HOMEOWNER FLOODPROOFING BEHAVIOR II:

EDUCATIONAL INTERVENTIONS AND OTHER INFLUENCING FACTORS

Prepared for
the

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TABLE OF CONTENTS

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EXECUTIVE SUMMARY

This report is the second in a series on how and why homeowners floodproof their properties. Floodproofing can include one or more alterations to a yard, building, or contents to reduce the susceptibility to flood damage. Examples of floodproofing include filling or grading to keep surface waters away from the house, installing sewer backup valves, and moving appliances, furnaces, and electrical circuits out of the basement.

The first report, Homeowner Floodproofing Behavior, was based on a survey of 550 victims of the 1986 flood in the Chicago suburban area. It focused on what measures were undertaken, how effective they were, how they were financed, demographic information on who did them, and how the homeowners learned about them.

The Chicago suburban area was hit by a second flood in 1987. Using the lessons learned from the first report, the Illinois Division of Water Resources and the Federal Emergency Management Agency conducted two "educational interventions" to promote homeowner floodproofing:

1. Three evening "open houses" were held within two weeks of the flood. Residents were invited to drop in to see a slide show on floodproofing and talk to government experts and contractors.

2. "Mitigation Tables" were established at the Disaster Application Centers (DACs). Flood victims seeking disaster assistance reviewed their building and flood situation and were given advice on how damages could be reduced from a similar flood.

A sample of those who attended these two interventions (440 of the 6,200) was surveyed one year later. To measure the impact of the programs, a third control group was also surveyed. Because the programs were made available to all the Chicago area flood victims, the control group had to be from a different area. Suburban Milwaukee had had two similar storms and a sample of flood victims were surveyed. However, it turned out that there were enough differences in demographic, building, and flood characteristics that comparisons between the control group and the two intervention groups are not dependable.

The research confirmed many of the findings of the first survey. There was an even higher rate of floodproofing: 63% vs. 49% after the 1986 flood. This is probably due to the facts that this was the second flood and the shallower waters made more measures more feasible. The research found strengths and weaknesses in both of the educational interventions. These findings are detailed in Section 4 of the report.

This Executive Summary uses the results of this second survey to address conclusions drawn on the possible role of government agencies. Two questions are most important: How can the government most effectively promote floodproofing? and Does financial assistance make a difference?

Promoting Floodproofing

The survey findings show six key factors that should be included in a program to promote floodproofing or advise property owners on how to floodproof:

1. Recommended floodproofing measures must be appropriate for the building and the flood hazard. There are many situations, particularly in deep or fast moving water, where floodproofing is not appropriate. Caution must also be taken to prevent dry floodproofing basements without accounting for hydrostatic pressures. It is particularly important that homeowners be convinced that a floodproofing measure will be effective.

2. The measures recommended must be "realistic," that is appropriate for the area's housing conditions and the owner's financial condition. Elevating a house 6 feet higher than the neighbor's or spending more money than the building is worth may not be considered realistic. Conversely, examples of successful floodproofing projects in the neighborhood show people what really works.

3. Homeowners must be convinced that they will be flooded again someday and that the government has done or is doing all it can. In other words, they must understand that it is up to them to protect themselves from a certain return of floodwaters.

4. The information must be provided in an appropriate format immediately after a flood. The information should be presented so owners learn about the options and make their own decisions. Tangible and local examples of floodproofing (e.g., having a standpipe on display) are preferred over pictures in a book. Caution must be taken to avoid being too complicated or technical.

5. Homeowners desire direct one-on-one consultations to learn about floodproofing and then later to confirm their preliminary conclusions about which measures are best. They desire consultations with both contractors and government experts.

6. A strategy should be developed that uses several informational approaches that reinforce each other. The message can be delivered through the media, in a homeowner's handbook, on a video tape, through statements of support from local officials, at open houses, at the Disaster Application Centers, and via contractors. A coordinated effort that explains the appropriate measures, encourages people to prepare for the next flood, provides successful examples from the community, and offers direct consultation should be most effective.

Financial Assistance

This study, combined with the first survey, has revealed the following facts about financial assistance:

1. Those who had floodproofed before the 1986 flood were less likely to receive a flood insurance claim in 1986; those who had floodproofed after the 1986 flood and were flooded again in 1987, were less likely to apply for disaster assistance.

2. The cost of a floodproofing measure affects whether it will be implemented. People are most likely to have already implemented the less expensive measures. Two-thirds of the flood victims want to do more floodproofing. The first study showed that cost was the number one reason people gave as to why they had not undertaken a measure they wanted. This study shows a correlation between the measures the owners wanted but had not installed and their cost.

3. This study found that income affects floodproofing:

   a. People with higher incomes undertook more floodproofing measures and spent more on floodproofing. There is no similar finding for education and other related demographic characteristics.

   b. The floodproofing measures taken by people with higher incomes were more appropriate and effective. Those homeowners with higher incomes are better protected.

   c. People with higher incomes were able to take better advantage of the educational interventions. They had a significantly higher floodproofing rate than the lower income people who attended an open house or mitigation table.

4. While less expensive measures are sought by homeowners, the appropriateness and effectiveness of measures are more important to them than cost. They perceive that a cut-rate measure is a waste of money if it fails during a flood.

Floodproofing is best promoted after a flood when repairs are being made and the owners are in the right frame of mind. However, this is the time when the owners are in the worst financial condition. Financial assistance to floodproof at that time could make a difference in whether flood victims floodproof and whether the measures they implement are adequate to protect them from future damage. Furthermore, floodproofing has been shown to reduce the need for continued disaster assistance and flood insurance payments.

I. INTRODUCTION

This is Part II of a four-part study of homeowner floodproof retrofitting--changes made by homeowners to their homes after construction and frequently only after the homes have been flooded to prevent future flood damage. The first phase of the project had as its goals to ascertain the rate of retrofitting occurring and to describe a variety of characteristics about the retrofitting behavior and those who had done it.

The second phase of the study has as its goals: 1) to refine what is known about flood victim floodproofing behavior, 2) to assess the effect of two government educational interventions on floodproofing and 3) to recommend intervention configurations on the basis of the findings.

The third phase will involve conducting in-depth interviews (rather than using mail surveys with closed-ended questions) in order to better understand the retrofitting decision-making process. The fourth phase will be a compilation of the findings from the first three phases (plus those of an earlier retrofitting study conducted in Louisiana) into a monograph. Included in the monograph will also be chapters by practitioners at all levels of government assessing whether government should play a role in retrofitting and if so, what should that role be.

Prior to these studies, little was known about homeowner post-flood retrofitting behavior. In fact, it was thought by many that homeowners generally were unwilling to undertake individual protective actions because they believed: 1) that it was the government's responsibility to solve flooding, 2) that area-wide structural solutions were better than individual solutions and 3) that the government was going to be able to provide such structural solutions.

Part I confirmed that homeowner flood victims still believed that the government had a responsibility to protect communities from flooding and that area-wide structural solutions were better than individual measures. What was debunked was that these beliefs were incompatible with retrofitting. Because the flood victims studied no longer believed so confidently that the area-wide structural solutions were forthcoming, they were actively seeking and implementing individual solutions while still desiring and working toward the structural ones.

The first study indicated flood victims have a strong interest in retrofitting, especially for basement flooding. It also provided many details about the exact measures taken, timing of implementation, cost, source of funding and source of

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* Copies of the full report and summary are available from the Office of Disaster Assistance Programs, FEMA.

information about retrofitting, who supervised/actually implemented the measures and their success. Questions were also asked the flood victims about ways in which the government might assist victims in the retrofitting process.

Also studied in the first phase were two government educational interventions which were implemented in pilot form immediately after the 1986 flood. However, because there had been some difficulty in determining from the records kept which flood victims had been exposed to the interventions and which ones had not, we were not confident that the findings about the interventions were accurate. It was hoped that during the next major Illinois flood the interventions could be implemented more fully and with detailed records kept of those who participated. Unfortunately, the opportunity to accomplish this came only too soon when a second major flood struck the northwestern Chicago suburbs 10 months later in August, 1987. It was possible through study of these 1987 flood victims to continue discovering more about the retrofitting process and to assess the impact of the educational interventions.

Open Houses

The first educational intervention implemented during the 1987 flood recovery is the floodproofing open house. Conceived following the 1981 disaster declaration for the southern Chicago suburbs, it was designed to provide direct advice to property owners about retrofitting. At the meeting held in the evening in a public building in a flooded community a slide show is presented based on the Protect Your Home manual prepared by the Illinois Division of Water Resources. Attendees then visit with government experts (e.g. the Corps of Engineers, FEMA, health department representatives, building inspectors, other officials knowledgeable on retrofitting). Contractors experienced in flood protection measures are also present with appropriate displays to demonstrate their products.

The open houses were designed to incorporate approaches found useful in previous research on the ways to influence behavioral change--in this case to encourage effective individual home retrofitting. Several reviews encompass much of these findings (Planning and Management Consultants, 1980; Cook and Berrenberg, 1981; Sims and Baumann, 1983; Sorensen and Mileti, 1987).

The strategies deemed important in this project and their implementation in the open houses are:

1) To provide scientific information (Sorensen and Mileti, 1987) about flooding conditions in a clear fashion (Planning and Management Consultants, 1980).

- Implemented by the beginning part of the slide show.

2) To explain carefully what the desired behavior is (Planning and Management Consultants, 1980).

- Again, the slide show presentation.

3) To give practical instructions as to how to accomplish the desired behavior (Sorensen and Mileti, 1987) so that any attitude changes accomplished by the scientific information will be followed by "attitude-consistent behavior" (Cook and Berrenberg, 1981).

- Slide show, experts at booths, contractors.

4) To provide models of the behavior desired in a simple format (Sorensen and Mileti, 1987) and to try to facilitate its implementation (Sorensen and Mileti, 1987; Cook and Berrenberg, 1981).

- Same as #3.

5) To present information in a format which enhances the credibility of the message (Planning and Management Consultants, 1980).

- Sponsorship by state and local government.

6) To demonstrate the benefits (symbolic incentives) (Cook and Berrenberg, 1981) in economic terms as well as in terms of emotional, timesaving, and other benefits.

- Same as #3.

7) To try to get behavior reinforced socially (Planing and Management Consultants, 1980)

- Evening meeting with attendees able to socialize and view retrofitting measures while talking with neighbors and friends.

8) To provide the information in time to be useful for decisions being made about the desired behavior.

- Holding the open houses as soon after the flood as possible.

Such open houses were implemented in October, 1986, within a week after the flooding and then ten days after the floods of August, 1987. Three open houses were held in 1987 which were attended by 450 area residents (see Appendix A for a detailed description of Open House procedures).

Mitigation Tables

Following the December, 1982 floods in downstate Illinois, the Illinois Division of Water Resources provided a flood hazard

mitigation expert at several disaster assistance centers (DACs). These experts were co-located with the map readers and provided advice on acquisition, relocation, and elevation of buildings--those activities appropriate for the deeper flooding in the affected areas which are also those activities for which financial assistance was easiest to obtain. Mitigation experts were also co-located with the map readers after the 1986 Chicago flood but funding restricted the amount of time they could be there. Thus, only one quarter of the flood victims who visited the DACs were given direct consultation.

The 1987 implementation of the mitigation table was a more sophisticated and extensive version of the earlier ones. Independent mitigation tables were established at all of the DACs staffed initially by state employees, FEMA reservists and consultants, all of whom had retrofitting knowledge and had participated in a training session. During the end of the period when the DACs were open, other reservists who had less retrofitting knowledge had to be placed at the mitigation tables (see Appendix B for a detailed description of the mitigation tables).

In addition to approaches found successful in other projects which were implemented in the open house, others were also included in the mitigation table format:

1) To make the advice as directly applicable to the flood victim's particular flood situation.

- Each attendee was asked to describe the design of their home so that the appropriate diagram could be used to suggest retrofitting measure.

