do you think the insurance company treated your claim?
PLEASE CIRCLE THE ONE NUMBER THAT CORRESPONDS WITH YOUR ANSWER

1 Very fair treatment
2 Somewhat fair treatment
3 Somewhat unfair treatment
4 Very unfair treatment

→ SKIP TO QUESTION 27

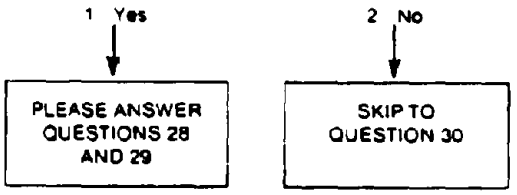
→ PLEASE ANSWER QUESTION 26

26. Did your insurance company do any of the following things?
PLEASE ANSWER "YES" OR "NO" TO EACH ITEM

	Yes	No	
(15)	1	2	Process your claim too slowly
(16)	1	2	Disallow claim unfairly
(17)	1	2	Did not pay enough to replace damaged or lost property
(18)	1	2	Company representative was bad mannered
(19)	1	2	Company did something else that was unfair

27. Did you receive any payments on your claim from your insurance company?

(20)



28. How much of the costs of replacing or repairing damaged property did the insurance company pay?
CIRCLE ONLY ONE ANSWER BELOW

(21)

1 None
2 Less than 10%
3 10% – 29%
4 30% – 49%
5 50% – 69%
6 70% – 89%
7 90% – 100%

29. For what damages did you receive payment from your insurance company?
PLEASE CIRCLE "NO" OR "YES" TO EACH KIND OF DAMAGE LISTED.
FOR EACH KIND OF DAMAGE FOR WHICH YOU RECEIVED PAYMENT, INDICATE THE AMOUNT OF MONEY YOU WERE REIMBURSED.
PLEASE ESTIMATE IF YOU DO NOT KNOW THE EXACT AMOUNT

	RECEIVED PAYMENT? No	Yes	AMOUNT REIMBURSED BY INSURANCE	
Damage to building you lived in	2	1 →	$ _____	(22, 23-28)
Costs of injuries received by persons	2	1 →	$ _____	(29, 30-35)
Damage to personal possessions (clothes, furniture, etc.)	2	1 →	$ _____	(36, 37-42)
Damage to cars or trucks	2	1 →	$ _____	(43, 44-49)
Other damage	2	1 →	$ _____	(50, 51-56)

IF YOU HAD ANY COSTS OR EXPENSES DUE TO THE EVENT, ANSWER QUESTION 30

30. Did you receive any help in paying these expenses from any of the following sources?
PLEASE CHECK "NO" OR "YES" TO EACH SOURCE.
IF YOU RECEIVED MONEY, PLEASE INDICATE THE AMOUNT.
IF THE HELP WAS IN THE FORM OF A LOAN, ENTER THE AMOUNT IN THE "LOAN" COLUMN BELOW.
IF A GRANT OR GIFT, USE THE GIFT COLUMN.

	RECEIVED FINANCIAL HELP? No	Yes	AMOUNT RECEIVED As Loan	As Grant or Gift	
American Red Cross	2	1 →	$	$	(7, 8-19) 5-F 6-C
Relatives	2	1 →	$	$	(20, 21-32)
Small Business Administration business loan	2	1 →	$	$	(33, 34-45)
Small Business Administration personal loan	2	1 →	$	$	(46, 47-58)
Farmers Home Administration	2	1 →	$	$	(59, 60-71)
FDAA (Federal Disaster Assistance Administration)	2	1 →	$	$	(7, 8-19) 5-G 6-0
FEMA (Federal Emergency Management Agency)	2	1 →	$	$	(20, 21-32)
Veterans' Administration	2	1 →	$	$	(33, 34-45)
Unemployment insurance	2	1 →	$	$	(46, 47-58)
Other federal government agency or program	2	1 →	$	$	(59, 60-71)
Local bank or savings and loan	2	1 →	$	$	(7, 8-19) 5-H 6-0
Local community organization	2	1 →	$	$	(20, 21-32)
Church or Synagogue	2	1 →	$	$	(33, 34-45)
State government agency	2	1 →	$	$	(46, 47-58)
Local government agency	2	1 →	$	$	(59, 60-71)
Labor union	2	1 →	$	$	(7, 8-19) 5-I 6-0
Employer	2	1 →	$	$	(20, 21-32)
Some other help (DESCRIBE)	2	1 →	$	$	(33, 34-45)
_____					(46-47)