2) To offer the advice in a one-on-one conversation rather than a group presentation in order to be able to mold the information to the individual's needs and to answer specific questions as they arise.

- Each attendee spent on the average of 10 minutes with a retrofitting counselor.

3) To deliver the technical information in a non-threatening way in the belief that <u>how</u> it is communicated is as important as <u>what</u> is communicated.

- Each counselor took care to explain the measure in non-technical terms if the attendee showed a lack of technical knowledge.

4) To show interest and concern for each flood victim's plight rather than making a routinized, formal presentation. This lends credibility to the topic and the advice given.

- Retrofitting counselors wore handwritten name tags and listened to generalized concerns from the flood victim before directing the conversation to retrofitting.

At the end of the first 13 days of DAC operation, a total of 5,733 people of the 8,126 DAC visitors were counseled. This represents 70% of all people entering the DAC's.

Anticipated Limitations and Outcome

Certain limitations were expected to reduce the influence of the two educational interventions. For example, the open houses did not provide one-on-one retrofitting consultations to the extent necessary to address each flood victim's unique flooding problems. It was also believed that the open houses might have been held too early after the flood to permit those most seriously flooded to attend because they were still involved in the basic cleanup of their homes.

Different limitations were known about the mitigation tables. Flood victims occupied with completing forms and dealing with several officials about various needs may not be in a frame of mind to pause for retrofitting assistance. Also, some may have already begun their damage repairs before attending a DAC and thus had passed the "window of opportunity" with regard to retrofitting counseling. Also, the training sessions to which the experts were exposed just before staffing the mitigation tables may not have been adequate to inform them of the unique conditions of the flooding and thus the appropriate retrofitting measures to recommend.

Despite these known factors that might have reduced the positive effect of the interventions, it is believed that both the open houses and the mitigation tables approximated the realistically best effort that could be implemented given cost, logistical and time constraints. It is believed, thus, to be an appropriate test of their effectiveness which will be measured principally by a higher rate of retrofitting by those counseled. Two other measurable possible differences is that the number of measures undertaken per person counseled would be higher and the amount of money spent on retrofitting would be greater. Effectiveness of the measures implemented in preventing future flooding, while a desirable test of the interventions, would not be possible unless the area experiences another flood in the future.

II. DESCRIPTION OF THE FLOODS

Illinois, August, 1987

An all-time record was established for Chicago area precipitation when 9.35 inches of rain fell at O'Hare International Airport from 9:16 p.m., Thursday, August 13 to 2:45 p.m., Friday, August 14. Record rainfall amounts were also experienced in the city of Chicago and the suburbs within a 10 to 15 mile radius of O'Hare.

Widespread flooding resulted. The areas most acutely affected were the communities on the Des Plaines River and its largest tributary, Salt Creek. O'Hare Airport was surrounded by water, making roadways impassable. Arterial traffic around O'Hare was stalled all day long on Friday, August 14; portions of the Kennedy and Edens Expressways had 300 vehicles stranded in waters up to six feet deep.

Flash flooding began at approximately 7 a.m. Friday and continued until 11 a.m. General flooding occurred after that time. The Des Plaines River crested at Des Plaines at 3:30 a.m. Saturday morning, August 15 and at 1 p.m. the same day 16 miles downstream at Riverside.

Because of the record flooding and flooding in areas not mapped as Special Flood Hazard Areas, thousands of people were caught unaware. Preliminary estimates are that 16,000 buildings were damaged. Sixty-six percent of the damaged properties had basement flooding only. Twenty-six percent had floodwaters over the first floor with less than 3 feet deep, and 8 percent had floodwaters over 3 feet over the first floor.

In spite of the vast number of flooded basements, there were relatively few wall or floor failures. This may be due to the construction techniques used in the Chicago area to protect basements from high ground water levels. Where there was overland flow, pumps could not keep up with the sewer inflow and seepage so basements flooded before hydrostatic pressure could build up.

Wisconsin, September, 1986

During the month of September the southern two-thirds of the state experienced record rain. On September 9, showers and thunderstorms developed during the day and continued into the night dropping from 1 to 2 inches in a west to east path across the central part of the state. This rainfall served to soak the ground thereby setting the stage for the flooding caused by the downpours that followed.

Heavy rains began the evening of the 10th and continued through the morning of the 11th. This was part of the same weather front that continued eastward and devastated a large section of central Michigan. Flashflooding occurred in central, east-central, south-central, and southeast Wisconsin. Hardest hit were Fond du Lac, Dodge, Washington, Ozaukee counties and northern Milwaukee County. Two-day totals for the period ending on the 11th amounted to 4.5 inches in many parts of Milwaukee County.

Another round of rain fell on the evening and morning of the 14th and 15th. This added another half to one inch of rain throughout the affected area. While this period represented the most severe period of the month, the rain was far from over. Intermittent light rain and drizzle fell from September 17th through the 19th. The heavy rains and thunderstorms returned on the night and morning of September 20th and 21st.

Early Monday morning, on September 22, new storms developed in east-central Wisconsin. The storms continued through the southeastern portion of the state. On the 26th storms struck the eastern portions of the state dropping from 1 to 4 inches.

These heavy rainfalls caused a multitude of problems. Rivers rose to record high levels for September. The Fox, Chippewa, Rock, Trempealeau, Black, Milwaukee, Wisconsin, Mississippi, Root, Pecatonica, Yellow, and Fond du Lac Rivers were at or above flood stage during the month of September. Many communities had to deal with not only repeated basement and street flooding and sewer backup but also with riverine flooding.

III. RESEARCH METHODS

The Sample

Three separate samples were drawn: one for the open houses, a second for the mitigation tables and a third for the control group.

Registration forms were completed by 264 of the approximately 450 open house attendees. All were included in the sample.

All DAC attendees who were counseled on a one-on-one basis by the mitigation table staffs were listed by DAC identification number on a control sheet at the table (see Appendix B). Lists from four of the six DACs comprised the sampling frame from which the mitigation table sample was drawn. These DACs were selected because they contained a variety of flood experience characteristics: two of the DAC areas had overlap with the 1986 flood, two did not; all four had a variety of depths and surface/subsurface flooding configurations.

The four DACs used were: Addision, Wheaton, Des Plaines and Melrose Park. Norridge and Skokie were not included in the sampling frame because they experienced primarily sewer back-up and were not affected in 1986. If they had been included, the sample would have been heavily skewed to these two characteristics.

A systematic sample of every 13th case was selected from the control sheets of the four DAC mitigation table control lists. This yielded a sample size of 304, approximating the necessary sample size to assure a confidence level of +/- 5 percent.1

The control group was selected from the flood victims who attended the DACs after the September, 1986 Milwaukee floods. The reason for selection of this group for the control group was that it was believed the type of flooding was similar to the Chicago floods, the locations were in the same geographic region, and they were both urban/suburban as opposed to rural. It was also believed that they were similar in terms of educational and income characteristics (which was found not to be the case as described in section IV A of the findings).

The number of DAC attendees after the September, 1986 flood was 1,476. Some of these had also been flooded a month earlier as well. In order to be assured that the control group contained flood victims who had been flooded more than once--a characteristic linked with floodproofing in the previous study and expected to occur in the suburban Chicago experimental groups (due to overlap with the October, 1986 flood), all who had

registered at both the August and September DAC's were included in the sample. This number was 111. The remainder of the desired sample size of 306 for a +/- 5 percent confidence level were drawn systematically from the 1,365 remaining.

The combined sample contained 874 persons. The disposition of the sample is:

874 persons selected
- 58 returned by post office (moved or incorrect address)
816 persons received questionnaires

529 returned (65% of those who received surveys)
- 34 unable to use (renters, condos, etc.)

495 used in analysis (61% of those who received surveys)

subsamples:

181 mitigation table attendees
161 open house attendees
147 Milwaukee DAC attendees

It is expected that the somewhat lower return rate than obtained in the first study (of the suburban Chicago flood of October, 1986) was due to the delay in sending out the surveys (October, 1988 instead of on the anniversary of the flood in the late summer). This was due to computer difficulties which arose in pulling the Milwaukee and Illinois mitigation samples from the DAC records.

The greatest loss in sample was the return of 41 of the 58 from the post office in Milwaukee. It appears from the characteristics of the Milwaukee respondents that not only did some residents move during the two years since the floods due to the flooding but also due to normal family life cycle changes. There is a disproportionate number of young families and widows in the Milwaukee sample.

The Questionnaire

A 12-page, 59-item, self-administered questionnaire was utilized for the Illinois sample (see Appendix C). Wisconsin respondents received the same survey except that the section on evaluation of the educational interventions (10 questions) was eliminated and replaced by one matrix question on ways the government could inform flood victims about retrofitting. Six questions were open-ended; the remainder were closed. A pretest of the survey mailed to 50 respondents selected systematically from the samples permitted the closure of the questions with answers provided appropriate to the expected responses. This facilitates the coding and analysis phases of the project.

The questionnaire contained sections examining the following

topics: 1) nature of flooding experienced, 2) floodproofing experiences, 3) important qualities of floodproofing, 4) sources (actual and desired) of floodproofing information, 5) assessment of educational interventions, and 6) sociodemographic characteristics of respondents.

The "total design method" developed by Dillman (1978) was utilized. The procedure entails preparing a cover letter and survey instrument which are non threatening and encouraging of a response. A postcard reminder is mailed to each person in the sample one week after the initial mailing and a second questionnaire is mailed two weeks after the postcard to individuals who have not responded. The Illinois surveys were mailed with letterhead and envelopes from the Illinois Division of Water Resources, the Wisconsin from the Wisconsin Department of Natural Resources and signed by respective floodplain management officials (see Appendix C). The self-addressed and stamped envelopes were returned to the University of New Orleans in order to assure confidentiality.

Data were entered by terminal to create the data files for computer analysis with the SPSS-X statistical package on a DEC VAX 8300 mainframe computer. Additional variables were computed using the same software. They are explained as used in the Findings section (IV). See Appendix E (bound separately) for the frequencies for all coded variables used. In addition, the open-ended responses were listed by ID for summarization and analysis. These summaries are included in the Findings section where appropriate.

IV. FINDINGS

A. DESCRIPTION OF VICTIMS AND FLOOD EXPERIENCES

Analysis of the findings for this study must begin with a description of the respondents and their flood experiences. This is in order to place the floodproofing observed within the context in which it took place. It is not yet known how universal (within the United States) floodproofing behavior is. Thus, at this stage of research on the topic, the findings must be qualified as to the type of flood victim being observed retrofitting and the particular flood experiences which they have had. This information will be presented in a comparative manner separating the Illinois and Wisconsin respondents.

Victim Characteristics

Respondents from Illinois varied significantly from the Wisconsin group. Illinois respondents were considerably more affluent (see Table 1 in Appendix D), and better educated (Table 2). Almost half of the Illinois respondents earn over $40,000 while only 13 percent of the Wisconsin residents do. The Wisconsin respondents were older--almost a third 60 or over while more Illinois respondents were in the 40-49 year age category (Table 3); more likely to be female--two thirds versus one third of Illinois (Table 4); and in single-headed households rather than couples--45 percent versus 25 percent of the Illinois respondents (Table 5). While income and education have not been found to be significantly associated with retrofitting--nor are they in this study, age/gender/household type when combined do demonstrate some differences which will be discussed below (see section IV C below).

Flood and Damage Experiences

The flood and damage experiences between the two groups were more similar but still demonstrated some differences. The Wisconsin flood victims are more likely to have full basements -- 93 percent versus 67 percent for Illinois, while the Illinois respondents have a greater variety of house foundations, especially split level (Table 6). More Illinois respondents reported that they had had first floor (surface) flooding--92 versus 80 percent for Wisconsin (Table 7)--and that the water had entered their homes through doors and windows--52 versus 25 percent for Illinois (Table 8).