31. Did you take a deduction from your income tax for the expenses you had in connection with the event?

(48) 1 Yes → SKIP TO QUESTION 33

2 No → PLEASE ANSWER QUESTION 32

32. Why didn't you list the costs in your tax return?
PLEASE CIRCLE AS MANY AS APPLY

(49) 1 Did not know that losses were tax deductible

(50) 1 Did not have enough income to make it worthwhile that year

(51) 1 Insurance payments covered all or most of the losses

(52) 1 Never itemize deductions on my return

33. Was there any interruption in public utilities at your home or in your immediate neighborhood because of the event?
PLEASE CIRCLE "NO" OR "YES" TO EACH UTILITY LISTED BELOW
IF "YES," ENTER THE NUMBER OF DAYS THE UTILITY WAS INTERRUPTED

	INTERRUPTED? No	INTERRUPTED? Yes	NUMBER OF DAYS INTERRUPTED	
Gas	2	1 →	_____	(53 54-56)
Electricity	2	1 →	_____	57 58-60)
Water	2	1 →	_____	(61 62-64)
Sewer	2	1 →	_____	(65 66-68)
Garbage Collection	2	1 →	_____	69 70-72)
Public Transportation	2	1 →	_____	73 74-76)
Telephone Service	2	1 →	_____	77 78-80)

34. As a result of the event, were any other homes or apartments damaged on your block or in your neighborhood?
CIRCLE "NO" OR "YES" TO EACH AREA BELOW
IF "YES," ENTER THE NUMBER OF HOMES DAMAGED – ESTIMATE IF YOU ARE UNSURE

	OTHER HOMES OR APARTMENTS DAMAGED? No	OTHER HOMES OR APARTMENTS DAMAGED? Yes	NUMBER OF OTHER HOMES OR APARTMENTS DAMAGED	
Your block	2	1 →	_____	8-13 5-C / 6-C
Your neighborhood	2	1 →	_____	14 15-20
Your city or town	2	1 →	_____	21 22-27

35. **Several private groups and government agencies offer help to victims of disasters and fires. In connection with this event, did any of the following agencies contact you or did you contact them?**

PLEASE CIRCLE "NO," "NOT SURE" OR "YES" TO EACH GROUP OR AGENCY CONTACTED

FOR EACH AGENCY WITH WHICH YOU HAD CONTACT, CIRCLE YOUR DEGREE OF SATISFACTION WITH THE CONTACT – "HIGH," "MEDIUM" OR "LOW"

CIRCLE "NO" OR "YES" AS TO WHETHER YOU RECEIVED ANY ACTUAL HELP FROM THE CONTACTED AGENCY

	WERE YOU CONTACTED?			SATISFACTION WITH CONTACT?			RECEIVE ANY HELP?		
	No	Not Sure	Yes	High	Medium	Low	Yes	No	
Fire Department	2	3	1	1	2	3	1	2	(28, 29-30)
Local, County, Sheriff or State Police Department	2	3	1	1	2	3	1	2	(31, 32-33)
American Red Cross	2	3	1	1	2	3	1	2	(34, 35-36)
National Guard	2	3	1	1	2	3	1	2	(37, 38-39)
Salvation Army	2	3	1	1	2	3	1	2	(40, 41-42)
Local church or synagogue	2	3	1	1	2	3	1	2	(43, 44-45)
Federal Disaster Assistance Agency (FDAA)	2	3	1	1	2	3	1	2	(46, 47-48)
Local welfare department	2	3	1	1	2	3	1	2	(49, 50-51)
Small Business Administration	2	3	1	1	2	3	1	2	(52, 53-54)
Farmers Home Administration (FHA)	2	3	1	1	2	3	1	2	(55, 56-57)
Civil Defense	2	3	1	1	2	3	1	2	(58, 59-60)
Federal Emergency Management Administration (FEMA)	2	3	1	1	2	3	1	2	(61, 62-63)
Labor union	2	3	1	1	2	3	1	2	(64, 65-66)
Veterans' Administration	2	3	1	1	2	3	1	2	(67, 68-69)
Military units of the Regular Army	2	3	1	1	2	3	1	2	(70, 71-72)
Local hospital	2	3	1	1	2	3	1	2	(73, 74-75)
Local civic organizations (e.g., Lions, Kiwanis, Chamber of Commerce, etc.)	2	3	1	1	2	3	1	2	(7, 8-9) [5-K / 6-O]
Mennonite Relief Organization	2	3	1	1	2	3	1	2	(10, 11-12)
Local public works department	2	3	1	1	2	3	1	2	(13, 14-15)