However, when surface flooding is measured simply by whether the flood victim experienced any surface flooding or not, the two groups are very similar with about 60 percent of both groups experiencing it (Table 9). The same holds for subsurface

flooding with about 70 percent of both groups having been flooded by subsurface water (Table 10).

While both groups experienced similar amounts of surface and subsurface flooding, there is a significant difference between the two groups with regard to the depth of the water regardless of its source (Figure 1). While over one half of the Illinois respondents had greater than three feet of water in their basement or had water on the first floor only one quarter of the Wisconsin respondents did. This difference is reinforced by the different amounts of damage which they experienced (Figure 2). About one third of the Illinois respondents reported damage over $16,000 while only 5 percent of the Wisconsin respondents did. This difference, however, may be due to not only differences in severity but also in the actual value of their homes, the Illinois respondents being more likely to have expensive ones.

Finally, the original Illinois estimates of the rate of repeated flooding for the Illinois flood victims had been too high. Only 8 percent of the Illinois respondents indicated that they had attended the DAC during the October, 1986 flood (Table 11). Thus, the one third rate of repeated flooding which had been "forced" for the Wisconsin sample made the difference significant.2

B. RETROFITTING ACTIONS

Because little had been known about homeowner floodproofing prior to this research project, some questions about floodproofing actions asked on the first questionnaire were repeated to confirm the earlier findings. In addition to these repeated questions about retrofitting, four other dimensions of retrofitting were explored: 1) important qualities of retrofitting, 2) whether a homeowner will make retrofitting known to prospective buyers, 3) perceived responsibility of a homeowner to protect home and 4) effectiveness of specific retrofitting measures.

Degree and Nature of Retrofitting Actions

The high rate of retrofitting observed after the 1986 flood appears not to be an aberration. In fact, the rate of retrofitting after the 1987 flood was even higher at 63 percent than the 1986 rate of 49 percent (66 percent when it includes moving items upstairs as a measure) (see Table 12). The increase of 13 percent from the 1986 flood may be due to the occurrence of flooding in the area twice within the two years. Even those who may not have been personally flooded during the two floods were aware of the existence of them in the area.

When the rate of retrofitting at any time in the past was calculated it was 70 percent (Table 13). This was due to the higher rate of retrofitting after the 1986 flood because the prior retrofitting approximated that found in the 1986 study (about 20 percent) (Table 14).

Measures actually implemented approximated the earlier study (Table 15). Installation of a sump pump was the most popular measure followed closely by waterproofing basement walls, improving drainage and adding dirt fill around the home.

Timing of Retrofitting

Measurement of timing of the retrofitting was done differently than in the first study. Instead of measuring the action from the date of the flood, respondents were asked whether they implemented the measures alone or in conjunction with flood damage repairs (Table 16). About one third was done with flood repairs, one third split--some alone, some flood repairs, and about one quarter did them separately. However, if the homeowner had gone to a DAC after the previous flood (Table 17), or if they had floodproofed before, they were more likely to do some of the retrofitting in conjunction with the repairs (Table 18). These findings are useful when combined with the findings of the first study that retrofitting is done soon after the flood in knowing when retrofitting information and financial assistance can be the most useful.

Use of a Contractor

The question of whether a contractor was used to make the retrofitting change was included again because of the continued interest in the question of when a contractor is best used and when a homeowner can implement an effective retrofitting measure. One determinant of this decision will be whether the homeowner has home repair capability or whether they could learn it. Another has to do with the difficulty of implementing the measure. Analysis of the 1987 data suggests some relationships. First, repeated flooding and previous floodproofing are not associated with use of a contractor. It does not appear that a person turns to a contractor when their house is flooded more than once or after they themselves have tried some retrofitting measures earlier.

A relationship does appear, however, for use of a contractor for some of the work if there is severe damage (as measured by cost of the damage) (Table 19) or if the first floor was flooded (Table 20). The homeowners who are most likely to have a contractor do the retrofitting are those who have elevated their home, raised their wiring or sewer pipes or installed a backup valve (Table 21). While not perfectly associated, the cost of doing the work is ranked approximately in the order of use of a contractor.3 The other factor which appears to determine use of a contractors is when the measure requires the special skills of house raisers, plumbers, electricians, glaziers and waterproofers.

Desired Floodproofing

The desire to retrofit in the future was slightly lower for this 1987 study than for the 1986 flood victims (71 percent in 1986 versus 66 percent in this study) (Table 22). This may be due to the greater number of respondents who had already retrofitted (68 percent in this study versus 56 percent in 1986). The retrofitting measures most desired were similar to those desired by the 1986 respondents with the sewer backup valve being the most popular (Table 23). Other popular measures include raising sewer pipes, purchasing a sump pump and waterproofing basement walls. The cost of measures may have influenced which ones have already been done versus which ones are desired (Table 24). The more inexpensive measures are less likely to be desired as compared to implemented than are the more expensive. For example, a less expensive measure such as raising a furnace or appliances is 3.4 times less likely to be desired than already done; a more expensive measure such as building a levee or berm is 4.6 times more likely to be desired than already done.

One final point about the desired retrofitting is that while 66 percent of the respondents want to take further measures, only two thirds of these specified exactly what they wanted to do. This can be seen optimistically as the fact that two thirds know what they want to do, or pessimistically that a third do not. It

is obvious, however, that a sizable percentage would benefit from expert assistance in determining the best options.

Characteristics of the respondent and the flood conditions were examined for those desiring additional floodproofing. Only one association emerged: those who had attended a Disaster Assistance Center after the previous flood as well as the recent flood are more likely to want to protect themselves from future damage than those who did not (Table 25). It may be that these are individuals who are actively seeking solutions and that they have not found them in government assistance. Thus, they want to find a personal, self-help solution.

Finally, no difference was found in desired future floodproofing between those whose earlier measures had been moderately effective as opposed to those whose efforts had been a failure or very successful. This is contrary to the findings in the 1986 study. This difference may be due to the fact that more respondents had already floodproofed since they were flooded in 1987--especially more of those who had had moderate success in previous floodproofing (see below), perhaps reducing their desire to do so in the future.

This interpretation is supported by the relationship found between appropriate retrofitting measures implemented after the 1987 flood and a lack of desire to retrofit further (Table 26). Appropriateness was measured by the second author of this report who assessed the measures implemented based on the flood conditions described by the respondent.4

Effectiveness of Retrofitting Measures

As the engineering research conducted by the Corps of Engineers, private contractors and home repair manufacturing companies develop increasingly effective retrofitting measures, it is useful to know what was effective in previous floods. The questions pertaining to this topic were refined from the first to the second study so that it is possible to know exactly what worked and what did not.

First, just as in the 1986 questionnaire, respondents who had retrofitted before the 1987 flood were asked how effective their measures had been if they had been "tested" by the 1987 flood (Table 27). Only 74, or 15 percent of the respondents had had previously-installed measures tested in the 1987 flood. Of those, 12 percent indicated that they had been very effective; the rest were split evenly between "somewhat effective" and not helping at all. Following this general question, respondents were asked to specify what measures had been effective, what ones had failed and why they thought they had failed.

Few differences appear in the list of effective and ineffective measures. Those that were mentioned only as effective include overhead sewers, raising the entire home, and battery/gas powered generators. Ineffective retrofitting

measures more often included sump pumps and back up valves. The reasons for the ineffectiveness of sump pumps was that the water entered the basement too quickly for the pumps to handle it. Pumps that were not operated by a battery or generator failed when the power failed. Also, some pumps and valves failed due to rusting, etc. The most common reason given for the failure of the measure, whatever its type, was the magnitude of the flooding. As typical respondents reported:

"There was just too much water everywhere."

"Too much water too fast...."

"Water was rising too fast...."

"Because the flooding problem is overwhelming...."

The measures were simply not able to handle the speed with which the water rose and its eventual depth.

From these reports it appears that it is frequently not the measure itself which is the problem (except for electric generators) but rather the appropriateness of the measure for the flooding conditions. . One reason for this "mismatch" may be that recent flooding is greater than previously experienced flooding ("Water came up 3 feet higher than in '72."). Another is that the measure was implemented without the homeowner being aware of its capacity limitations.

Important Retrofitting Qualities

This latter conclusion is supported by the importance which the respondents gave to certain qualities of retrofitting measures. Their opinions about important qualities were obtained for measures already implemented (Table 28) and for desired measures (Table 29). The quality which is considered the most important for both implemented and desired is that the measure be appropriate for the home owner's house and flooding conditions. Of those measures already implemented, the two other qualities most often selected are that the measure be cost effective (not necessarily inexpensive) and recommended by an expert (as a means of assuring appropriateness).

When all respondents (not just those who retrofitted after the 1987 flood) were asked to rate qualities of measures, again appropriateness emerges as the most important (Table 29). Noteworthy in these responses are the two qualities ranked the lowest: little effort to do and inexpensive. It appears that if the measure will be effective, homeowners are willing to put in the effort and the monetary investment. It is important to note that there were no statistically significant differences between lower and upper income respondents on these qualities (except permanence which was more desired by lower incomes) although 56 percent of the lower income respondents rated

inexpensive as a very important quality as opposed to 42 percent of the more affluent respondents (data not presented in tabular form).

Attitudes Toward Retrofitting

Two questions were asked to assess homeowner flood victims' attitudes toward retrofitting. One question was asked only of those who had retrofitted: whether they will mention their retrofitting if they ever put their house up for sale (Table 30). Over one half responded "yes"; another 30 percent were uncertain. Only 16 percent said no. For those who had retrofitted before the last flood, there was an association between having retrofitted successfully and expecting to tell a prospective buyer about the measures (Table 31).

The second attitudinal question pertains to whether respondents think it is the responsibility of homeowners to protect their homes from future damage (Table 32). It was asked of all respondents. One third of the respondents selected the response half way between the two extremes--neither completely their responsibility, nor not at all their responsibility. The remainder were evenly distributed among the other four categories. There is definitely no strong sentiment by these homeowner flood victims against assuming some of the responsibility of self-protection.

Several characteristics of the respondents are linked to the perception of homeowner responsibility. Those more likely to believe that it is the responsibility of homeowners to protect their homes are younger (Table 33) and more affluent (Table 34). These associations suggest that responsibility is associated with resources: younger homeowners have more energy to retrofit and the more affluent the economic resources.

Previous flood experience also affects a respondent's sense of responsibility. Those who were flooded before are more likely to feel that they have a responsibility (Table 35).5 However, of those who were flooded, those who attended a Disaster Application Center after the previous flood--i.e. two consecutive floods--are less likely to believe it is their responsibility (Table 36). Those who attend a DAC are more likely to be flooded more severely. They may also have a different orientation toward government responsibility. Or, the DAC experience may encourage reliance on the government. Determination of the correct explanation awaits a study which focuses on comparing those who attend DACs and those who do not.

Finally, there does not appear to be an association between having had a retrofitting measure fail and belief that it is not homeowners' responsibility to protect themselves (not reported in tabular form). Thus, actual failure at retrofitting does not seem to change one's attitude on this topic.

Summary of Retrofitting Actions

There is a high rate of retrofitting reported by the respondents especially installing sump pumps, waterproofing walls, improving drainage and adding dirt fill. Many measures were implemented with damage repair. Homeowners used contractors when seriously damaged or first floor damaged.

There is also a strong desire to retrofit in the future, especially by those flooded twice. The most popular desired measure is the sewer backup valve.

Many retrofitting measures implemented in the past were at least somewhat effective. Many which failed did so because the flooding occurred very quickly and floodwaters were considerably deeper than measures were able to accommodate. Because of these experiences, respondents are most concerned that measures be appropriate to their particular flooding experience. They are not so concerned with the cost or the effort it takes to do.

Finally, homeowner flood victims expect to tell prospective buyers about their retrofitting measures. And many, especially the young and affluent, believe that homeowners have some responsibility for protecting their homes.

C. CHARACTERISTICS OF RETROFITTER AND FLOOD CONDITIONS

As with the questions about retrofitting, a series of questions about victim and flood characteristics were repeated in order to confirm the earlier findings. The findings were confirmed for the Illinois sample and thus will simply be listed by topic with the appropriate table reference. However, most of the earlier findings were not found to hold for the Wisconsin sample. The same tables will be repeated for the Wisconsin sample in order to permit comparison.

Illinois Sample

Current Flood Experience

- Those with subsurface water or both subsurface and surface were more likely to retrofit than those with only surface flooding (Table 37).

- Those with one to three feet of water in the basement were more likely to retrofit than those with less than a foot in the basement or water over the first floor (Table 38).

- Those with moderate amounts of damage ($10,000 to $25,000) are more likely to retrofit than those with inexpensive or very expensive damage (Table 39). While this relationship is not statistically significant, it is the same pattern observed in Phase I where it was statistically significant.

Previous Flood Experience

- Those respondents from the Illinois sample who had been flooded by both the 1986 flood as well as the 1987 flood were more likely to retrofit than those with only the 1987 flood experience (Table 40). However, the association does not hold for those who attended a DAC in 1986 and 1987. This may be due to the association between 1986 flooding and retrofitting <u>before</u> the 1987 flood (Table 41). However, this explanation may only apply to those who were successful in their retrofitting as the next finding suggestions.

Previous Floodproofing

- Those who retrofitted before the last flood were more likely to retrofit after the last flood (Table 42). Especially likely to retrofit are those who were moderately successful in their earlier retrofitting--as opposed to those who were either very successful or unsuccessful (Table 43).

Social Characteristics

- As with Phase I, the income and education of the homeowners are not associated with whether they retrofitted or not. This reconfirmation is especially important because income and education vary more in this sample than in the first one (for example almost one third have less than $19,000 family income). Home flood protection cuts across social class lines.

However, while income is not associated with the actual rate of retrofitting, it is associated with the number of measures implemented, and the amount spent on it. Table 43a shows that those of higher income ($50,000 or more) were more likely to implement three or more measures. Sixty percent of the more affluent implemented three or more while a little over one third of the less affluent did.

Likewise, the more affluent are likely to spend more on the retrofitting (Table 43b). Almost seventy percent of the more affluent spent over $700 while only about half of the less affluent did.

The association between income and the appropriateness of the measures implemented is weaker (statistically significant at .08) but does show a pattern when the income split is made between those who earn less than $40,000 and those who earn more. About 10 percent more of the affluent implemented the most appropriate measures than did the less affluent (Table 43c).

- Age is associated with retrofitting (Table 44). Those who have the lowest rate are older women heads of households. For such women from both the Illinois and Wisconsin samples over 60 years of age (about ten percent of the sample), 53 percent floodproofed as opposed to the 66 percent average rate (data not presented in tabular form).

Wisconsin Sample

Current Flood Experience

- There is no statistically significant relationship between source of water and whether the Wisconsin homeowner respondent retrofitted (Table 45). The highest rate of retrofitting was done by those who had experienced both surface and subsurface flooding combined.

- Retrofitting varies by depth of water but not enough to be statistically significant (Table 46). As with the Illinois sample, those with less than a foot of water in the basement were least likely to retrofit. Those with a greater depth in the basement were more likely, also similar to Illinois. The different finding is the rate of retrofitting for those with water on the first floor--83 percent. However, the number of respondents is so small (n=6) for this finding only to be suggestive.

- Damage costs, as with the Illinois sample, did not have a statistically significant effect on retrofitting although, like Illinois, it is more likely to occur if flood victims have more damage (Table 47). The pattern does not appear to decline with the high damage costs, however, as it does with the Illinois sample. This may be due to the fact that the most costly damage was not so costly as it was in Illinois.

Previous Flood Experience

- No difference exists in retrofitting rate for those who attended the DAC during both the August and September floods and those who only attended in September (Table 48). This lack of difference may be attributable to both floods occurring so close together. However, it would still be expected that those who were seriously enough flooded both times to warrant a visit to the DAC would have been more inclined to retrofit.

Previous Floodproofing

- Those Wisconsin respondents who had retrofitted before the last flood were more likely to retrofit after it also (Table 49). While not significant at .05, it is strong and in the same direction as the Illinois findings. As only 18 respondents had had previous retrofitting measures "tested" by the last flood, it it not possible to examine statistically the effect of success or failure on later retrofitting. However, the findings are not suggestive of a relationship as 15 of the 18 retrofitted after the September, 1986 flood, regardless of the success of their previous retrofitting measures.

Social Characteristics

- As with Illinois, income is not associated with the rate of retrofitting. In fact, for the Wisconsin respondents there is an inverse pattern (although not statistically significant) of lower-income respondents retrofitting more than the affluent.

As with the Illinois sample, income is associated with the number of measures implemented (Table 50) and the amount spent (Table 51). Because the income of the Wisconsin sample is generally lower, the split between less and more affluent was made at the +/- $30,000 level. Also as with the Illinois sample, there was an association (significant at only .07) between income and the appropriateness of the measures implemented (Table 52).

- Unlike Illinois, age was not associated with retrofitting. The two lowest categories, however, were the same as for Illinois: 40-49 years of age and 60 years plus (not reported in tabular form).

Combined Analysis for Source and Depth

Summary of the rate of retrofitting for various sources and depths of floodwater makes the similarities and differences between the two groups even clearer.

Summary of Source and Depth Tables: Retrofitting Rates

	Source of Water			
	No Water To House	Surface Only	Subsurface Only	Both
Illinois	59%	39%	74%	70%
Wisconsin	46%	63%	60%	68%

	Depth of Water			
	<1 ft.	1-3 ft.	3+ ft.	1st Floor
Illinois	62%	78%	66%	41%
Wisconsin	52%	66%	68%	---*

* Number of cases only 6.

While the Illinois findings would suggest that subsurface flooding may be easier to mitigate against and thus the association between subsurface flooding and retrofitting, the Wisconsin findings challenge this. Virtually no difference in rate exists for the Wisconsin respondents among surface, subsurface and combined categories. It may be that it is easier to retrofit against surface water in the Wisconsin flood area than it is in the Illinois. Lots may be larger, the topography different. However, the difference between the two groups suggests that it is not the source of the water per se which makes the difference in the decision to retrofit.

This observation may also hold for the depth of the water. It does not appear to be the depth of water per se (above a level of one foot) which makes a difference in the decision to retrofit. Wisconsin respondents who had more than three feet were as likely to retrofit as those with only one to three feet, the depth where the most retrofitting occurred in Illinois. While this difference may be due to emphasis in the educational interventions on retrofitting for this depth of flooding (as will be discussed below in the next section), the same relationship had been observed in Phase I when the interventions were expected to have a much smaller impact because of the limited training and staffing problems. The question is: "What enables (influences) the Illinois respondents to retrofit at such a high rate for 1-3 foot water depths that does not enable the Wisconsin

respondents?" This question will be explored in the next section as well as in the in-depth interviews planned for Phase III.

Summary of Retrofitter Characteristics

In the Illinois sample, characteristics of the respondents and the flood found to be associated in Phase I were reconfirmed in this study. These include the findings that homeowners likely to retrofit have most often been flooded previously and have retrofitted prior to the most recent flood. Also, those having been moderately successful in their earlier retrofitting efforts are more likely to try again. And, socioeconomic characteristics are not associated with the retrofitting rate but are associated with the number of measures undertaken and the amount spent. The association between income and appropriateness of the measures implemented (while significant at .08 rather than .05) is also suggestive of the importance of income in retrofitting.

New findings about characteristics not studied in the first phase show that Illinois retrofitters are likely to have experienced subsurface flooding with water of one-to-three feet in the basement and a moderate damage cost.

Some differences emerged between the Illinois and Wisconsin samples which are not yet fully explained. An especially interesting difference is that Wisconsin respondents retrofit about the same rate regardless of whether the flooding came from the surface or subsurface while Illinois respondents were more likely to retrofit if the flooding were subsurface.

D. EFFECT OF EDUCATIONAL INTERVENTIONS

It was decided during the 1987 Illinois post-flood recovery period to counsel every person who attended a DAC whom the public officials felt could benefit from mitigation table counseling (those with house damage as opposed to vehicle damage or damage to personal items in a rental unit or condominium). Because of this decision, it was not possible to select a control group from the Illinois DAC attendees. Thus, this section reports on the comparison of the two intervention samples--from the open houses and mitigation tables--with the Wisconsin sample chosen as the control group.

This decision to select a control group from another flood had its drawbacks and benefits. One drawback is that the control group may not have had the same flood experiences as the experimental groups. The terrain may be different. House construction may be different. It was known that the timing of the flood is different--one year earlier. And, the control group, although it was believed to the contrary when the sample was selected, has different sociodemographic characteristics.

What are problems for the ideal experimental model--which strives for no differences in the experimental and control groups except for exposure to the interventions, may be useful in the search for clues about who retrofits and why. If the control group had come from Illinois, the higher rate of retrofitting for those with surface water and first-floor damage would not have been discovered and the impression from the Illinois studies would have been that all surface and first-floor damage conditions discourage retrofitting. Because of this finding a "conditional" question must now be asked: "Under what types of deeper and surface water flooding conditions can we expect retrofitting to occur and under what conditions can we expect it not to occur?"

This section focuses, however, not on the sub-group differences in retrofitting caused by differences between the Illinois and Wisconsin samples, but rather on the effect of the educational interventions. As we shall see, they may be interrelated; but we will focus here on the interventions and consider the differences as they appear to influence the effect of the interventions. The three groups taken as a whole will be examined first and then subgroups of the three samples with particular characteristics will be analyzed.

Four measures of the effect of the interventions will be presented: 1) rate of retrofitting, 2) number of measures implemented, 3) amount spent on measures and 4) appropriateness of measures implemented.

Effect of Interventions on Rate of Retrofitting

The experimental groups were categorized, first into the two groups--open house and mitigation table--and then into three groups--open house, mitigation table and both--as one third had been exposed to both interventions.6

The rate of retrofitting is nearly identical for the two experimental groups and the control group (Table 53). When the experimental groups are divided into three groups with the addition of a "both open house and mitigation table" category the rate drops for open house attendees (Table 54). This is likely due to the fact that those who attend only the open house have had less damage to their homes--i.e. more likely to have had less than a foot of water in the basement and thus, less costly damage. Such a finding was also observed in the Phase I study.

The next step of the analysis was to ascertain if the interventions might have had an effect on some subgroups of the respondents although in toto there was no difference. Socioeconomic and demographic characteristics and flood experiences measured in several ways were examined. Only a few subgroups characteristics emerge as having been associated.

More affluent individuals ($40,000+) who attended both the open house and the mitigation table as well as just the mitigation table were more likely to retrofit than the Milwaukee respondents of similar income (Table 55). About 70 percent of these respondents retrofitted as opposed to 44 percent for the Milwaukee sample. The apparent effect of the interventions on the more affluent as opposed to the less affluent may be due to several factors: (1) Individuals of higher income usually perceive that they have more control over their lives than individuals of lower income. Thus, they might have sought solutions more actively from the experts. (2) More affluent respondents were able to afford the measures recommended by the experts. (3) The experts may have presented the information in a sophisticated way which limited its utility to the less well educated. The last explanation, however, does not appear to be the case because the respondent's education did not influence whether the interventions had an effect.

Demographic characteristics--sex, age, household type--taken alone do not affect the influence of the interventions. However, two demographic characteristics of the respondents when combined may have an effect although the association is not significant at the .05 level due to the small number of individuals with these characteristics (Table 56). Older women who are heads of households who were counseled at the DAC and/or attended an open house were more likely to retrofit than the Milwaukee respondents with similar characteristics.