36. Did you get any help from friends or relatives?
PLEASE CIRCLE "NO" OR "YES" TO EACH SOURCE OF HELP
IF "YES" TO HELP, CIRCLE THE KIND OR KINDS OF HELP RECEIVED

	RECEIVED HELP?			KIND OF HELP (CIRCLE AS MANY AS APPLY)				
	No	Yes		Shelter	Loans	Gifts	Labor	
Friends	2	1	→	1	1	1	1	(16 17-20)
Relatives	2	1	→	1	1	1	1	(21 22-25)
Neighbors	2	1	→	1	1	1	1	(26 27-30)
Church or Synagogue	2	1	→	1	1	1	1	(31 32-35)
Co-workers	2	1	→	1	1	1	1	(36 37-40)
Employer	2	1	→	1	1	1	1	(41 42-45)

37. How long did it take you to fix up your house and get repairs done to be as comfortable as you were before the event?

(46)

1 Damage too much to repair

2 No time at all because little or no damage

3 At least a few days to repair

(47-49) **38. How many days?** _____

(50-52) **39. All told, how long did it take for you and your family to settle back into your routine, after the event — how many days?** _____

40. As a result of the event, did any of the following happen to you or your family?
PLEASE CIRCLE "NO" OR "YES" TO EACH ITEM.

	No	Yes	
(53)	2	1	Went into debt borrowing money to pay for medical bills
(54)	2	1	Went into debt to pay bills for repairs to property or replacement of things destroyed
(55)	2	1	Was unemployed for more than a week because of damage to the place where you worked
(56)	2	1	Became depressed over the event
(57)	2	1	Decided to move because it was too dangerous living in that location
(58)	2	1	Looked into getting more insurance coverage for events of that sort
(59)	2	1	Had to use up our savings to pay for losses and expenses
(60)	2	1	Had to sell some of our things to pay for losses and expenses
(61)	2	1	Had to get an additional mortgage (or bigger mortgage) to finance repairs to my house
(62)	2	1	Went into debt so deeply to pay for damages and/or injuries that we had to go without a lot of necessities to pay back our debts

41. At the time the event occurred, did you own or rent your house or apartment?

(63)

1 Rent

↓

41a. What was your monthly rental, excluding utilities?

$ _____
(64-69)

2 Own

↓

41b. What was the approximate value of your home — what price do you think you could have sold it for at at the time?

$ _____
(70-75)

FAMILY BACKGROUND QUESTIONS

42. What is the make-up of your household?
PLEASE ENTER BELOW THE RELATIONSHIP TO YOU AND THE AGE OF EACH PERSON LIVING IN YOUR HOUSEHOLD USING CIRCLES, INDICATE THE SEX OF ALL PERSONS, WHETHER OR NOT THEY ARE EMPLOYED AND WHETHER OR NOT THEY WERE LIVING WITH YOU AT THE TIME OF THE EVENT
START WITH YOURSELF ON THE FIRST LINE

5-6
6-7

RELATIONSHIP TO YOU	AGE	SEX MALE	SEX FEMALE	EMPLOYED? Yes	EMPLOYED? No	LIVED IN HOUSEHOLD AT TIME OF EVENT? Yes	LIVED IN HOUSEHOLD AT TIME OF EVENT? No	
YOURSELF	___	1	2	1	2	1	2	(7-11)
	___	1	2	1	2	1	2	(12-16)
	___	1	2	1	2	1	2	(17-21)
	___	1	2	1	2	1	2	(22-26)
	___	1	2	1	2	1	2	(27-31)
	___	1	2	1	2	1	2	(32-36)
	___	1	2	1	2	1	2	(37-41)
	___	1	2	1	2	1	2	(42-46)

43. How much formal education have you had?
PLEASE CIRCLE ONLY ONE ANSWER BELOW

1 Did not graduate from high school (47)
2 High school graduate
3 Some college
4 College graduate
5 Graduate or professional training beyond college graduate

44. Do you own or rent the house or apartment you are living in now?

1 Own (48)
2 Rent

45. Do you have any of the following kinds of insurance coverage at the present time?
PLEASE CIRCLE 'YES' OR 'NO' TO EACH KIND LISTED BELOW

	Yes	No	Not Sure	
(49)	1	2	3	Automobile liability
(50)	1	2	3	Fire insurance for house or apartment structure
(51)	1	2	3	Fire insurance on furniture and possessions
(52)	1	2	3	Flood insurance
(53)	1	2	3	Earthquake insurance
(54)	1	2	3	Windstorm insurance
(55)	1	2	3	Burglary insurance on furniture and possessions
(56)	1	2	3	Medical expenses insurance