Because the number of women with these characteristics is very small in the Illinois sample (10 percent), it might be assumed that to assist such a small group would be an unimportant

reason for encouraging the continuation of educational interventions. However, as the same table shows, the number of women in this category in the Milwaukee sample is double (30/147 in the sample or 20 percent). Thus, in older neighborhoods where widows comprise a significant portion of the population, educational interventions may be an very important way of increasing retrofitting.

It is also important to note that the Milwaukee older female heads of households retrofitted at a rate of 10 percent below the average (of 63 percent) while the Illinois women retrofitted at a rate of 10 to 15 percent higher. Such a high rate suggests that the interest to protect their homes is very strong when such technical assistance is provided. It may, in fact, be one of the most motivated groups because of their fixed incomes which do not easily permit the absorption of flood damage costs and because of a strong desire to remain in their family homes as long as possible.

The two flood experiences explored in the previous section--depth and source of water--do appear to influence the effect which the interventions have on the respondents. No effect is observed for the interventions for surface and a combination of surface and subsurface flooding. However, the experimental groups do show a greater rate of retrofitting than the control group for subsurface water, especially those exposed to the mitigation table counseling or to both the mitigation table and the open house (Table 57).

Illinois respondents with certain depths of water seemed also to have been influenced more than those with other depths While not a statistically significant difference, the experimental group respondents with 1-3 feet of water in their basements were all more likely to retrofit than the control group (Tables 58). The smallest difference between an intervention group and the Milwaukee group is eight percent.

For respondents with three feet or more of water in their basements, there is no difference between the experimental and control groups. Finally, there are so few with water on the first floor in the Milwaukee sample that a comparison between the experimental and control groups is impossible. However, the same pattern emerges as with those with deep basement flooding: Those who went to both interventions are more likely to retrofit. The next section on sources of information about retrofitting includes analysis which suggests that respondents did receive information about first-floor retrofitting from the two interventions. Why they did not retrofit at a higher rate given that they received information from the interventions will be explored in the in-depth interviews in Phase III.

Additional Measures of Intervention Effects

Finally, three other measures of the impact of the interventions were attempted. The first is the number of

retrofitting measures implemented. No pattern of influence emerges. The second measure is the amount of money spent by respondents on retrofitting. No statistically significant association between the two variables in general exists but more of the mitigation table advisees and those who experienced both the open house and mitigation table spent $1,200 or more than the Milwaukee respondents (37 percent versus 29 percent).

The third additional measure is the appropriateness of the measure implemented based on the characteristics of the flood experience. No statistically significant difference was found between the intervention and control groups on this measure. The open house attendees were more likely to have implemented measures which were evaluated positively than was the control group (44 percent versus 36 percent for the control group).

Summary of Findings about Educational Interventions

No difference was observed between the intervention groups and the control group when examined in toto. Certain subgroups of the intervention groups did retrofit at a rate higher than their Milwaukee counterparts: the more affluent; older female household heads; those with subsurface flooding and those with one to three feet of water in the basement. No associations were found between the experimental/control groups and the number of measures undertaken nor the amount of money spent nor the appropriateness of the measures implemented.

E. SOURCES OF RETROFITTING INFORMATION

Illinois respondents were asked about the specific sources of their retrofitting information while Wisconsin respondents were asked to evaluate seven different methods of delivering such information. Illinois respondents were also asked what information, if any, about retrofitting they would like to know. The results of these questions follow.

Actual Sources of Retrofitting Information

Becoming aware of an idea and then learning more about it can be a very long process with information being gleaned from numerous sources; or it can be a very short one in which the person first learns about the idea and obtains detailed information all during the same encounter. If the process is short and intense, it is likely that the person can recall the source, but if many sources are involved over a period of time, recall may weak. Because of these dynamics, obtaining information about this process by the use of closed-ended questions has its limitations. With these reservations in mind, the question of source of information was repeated in Phase II but was modified to try to ascertain who introduced the respondent to the idea of retrofitting and then how they obtained additional information after that introduction.

First sources of information were examined for the two intervention groups and the control group (Table 59). Sixteen percent of those who attended the open houses mentioned them as their first source. That it is not more suggests that those who attend open houses have been exposed to the idea of retrofitting before they go and thus are probably seeking more information when they attend. Two popular first sources of information for those who went to the open houses are the media and homeowners who had already floodproofed. It may be that they learned about the open houses from the media and thus mention that as their first source.

Those who had been counseled by the mitigation table experts were more likely not to have been exposed to retrofitting information before going to the DAC or before retrofitting initially. Almost a third reported that the mitigation table was their initial contact. Another twenty-five percent indicated that they had had no source or had figured it out as they went along.

Over 40 percent of the Milwaukee respondents indicated that they had had no source of retrofitting information or had learned to do it as they went along. Those who did have an information source most often indicated a contractor or someone else who had already retrofitted.

Only one half of the respondents indicated a second source of retrofitting information (Table 60). The percentage for the

three groups varied considerably: 68 percent of the open house attendees reported a second source; 52 percent of those who were counseled at the mitigation tables; and 31 percent of the Milwaukee respondents. By comparing the two tables it is possible to see that the open house is more a second source of information for those who attended them while the mitigation table counseling is more likely to be the first source for those who had that experience. These differences suggest that the two interventions may serve a different function for these two groups--the mitigation tables as an introduction to retrofitting, the open houses as a means to obtain adequate information to actually implement the measures.

This conclusion is confirmed by further analysis of the two tables. Forty percent of the open house attendees reported the open houses as their first or second source of retrofitting information. For those who were counseled at the mitigation table, 77 percent mentioned either the retrofitting expert or the booklets distributed at the mitigation table as either their first or second source of information.

Some final details about sources are informative. Besides the interventions, the open house attendees selected a mitigation table retrofitting expert most often as their second source of retrofitting information. Smaller percentages selected someone who had already retrofitted or a contractor about evenly as sources of information.

On the other hand, those who were counseled at the mitigation table were more likely to select someone knowledgeable--but not necessarily someone who themselves had retrofitted--or a contractor. These are likely to be more formal relationships which may not be as fully informative. In the case of the contractor, the retrofitting is likely to be done by the contractor. Thus, the homeowner must assess the accuracy of the information coming from a source who is seeking their business. This puts a heavier burden on the first source of information to provide accurate and adequate information so that such an assessment can be made.

To extend this line of thinking further, the question was examined of the influence of the source of information on whether the respondent did the retrofitting themselves or hired a contractor. Sixty-eight of those who indicated that a contractor was their first source of retrofitting information used a contractor solely to do the retrofitting while few (14 percent) combined their own efforts with a contractor (Table 61). However, when a contractor was mentioned as the additional source of information, the sole use of a contractor dropped to 44 percent and the combination of doing it themselves and hiring a contractor increased to 32 percent (Table 62).

Sources of Information by Source and Depth of Water

There is still a question of whether the differences observed between the two Illinois intervention groups and the Milwaukee control group are due to the interventions or rather to other characteristics of the flooding, topography, etc. The previous analysis shows that, in general, open house attendees and those counseled by mitigation table experts were likely to identify them as being sources of information. This lends support to the utility of the interventions even though the rate of retrofitting was not higher, in general.

Following this line of logic it also would be useful to know whether those Illinois victims of specific types of flooding which had higher rates of retrofitting--specifically the respondents who retrofitted against one-to-three feet of basement flooding--were more likely to have selected open house and mitigation table experts as their source than those who had retrofitted less.

Tables 63 and 64 summarize the rate of retrofitting and the combined total percent of respondents who selected the three interventions--booklet, mitigation table and open house for source and depth of water.

Three of the subtables demonstrate a pattern of similarity between rate of retrofitting and selection of the interventions, one does somewhat and two do not. The lowest dependence on the interventions was for those who had been counseled at the mitigation table and had surface flooding (31 percent). The highest reliance was by those who had both surface and subsurface and had been exposed to both the open house and mitigation table (78 percent). When exposed to both interventions, the rate of selecting the interventions as a source was very high ranging from a low of 52 percent to the 78 percent high.

These findings are supportive of the importance of the interventions as sources of retrofitting information--but the findings are by far <u>not</u> definitive. It is likely that other factors--especially ease of implementation, aesthetic acceptability of the solutions, belief that the type and severity of flooding can be mitigated against, belief that retrofitting is the responsibility of the flood victim and the cost--are also playing a role in the decision making of the respondents by either enhancing or suppressing the role of the interventions. It may ultimately be impossible to accurately separate out the contribution of the interventions but the question can be addressed further by examining the comments written on the question which asked what they wanted to know about retrofitting and at the back of the survey.

Summary of Written Comments

Many respondents were concerned with knowing the costs of retrofitting measures and how to finance them. Some specifically requested low interest loans targeted at retrofitting. Others requested that the grants be larger for those who could not qualify for the SBA loans. Some of those who could qualify for the SBA loans felt that they were not adequate to repair and retrofit at the same time. A couple felt the requirements for the SBA loan were too stringent, one mentioning that they received a $9,000 car loan two months after being rejected for an SBA loan of $3,000. Another suggestion was to have retrofitting measures be tax deductible like the energy conservation methods were.

Other factors besides financing were also mentioned as inhibiting their retrofitting. One concern repeated by several respondents was a frustration that the communities, the state and the federal governments were not doing what they could to prevent and protect them from the flooding. Because the respondents believed this to be the case, they claimed that they were less willing to do their share. Another concern was that residents did not know enough about why they were flooding. Without this information they suggested that they were unable to decided whether to retrofit or not. In this vein several wanted to know what a floodplain was and whether they were in one and what their future probabilities were of flooding.

Another factor mentioned by some was that they were prohibited from building up their land because of local floodplain ordinances. They argued that they had no alternative to this which they perceived as viable.

Respondents also wanted more and specific retrofitting information. Some asked questions about specific measures. Others wanted general information. Some said that if they knew what to ask, they would ask it but they did not know. The Illinois respondents had more specific questions. The Illinois respondents also suggested ways to improve the interventions:

The five most commonly mentioned suggestions in order are:

- list vendors, prices, effectiveness comparisons
- have more experts, contractors at open houses
- develop and give advise on reasonable, practical alternatives
- provide more information/literature
- display actual models.

Other suggestions mentioned included:

- more open houses--some during non flood times
- more publicity about the open houses
- more affordable measures mentioned
- meetings among neighbors on each block so floodproofing can be customized
- hands-on displays
- brief videos

- site visits (some respondents mentioned willingness to pay modest amount)
- ways to assess contractor competence
- help from local authorities
- less "run around" from additional government sources recommended at open houses and mitigation tables
- assistance from local authorities
- put retrofitting information in tax bills
- put retrofitting information and displays in plumbing and hardware stores
- put retrofitting information and displays in local libraries
- advertise them in local media
- show local examples of measures that work in neighborhood, community

Retrofitting Information Source Recommendations from Control Group

Finally, a list of possible sources of retrofitting information was offered to the Milwaukee respondents for their assessment. It was felt that because they had not been exposed to any formal interventions, they would be a good source of an unbiased assessment of what they would prefer. Table 65 presents their evaluations. Most popular was a retrofitting handbook followed by visits by experts to their homes, direct discussion with a retrofitting expert and a television program.

Summary of Findings about Sources of Information

Illinois respondents were very likely to indicate that the interventions were sources of retrofitting information for them. Those who had been exposed to both interventions mentioned the interventions most frequently. The rate of selection of an intervention followed a pattern similar to the rate of retrofitting for several of the interventions when different depths and sources of flooding were examined.

Other factors which entered into the respondents' retrofitting decisions other than the interventions were expressed by the respondents. These included: the cost, the belief that the government was not doing its share; more information about the flooding; more retrofitting information.

Finally, Milwaukee respondents also wanted direct counseling by a retrofitting expert including a site visit.