46. What was your total family or household income in 1979 and what was it in the year you experienced the event?
CIRCLE THE APPROPRIATE NUMBER FOR 1979 AND THE YEAR OF THE EVENT

	TOTAL FAMILY OR HOUSEHOLD INCOME	
	1979	Year of Event
(57-58)		
Under $5,000	0	0
$5,000 to $7,499	1	1
$7,500 to $9,999	2	2
$10,000 to $12,499	3	3
$12,500 to $14,999	4	4
$15,000 to $19,999	5	5
$20,000 to $24,999	6	6
$25,000 to $29,999	7	7
$30,000 to $39,999	8	8
$40,000 or over	9	9

47. What is your family's racial background?
PLEASE CIRCLE ONLY ONE ANSWER BELOW

(59)

1 White
2 Black
3 Hispanic
4 Oriental
5 American Indian
6 Other

48. Very often, when a hazard event occurs, other hazards are present, for example, an earthquake which causes a fire or a tropical storm which causes a flood.
PLEASE CIRCLE BELOW EVERY HAZARD THAT WAS PRESENT

(60) 1 Fire
(61) 1 Flood
(62) 1 Landslide
(63) 1 Hurricane
(64) 1 Tropical storm
(65) 1 Tornado
(66) 1 Windstorm
(67) 1 Earthquake
(68) 1 Lightning

THANK YOU VERY MUCH FOR ANSWERING THIS QUESTIONNAIRE.
PLEASE PLACE IT IN THE ADDRESSED, POSTAGE PAID ENVELOPE AND MAIL TO US

FOR OFFICE USE ONLY

69	70	71	72	73	74	75	76	77	78

References

American National Red Cross
1959-77 Annual Summaries of Disaster Services Activities (ANRC National Office, mimeo'd).

Brinkman, Waltraud A.R.
1975 Severe Local Storm Hazard in the United States: A Research Assessment. Boulder, CO: Institute of Behavioral Science Monograph #NSF-RA-E-75-011.

Cochrane, Harold L.
1975 Natural Hazards and Their Distributive Effects. Boulder, CO: Institute of Behavioral Sciences Monograph #NSF-RA-E-75-003.

Comptroller General of the United States
1977 California Drought of 1976 and 1977 -- Extent, Damage, and Governmental Response. Washington, DC: General Accounting Office.

Dacy, Douglas and Howard Kunreuther
1969 The Economics of Natural Disasters: Implications for Federal Policy. New York: Free Press.

Dillman, Donald A.
1978 Mail and Telephone Surveys. New York: John Wiley.

Hebert, Paul J. and Glenn Taylor
1975 Hurricane Experience Levels of Coastal County Populations -- Texas to Maine. U.S. Department of Commerce, National Oceanic and Atmospheric Administration.

Kunreuther, Howard, et al.
1977 Limited Knowledge and Insurance Protection: Implications for Natural Hazard Policy. Philadelphia, PA: The Wharton School, University of Pennsylvania. Draft report (mimeo'd).

National Oceanic and Atmospheric Administration
1977 Johnstown, Pennsylvania Flash Flood of July 19-20, 1977: A Report to the Administrator. Washington, DC: U.S. Department of Commerce.

Office of Management and Budget
1978 The United States Budget in Brief: FY 1978. Washington, DC: U.S. Government Printing Office.

Rossi, Peter H., James D. Wright, and others
1982 Natural Hazards and Public Choice: The State and Local Politics of Hazard Mitigation. New York: Academic Press.

United States Department of Commerce
1973 Statistical Abstract of the United States. Washington, DC: U.S. Government Printing Office.

Warrick, Richard A.
1975 Drought Hazard in the United States: A Research Assessment. Boulder, CO: Institute of Behavioral Science Monograph #NSF-RA-E-75-004.

White, Gilbert F. and J. Eugene Haas
1975 Assessment of Research on Natural Hazards. Cambridge, MA: MIT Press.

Wright, James D., Peter H. Rossi, Sonia R. Wright, and Eleanor Weber-Burdin
1979a After the Clean-Up: Long Range Effects of Natural Disasters. Beverly Hills, CA: Sage Publications.

Wright, James D., Peter H. Rossi, and others
1979b The Apathetic Politics of Natural Hazards. Amherst, MA: Social and Demographic Research Institute (mimeo'd).