F. EVALUATION AND COMPARISON OF OPEN HOUSES AND MITIGATION TABLES

Respondents were asked to evaluate their experiences with the open houses and mitigation tables. This section presents: 1) reports of the timing of the retrofitting decision vis a vis exposure to the interventions, 2) whether the respondent believed the intervention assisted and if so how, 3) descriptions of how the interventions helped, 4) a general evaluation of the interventions by all respondents regardless of whether they retrofitted including whether the utility was introduction of the concept, general information or specific details and 5) what could be done to improve the interventions.

Timing of Decision vis-a-vis Intervention

About half of the open house attendees who retrofitted made the decision to retrofit after attending; about sixty percent of those who were counseled at the mitigation table decided after (Table 66). First, it is interesting to note that about half recall that they were considering retrofitting before the exposure. For these, the interventions would likely serve a function of providing additional information rather than introducing them to the idea.

Second, while the open houses were held before the mitigation tables, it appears those who attended them are more likely to have considered retrofitting before attending. This is probably due to the fact that it is a self-select group who have been thinking about retrofitting and thus decide to attend.

When those who had decided after the intervention were asked if the intervention assisted them in making the decision, a majority of both intervention groups said yes but more of the Open House respondents (88 percent versus 64 percent) believed that was the case (Table 67).

Those who made the decision before attending the intervention were less likely to believe that the intervention had helped them (Table 68). Again, more of the Open House attendees believed the intervention had assisted them (51 percent) as opposed to only 39 percent of those counseled at the mitigation tables.

Description of Intervention Contribution to Retrofitting

Mitigation Tables

If Decision Made after Exposure.

A variety of information was obtained by those counseled at the mitigation tables. They reported it by writing their answers on the questionnaire. The two most commonly mentioned were that

the respondents were given retrofitting options (21 percent) and advice on specifically what to do (36 percent). The remaining 43 percent, however, did not give these answers but rather a wide variety including the following: showed how home got flooded, that floods can be repetitive, some inexpensive measures, recommendation to retrofit, to contact local officials, about safety hazards, where to get financing, easiest method and where to get further help.

If Decision Made before Exposure.

Those who had made their decision to retrofit before being counseled at the mitigation table also indicated that they were given options (30 percent) and specific recommendations (30 percent). In addition, others mentioned that the expert counselor confirmed what they had decided to do (30 percent) and that that was important to them.

Open Houses

If Decision Made After Exposure.

Many fewer types of answers were given by those attending the open houses. Over 80 percent of these respondents indicated that they were either provided with retrofitting options (32 percent) or specifically what to do to protect their homes (50 percent). A few others mentioned the utility of the manuals and examples.

If Decision Made Before Exposure.

As with those who made their decision after attending, those who decided before limited their answers to either having received specific advice (30 percent) or knowledge about options (60 percent). Notice that the percentages, however, are reversed such that those who have decided before hand wanted to compare options while those who decided after were more focused in both deciding to retrofit and deciding what to do while attending.

It appears that the two interventions vary in the type of information that they are more likely to deliver. If the goal is to concentrate on the specifics of choosing and implementing the retrofitting options, the open house appears to do a better job. If additional information such as financing, safety hazards, etc. are equally as important, then the direct counseling of the mitigation table (with thus less time for the specifics of retrofitting and fewer examples of measures) might be more effective.

General Evaluation of Interventions

All attendees were asked to evaluate the interventions on a Likert scale (1=not at all useful to 5=very useful). When all attendees are examined, the open house is evaluated more positively with 54 percent giving it a 4 or 5 (Figure 3). Only

39 percent did likewise for the mitigation table. It must be remembered, however, that those attending the open house did so by their own choice, while those counseled at the mitigation table did not have a choice. When those who decided to mitigate after attending the intervention are examined, again the open house emerges as having a more positive evaluation. However, for those who decided before, there is about similar evaluation of both interventions.

Finally, those respondents who evaluated the interventions positively were asked whether they were helpful because they 1) introduced the respondent to the idea, 2) gave them general information about retrofitting, or 3) gave them specific information. While most of both groups indicated that the interventions gave them more general information (such as retrofitting options) (Table 69), a larger percentage of the open house respondents mentioned more specific information (20 percent versus 12 percent), while a larger percent of the mitigation table advisees mentioned being introduced to the idea (29 percent versus 23 percent).

Suggestions for Improvement

Finally, respondents were presented with a series of qualities of the interventions and asked to recommend whether there should be an increase, maintenance or decrease of them in future interventions (Table 70). The findings mirror the differences between the two interventions. Those in attendance at the open houses wanted more individual attention. As each person is counseled individually at the mitigation table, there is not much desire to increase individual attention whereas there is at the open house where individual advising is not done with everyone.

Two other findings are noteworthy. First, both groups want more displays of the measures and the mitigation table attendees want more handouts. Second, the open house attendees want more contractors present. There has been concern on the part of some public officials that flood victims believe contractors can prey on flood victims while they are vulnerable right after the flood. The desire of almost two thirds of those assessing the open houses to have more contractors does not give support to this being a generalized concern.

Respondents were also given a space in which to write their own recommendations for improving the interventions. A third who had been counseled at the mitigation tables indicated satisfaction as is. Another 16 percent wanted very specific recommendations for their particular home with site visits if possible. Others wanted more literature and displays. A few felt the table was not adequately identified.

About a fifth of those who attended the open houses were satisfied as they were. Ten percent wanted more contractors; eight percent wanted the approximate cost of the various measures

described; seven percent wanted the open houses held prior to a flood and another seven percent wanted individual consultations.

Summary of Open House and Mitigation Table Evaluation and Comparison

About half of the respondents had decided to retrofit before being exposed to one of the two interventions. Most of both those who made their decision before or after attending indicated that the intervention had provided them with retrofitting options and information about specifically what measures to undertake. Those who had made the decision before perceived the information more often as containing options rather than just one solution; those making their decision after perceived the information as focused on one solution.

Both interventions received generally positive evaluations with the open house receiving a higher one. This may be due to the fact that attendees are self selecting. Most who were exposed to either intervention reported receiving more general information rather than being introduced to the idea or obtaining very specific information.

Improvements suggested reflected the differences between the interventions and some common themes. Mitigation table advisees want more displays and handouts; those attending the open houses want more contractors present and more official who are retrofitting experts. Both groups wanted an increase of recommendations specific to their home site with a visit if possible.

V. CONCLUSIONS AND RECOMMENDATIONS

Retrofitting by homeowner flood victims is indeed a reality. Two thirds of the flood victims in the recent suburban Chicago and Milwaukee floods have taken measures to protect their homes and belongings from future damage, a rate even higher than had been found in the 1986 flood. To what extent these measures will accomplish their goal of protecting them from future damage is still untested and problematic. It depends on whether the measures chosen were appropriate for future flooding--which may be different from the flooding which prompted the retrofitting, whether they were installed correctly and whether they will work when tested by flooding.

Evaluation by 1986 and 1987 respondents of the effectiveness of earlier measures tested by the recent floods indicated that from 10 to 20 percent felt their retrofitting measures had been very effective in protecting their homes while another approximately 50 percent reported they had helped somewhat. Thus between 50 and 75 percent of the respondents who had retrofitted earlier believe that they benefited from their efforts.

As indicated above, the success of measures is dependent upon the appropriateness of the measures implemented. This fact is recognized very clearly by the respondents who rank appropriateness as the most important quality for implemented and desired measures. The configuration which produces such appropriate measures is a simple one:

1) flood victim must believe that they can protect themselves,
2) they must be motivated to do so,
3) they (or whomever they hire) must be knowledgeable as to what to do,
4) someone (they or a contractor) must be able to do it, i.e. the technology must exist and must be diffused, and
5) they must have the money to pay for the materials (and the work if they do not do it themselves).

Each will be examined briefly and recommendations given.

Belief That Protection Possible

Evidence from the surveys indicates that there is a strong general belief that flood victims in these floods can protect themselves. This is obvious from the rate of retrofitting. However, some do not believe that they can. Findings suggest that those in Illinois with over three feet of water in their basement and especially those with first-floor flooding are less likely to retrofit.

This belief may or may not be unfounded. Some written comments by the respondents indicate a doubt that any individual measures can be effective against their particular flood configuration. The data show that those who had retrofitted before the last flood whose measures had been tested found them less effective if they got more than three feet of water in their basement.

Also, some of the experts who advised the flood victims at the DACs were hesitant to recommend measures for certain types of flooding such as deep basement flooding because of the dangers retrofitting might cause such as the imploding of basement floors or the buckling of walls. The "bottom line" is that in some instances, it may be inappropriate to recommend individual retrofitting.

For those flood victims who incorrectly believe that they cannot retrofit against the type of flooding they experience, the answer lies in delivering to them the information necessary to change this belief.

Motivation to Retrofit

Again, the high rate of retrofitting suggests that there is motivation. One factor which may affect motivation is a disbelief that such severe flooding will occur again. Including information about the rate of serious flooding and factors which make future flooding even more likely such as the increased development of communities will help the flood victim understand future severe flood probability. Several respondents requested just such information realizing that it would be useful in making their retrofitting decisions.

A second factor which may affect flood victim retrofitting motivation is what the flood victim believes about the role of government in mitigating the flooding problem. Whether one expects the government to mitigate is not associated with whether the flood victim retrofits. This finding may occur because some who retrofit believe the government is not going to solve the problems and some who do not retrofit believe the same thing. One response is self protective while the other, as was expressed in the written comments, is a desire to have the government do what it has taxed the citizens to do before they will take any self-help measures.

Two things could obviously improve the motivation. The first is for the government (at whichever level) to mitigate to whatever extent is possible. This would possibly reduce the retrofitting rate of those who will not help themselves if the government takes action. It would, however, encourage those who are considering retrofitting but are frustrated with the lack of government action. Many respondents in their written comments expressed strong concern with the government's lack of monitoring of development and developers. Also, there was frequent frustration expressed about plans which the government indicated

would be implemented but had not been. Just as there has developed a state/federal partnership reflected for example in matching funds required for federal programs, so too flood protection could be approached by state and local government as a partnership between government assistance and homeowner self-help behavior assisted by the government.

Second, when further mitigation is not possible or is prohibitively costly, citizens should be informed of that fact so that they can then take actions to protect themselves. The lack of knowledge on the part of homeowners engendered by the reluctance of governments at each level to inform citizens that mitigation cannot or will not occur is paralyzing some homeowners from retrofitting. The flood victim is empowered to self-help by a belief that the government has done what it can and that there is nothing (little) more that can be done by the government.

Being Informed about Retrofitting

Improving knowledge about retrofitting can come about through making available to those who seek it retrofitting information and to those unaware of the idea a description of first what it is (i.e. its existence) and then how to do it. The respondents in Phase II found the educational interventions important as reflected by 50 percent of the sources they mentioned (either as their first or second source) being one of the interventions--the manual, the open house or the mitigation table.

Findings from Phase I and Phase II combined develop an outline of important qualities which the educational interventions should have. They should:

- Be timed so that the information is known when the decisions are made. This means that the information be disseminated very quickly after the flood in a way that the flood victims preoccupied with returning to normalcy can take advantage of.

- Include a series of possible options for the type of flooding which is common to the area flooded. Such a series of options seems to be more satisfying to the flood victim and "gets them thinking" about retrofitting more than providing them with only one way to do it. They seem to express confidence in knowing a variety of things they might do rather than just one. Also, as flood victims in these two studies have implemented on the average three measures, knowing a series of options enables them to put a package of measures together.

- Present the measures in the most "lifelike" fashion in order for the flood victim to understand how they work, what they will look like implemented, in other words to make the measures real for them. On site examples would obviously be the best but may be logistically the most difficult for floods which affect large numbers of people when the goal is to get the information to as many flood victims as possible. In lieu of on-site

viewing, displays should be included and they should be as realistic as possible.

- Try to have the learning experience as much of a "social" event as possible. By this is meant, not a party, but rather a situation in which learning about retrofitting can involve flood victims sharing their ideas and retrofitting needs with one another so that "peer learning" can take place but also so that norms of behavior can evolve and those participating can recognize that retrofitting is the norm.

- Make available retrofitting experts who are not only knowledgeable about retrofitting measures in general but also measures which would be useful for the specific flood conditions.

- Be sure the retrofitting information is communicated at the level of technical sophistication of the flood victims. If the flood victim feels intimidated by the information, they will reject it, as the respondent rejected the idea of putting the furnace in the attic. Also, as the study indicates that individuals such as older women who head their own households are benefiting from the interventions, it may be that the flood victims most likely to benefit will be those with the least knowledge about retrofitting. Thus, caution must be taken to "match" the victim with the information.

Conversely, it is important to offer sufficiently detailed information for the homeowner who is already motivated and somewhat knowledgeable about retrofitting. The desire to retrofit by those who have already done it should be taken advantage of by reinforcing the self-image of the person as a retrofitter. Repeat retrofitters should be identified during the one-on-one consultations and care taken to give such a person the information needed so that their future measures will be as or more successful as the ones already implemented, in other words to help the repeat retrofitter "refine" their efforts.

- Be cognizant that some retrofitting will be done by the flood victim and some by a contractor. The flood victim must then know when to call upon a contractor and when to do it themselves if they so choose. They must also be able to discuss the flood protection needed with a contractor if they decide to hire one. Knowing what to ask a contractor to be assured that they are knowledgeable is just as important as knowing how to do it if the flood victims are going to do it themselves. In some instances, what to ask the contractor and what to know if one is going to do it themselves are different.

- Make available diagrams and information that can be reviewed by the flood victim after they have been involved with the information intervention. The Protect Your Home manual was referred to by those who received it. Also, even more handouts were requested. And, the Milwaukee residents ranked a manual as the most important way to disseminate information.

- Offer the flood victim a one-on-one consultation with a retrofitting expert. This can take place at a mitigation table, as an exit interview at an open house or as an on-site visit. The latter would be preferable because the specifics of the site as well as the flood condition and house characteristics can all be viewed while the retrofitting discussion goes on. There appears to be a receptivity to paying a reasonable fee for such an on-site service.

Technology Exists and Is Diffused

As mentioned, at this time damage from some types of flooding ia not easily preventable. One goal of this retrofitting "thrust" should be to move quickly to develop and test technologies for these more difficult types of flooding such as fast flowing and deep water. Some types of flooding may never have mitigation measures other than removal of the structure from the threat. If there are some types of flooding for which there will never be feasible retrofitting measures, these are the ones for which the 1362 funding should be saved.

Not only are feasible measures lacking for certain types of flooding but information about some measures which have been developed has not yet been disseminated so that they can be implemented. Such dissemination not only will protect some homes but also will make the measures more acceptable by the sheer frequency of use. Solar panels are such an example. When first used they were seen as unsightly additions to residential structures. Today, they are hardly "visible."

New, visible, unusual retrofitting projects elicit that same response today. One hazard mitigation official indicated to me that he was including an architect in the team of officials to be trained for retrofitting advising because of the resistance to some of the retrofitting measures. For example, elevating a home is considered unsightly by many, especially if the home is near other homes which are constructed slab on grade.

Similarly, some respondents in this study expressed a concern that the measures recommended were too expensive or that they were "absurd." What is meant by the latter is that they do not conform to normal expectations of house construction. One respondent was miffed because the mitigation expert suggested that she place her furnace in the attic and that she build a wall around her home. The respondent wanted something more realistic. In a similar vein another respondent wrote about a plastic wrapping which had been suggested to him for his home. Again, he thought it "absurd." Retrofitting experts, however, would agree that all are viable suggestions.

Finally, the cost of retrofitting is likely inhibiting the rate of implementation. While most homeowners, regardless of income, will act to protect their homes, what they are able to afford appears to be quite different. Survey findings from Phase I of this project showed that those who received grants and loans

were likely to spend considerably more on retrofitting than those who did not. Phase II data suggested the same. While the rate of retrofitting is same for people of differing incomes, the number of measures; the amount they spend and the appropriateness of the measures varies such that the more affluent do and spend more on more appropriate measures.

Financing the Retrofitting

One way to make retrofitting more affordable is to develop and publicize less costly retrofitting measures. Several respondents asked for advice on less costly retrofitting measures. However, it is likely that effective retrofitting measures are more expensive than those which provide less protection. A battery-operated or gasoline driven sump pump costs more than an electric one. An automatic sewer back-up valve costs more than a manual one. Elevating sewer pipes is more costly than installing a stand pipe, and so forth. Based on this logic, it may be as important, if not more so, to assist the homeowner flood victim in financing the retrofitting than in recommending less expensive measures.

Concern with financing was the most commonly mentioned retrofitting topic in the written comments. Unlike energy conservation measures which are done at a time when the homeowner does not necessarily have other pressing needs, retrofitting is best done when the homeowner's resources are the most strapped. While government assistance helps in meeting these needs, most flood victims perceive that their costs far exceed the money given them by the government. While this may be as it should be--a sharing of the loss between the victim and the government, this reality means that many flood victims are without surplus resources to finance the retrofitting.

Legislation passed recently to provide for retrofitting funds as part of SBA disaster loans and to increase Individual and Family Grants provided by FEMA will likely assist with this problem. Other programs such as state-level loan programs will also assist if they are implemented immediately after the flood and publicized well in order to make the money available to the flood victims during the two-month period immediately after the flood when most retrofitting measures are done, according to the Phase I findings.

Nothing in Phase I and II of the research suggests that individual homeowner retrofitting is not a viable flood protection activity for many flood victims. Likewise there are many ways in which the government can help facilitate it. As the government's role in assisting the process is refined and implemented, more will be known about the best approaches to take to facilitate it. Phase III of this project will have as its goal to assist in this process of development and implementation by examining more closely the actual retrofitting decision-making process. The findings from Phase III will be available by August, 1989.

NOTES

1. In order to achieve exactly a .05 level of confidence for a population of 5733, a sample of 360 should have been selected (Sheskin, 1985). However, given that three samples had to be drawn--open house, mitigation table and control, it was decided to reduce the number for cost and data management purposes. The level of confidence is thus, .055.

2. The rate of repeated flooding in the original Wisconsin sample was the same as the rate in the returned sample. This fact makes it difficult to suggest that the repeated flooding rate for Illinois was really greater in the actual population than was obtained in the sample. It appears to be rather that the impression held by officials of considerable repeat flooding in Illinois was not the reality.

3. Cost of measures was not asked in this phase. The median values reported in the first phase were used in this analysis.

4. A score of zero was assigned to measures which were wrong for the flood conditions and could increase damage; a score of one was assigned to measures that would reduce some of the damage; and a score of two was given to those measures that should definitely reduce if not eliminate flood damage if the same flood recurred.

5. Only Illinois respondents were able to be used for this analysis. Responses to the questions about past flood experience in the Wisconsin sample suggested that the respondents were confusing the August and September, 1986 floods. They may have occurred too close together to be easily distinguishable.

6. Each Illinois respondent was asked if they had also experienced the other intervention. Sixty-eight (47 percent) of the open house attendees also were counseled at the DACs; 20 percent of those who were counseled at the mitigation tables attended the open houses. This rate may have been so high because the last open houses occurred after the beginning of the DACs and some retrofitting experts were recommending to the people with whom they spoke to attend the open houses.

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APPENDIX A

OPEN HOUSE

APPENDIX A

FLOODPROOFING OPEN HOUSES

The communities of Addison, Brookfield and Park Ridge were selected as locations of the open houses because they were centrally located to the three areas hardest hit. Local public officials agreed to the events and the date, time and sites were determined. All of the meetings were held in the evening approximately 10 days after the flood. They were publicized through the media.

The format of the program included a slide show on protecting houses from flood damage which was shown several times during the three- to four-hour open house. The slide show began with a discussion of the various ways that a flood can damage a building and included graphic examples of collapsed walls and broken floors to illustrate the need for care and engineering of some of the protection measures.

Seven flood protection measures were then explained:

Flood Insurance	Elevation
Dry Floodproofing	Relocation
Wet Floodproofing	Maintaining Drainage
Levees and Floodwalls	

The last subject covered keeping streams clear of debris, growth, and garbage and advising residents to keep their eyes open for improper development that could cause a floodway obstruction. The slide show followed the manual Protect Your Home from Flood Damage with photographs of floodproofed buildings, most of them in Illinois.

Following the slide show, residents visited with contractors and government officials at tables in another room. The following types of contractors participated: basement waterproofers, sewer backup valve companies, sump pump companies, architects, general contractors, and house movers. Government agencies that have participated include the Corps of Engineers, FEMA, the NFIP insurance servicing, the Illinois Attorney General's Consumer Protection Division, the Red Cross, Illinois Division of Water Resources and local building and health department officials.

Contractors readily participate in these open houses for they are able to explain their operations and make business contacts. Their displays of sump pumps and back up valves and their pictures of houses being moved draw the homeowner's interest and help explain floodproofing techniques. The contractors' knowledge and practical experiences complement the theory and general orientation of the slide show.

All attendees receive a copy of Protect Your Home from Flood Damage and numerous handouts.

APPENDIX B

MITIGATION TABLE

APPENDIX B

DAC MITIGATION TABLES

The initial team of three state employees, four state consultants, and three FEMA reservists underwent a half-day training session on mitigation measures, financial assistance, and mitigation table procedures. This team began work the next morning at three disaster application centers. Eventually there were six DACs open at the same time. Table staffing varied from three in the busiest centers to one when DAC attendance died down.

Due to state funding restriction, the use of consultants had to be phased out after a week. Beginning on the fifth day of operations DAC registrars were cross trained as mitigation advisors. These people were given a two hour training session and were able to watch an experienced mitigation advisor for a few hours before they went on their own. The new staff were expected to know only a relatively narrow set of floodproofing activities and were not familiar with building permits, flood insurance or financial assistance programs. In all, twelve more activists were trained as mitigation advisors and eventually most of them worked in every DAC.

A preliminary set of DAC mitigation procedures was drafted for the training session. Several changes were made to these procedures based on experience. The procedures were then changed and the revised version is included as Attachment 1. In most cases the mitigation people counseled everyone who had some form of damage to their building or contents. In some cases, the heavy workload required the registrars to send only volunteers or people located in mapped floodplains to the mitigation table. Sometimes, a backlog of people waiting for the mitigation table resulted in presentations to small groups instead of one-on-one counseling.

The instructions for the mitigation table staff are included as Attachment 2. Dr. Laska's earlier work resulted in instructions that the advice be made as personal and as clear as possible. The objective of this was to give the client a very specific set of recommendations for his/her property. All visitors received a copy of Flooded Basements and/or Protect Your Home, depending on whether they had flooding over the first floor.

An average of 9-10 minutes was spent with each person or family. Each table had a supply of "typical building construction" drawings which are included as Attachment 3. The client would be asked what kind of building he or she had and the appropriate drawing would be selected. As the client explained

what happened during the flood, the mitigation table staff person would draw the source of entry and depth of water on the drawing with a blue marker. The staff would then review the most appropriate measures, again marking up the drawing to show where they would be installed.

Clients were advised briefly of potential funding sources and of flood, sewer backup, or sump pump failure insurance. They were also given the DFO's hotline telephone number to call if they had questions or needed help getting financial assistance. Those few who did call were given follow-up calls within 24 hours.

Each DAC table maintained a mitigation table record (Attachment 4). The DAC application form control number was recorded on this form to facilitate later follow-up surveys and recall of property owner name and address. A continuing record was maintained of summary data such as the total number of properties with flooding over the first floor by community. An example of this record is included as Attachment 5.

At the end of the first 13 days, September 9, the control numbers were identified for approximately 250 properties which had been recommended for elevation or relocation or whose owner was interested in selling. The FEMA-state mitigation staff pulled the names and addresses of these properties from the DFO computer. This information was provided to communities to assist their mitigation planning and to help identify target areas for acquisition or relocation. Printouts of their residents' names, addresses, and control numbers were provided to four requesting communities along with copies of the completed mitigation table record forms.

DAC Mitigation Table Procedures: Registrar Activities

People arrive, sign in, get a number, and wait in the waiting area. If sufficient copies are available, FEMA and state mitigation manuals are in the waiting area for them to read.

When their number is called, applicants go to the registrar. The registrar discusses the applicant's situation and completes the DAC registration form ("FEMA Form 90-69, Disaster Assistance Registration/ Application", Figure 1A). Among the questions the registrar asks is whether the applicant had any property damage.

If real estate or personal property was damaged (Section C.1. on the DAC registration form), the registrar checks box 18 in section D to refer the applicant to the mitigation table. The registrar instructs the applicant that the people at the mitigation table will discuss things that can be done to reduce damages from a similar flood in the future.

The mitigation table staff want to see everyone who can benefit from their advice. If the workload gets too heavy, the staff may request that the registrars do more screening. For example, the staff may be able to see only people whose buildings were severely damaged or only those who are interested in taking measures to protect themselves from future flooding.

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FEDERAL EMERGENCY MANAGEMENT AGENCY
DISASTER ASSISTANCE REGISTRATION APPLICATION

See Privacy Act on Reverse ☐ | CONTROL No. N5141 | OMB No. 3067-0009 Expires June 30, 1987

A APPLICANT INFORMATION

1. NAME OF APPLICANT (Last, First, MI)
2. NAME OF SPOUSE/Co-Applicant (Last, First, MI) 3. SSN: APPLICANT _____ SPOUSE _____
4. GIVE A BRIEF SUMMARY OF HOW YOU WERE AFFECTED BY THE DISASTER
5. DATE OF LOSS
6. ADDRESS OF DAMAGED PROPERTY — No. | Dir. | Street | City | State | Zip
7. COUNTY
8. PRIMARY RESIDENCE — ☐ NO, go to 9 | ☐ YES — ☐ Own/Rent Free ☐ Rent | ☐ House ☐ Mobile Home ☐ Apartment/Duplex ☐ Other
9. CURRENT MAILING ADDRESS — Same as above ☐ — No. | Dir. | Street | City | State | Zip
10. PHONE NUMBER(S) — CURRENT PHONE ( ) | WORK PHONE ( ) | ALTERNATE PHONE ( )

	YES	NO
11. Was your BUSINESS damaged (includes rental property you own, but not farm property)?	☐ Check D2, 6, 8	☐
12. Was your FARM damaged (includes crops, livestock, farm bldgs., machinery, but not FARM HOME)?	☐ Check D2, 7, 8	☐
13. Have you lost time at work or become UNEMPLOYED due to this disaster (includes Self-Employed)?	☐ Check D6	☐
14. Are your disaster-related needs LIMITED to BUSINESS or FARM damage, or UNEMPLOYMENT?	☐ STOP - Skip to D8 - 11	☐
15. Do you have EMERGENCY need for CLOTHING, SHELTER or FOOD?	☐ Check D3, 4	☐
16. Do you have disaster related ☐ MEDICAL, ☐ DENTAL, or ☐ FUNERAL EXPENSES?	☐ Check D3, C[4]	☐
17. Was your HOME or PERSONAL PROPERTY affected (includes vehicles)?	☐ Check D2, 8	☐
18. Do you need any services related to items D8 through D18?	☐ Check as Appropriate	☐

19. HOUSEHOLD

NAMES OF ALL PERSONS LIVING IN HOME AT THE TIME OF DISASTER	RELATION TO HEAD OF HOUSEHOLD	SEX	AGE	DEP. Y/N
	HOH			

(continued -)

20. Has anyone listed above also visited a DAC and applied for assistance? (Name):

B INSURANCE/HOUSING INFORMATION (Registrar: Advise applicant on disaster housing assistance ☐)

1. DAMAGE OR LOSSES CAUSED BY: ☐ Flood ☐ Wind ☐ Other ☐ Rain ☐ Fire
2. INSURANCE COVERAGE: ☐ NO INSURANCE ☐ Homeowners/Renters ☐ Mobile Home ☐ FLOOD — Policy No. & Company

REGISTRAR: If damage is limited to wind, rain and/or fire and applicant has homeowners/renters insurance, check B[2], skip to C.

3. Have any of the following items been SO SEVERELY affected that you and your family SHOULD NOT LIVE IN your primary residence?
☐ Foundation/Outside Walls ☐ Roof ☐ Only Access (Bridge/Road)
☐ Debris/Standing Water/Mud ☐ Utility ☐ Furnace (Season) ☐ Other
☐ YES, check B[1] and continue ☐ NO, continue

4. Have you made any repairs to the above items at your own expense TO ENABLE YOU TO LIVE THERE?
☐ YES, check B[1] ☐ NO — If B3 and B4 above are NO, check B[3] below

APPLICATION DECISION: B — B[1] ☐ Temporary Housing Application; B[2] ☐ No Application — Insurance; B[3] ☐ No Application-Insufficient Damage/Expense

5. CURRENT LOCATION: ☐ Home ☐ Friend/Family ☐ Mass Shelter ☐ Hotel/Motel ☐ Rental Unit
6. PAID FOR BY: ☐ Applicant ☐ Red Cross ☐ No Cost ☐ Other

C INCOME INFORMATION (Registrar: Advise applicant on SBA and IFG programs ☐)

DAMAGE ESTIMATE
Real Estate $ _____
Personal Property _____
Other _____

2. NUMBER OF DEPENDENTS IN HOUSEHOLD INCLUDING APPLICANT: _____

3. INCOME TEST ☐ Week ☐ Month ☐ Year
a. Gross income of Applicant $ _____
b. Other gross income (Include spouse's income, interest, dividends) _____
c. Total (a + b) _____
d. SBA minimum cost of living amount for this size household _____

If 3d is LESS than 3c: — Check C[1] below, issue SBA Application
If 3d is GREATER than 3c: — Check D1 and go to Section E

APPLICATION DECISION: C
C[1] ☐ SBA Application Issued
C[2] ☐ SBA Application Refused
C[3] ☐ SBA Decline Issued - This IS an IFG Application for Housing, Personal Property and Transportation
C[4] ☐ MEDICAL, DENTAL, FUNERAL EXPENSES-This IS an IFG Application

D REFERRALS (Initial in blank spaces)

☐ 1. Summary Decision (SBA) _____	☐ 6. Business Loans (SBA) _____	☐ 11. Legal Services _____	☐ 16. _____
☐ 2. Map Reader _____	☐ 7. Agricultural Aid _____	☐ 12. Social Security _____	☐ 17. _____
☐ 3. American Red Cross _____	☐ 8. Tax Assistance _____	☐ 13. Veterans Services _____	☐ 18. _____
☐ 4. Vol. Agency _____	☐ 9. Local Officials _____	☐ 14. Food Stamps _____	☐ 19. _____
☐ 5. Unempl. Assistance _____	☐ 10. Insurance Services _____	☐ 15. Consumer Svc. _____	☐ 20. Exit Interview _____

COMMENTS:

E CERTIFICATION

REGISTRAR: Ask APPLICANT to read the CERTIFICATION/AUTHORIZATION on the reverse side and SIGN below.
APPLICANT: I have read or had read to me and understand the Certification on the reverse of this form. ☐

1. SIGNATURE OF APPLICANT	2. DATE	3. DAC No.	4. NAME OF REGISTRAR (Print)	5. Land Registrar (Init.)

F FLOOD HAZARD DETERMINATION (This section to be completed by map reader)

1. COMMUNITY-PANEL NO.	2. MAP DATE	3. ZONES			
		☐ Zone A	☐ Zone V	☐ Other	
		☐ Not Mapped	☐ No Map	☐ Floodway	

DIRECTION TO DAMAGED PROPERTY (Nearest cross street and other location aids (sketch map if necessary))

FEMA Form 90-69, APR 86 REPLACES EDITION OF SEP 85 AND FEMA Form 90-72, SEP 85 WHICH ARE OBSOLETE.

FCO

DAC Mitigation Table Procedures: Mitigation Table Activities

1. Fill out the first four columns of the mitigation table record form (Appendix D):

   Control No.: Use the number at the top of the DAC registration form.
   Community: City or village name. If unincorporated, note accordingly, e.g., "uninc. Cook, east of Des Plaines."
   Source: Note one or more of the following.
   overbank: stream overflowed its banks
   sewer: sewer backed up
   drainage: more rain than drainage system could handle
   Depth: Note approximate depth in basement or over first floor, e.g., "B: 3'" or "FF: 2' + B."

2. Plan A (when there is adequate time and no long waiting line): Use the typical building construction drawings (Appendix C) when reviewing the person's source of flood damage and type of building. Take notes on the drawings as the person talks. Explain the various appropriate mitigation methods for that situation and note your explanations on the drawing. If the person is interested in mitigation funding, review the potential funding sources applicable to that person (e.g. SBA, IFG, 1362, etc.). If a code requirement is needed for funding, advise the person to first have the building inspector contact you before completing the application for SBA or IFG.

3. Plan B (when many people are waiting and in a hurry): Assemble those waiting into similar groups (e.g., those with only basement flooding) and give a general presentation to them. Give them the appropriate manuals and tell them that you can discuss protection measures when they see that you are free.

4. Advise everyone about flood, sewer backup, or sump pump failure insurance, as appropriate.

5. Give clients your name and DFO telephone hotline for them to call if they have questions or need help.

6. Complete the last three columns of the mitigation table record form (Appendix D).

   Manual: Which manual did they get? (*Protect Your Home, Basements,* or *Elevating and Relocating*?)
   Recommendation: What did you advise?
   Follow up: Is the person going to need more technical advice, help with the building department, or help with disaster assistance? Put "yes" for all potential acquisition or relocation properties.

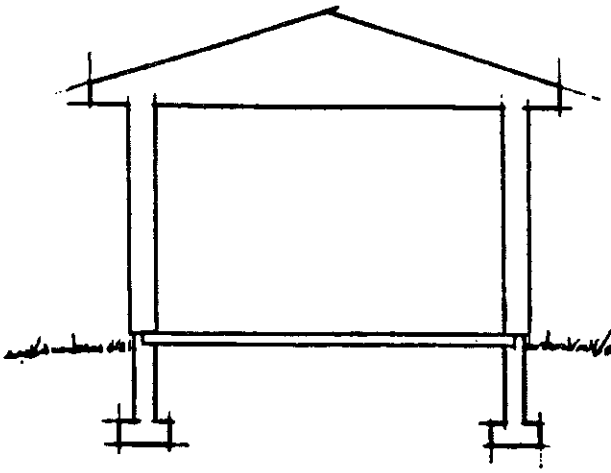
7. Initial Box 18 on the DAC registration form and instruct the applicant on where to go next.

Typical Mitigation Recommendations

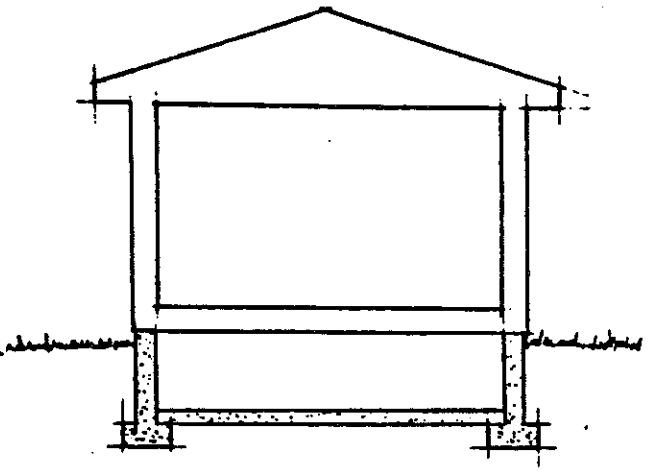
Construction	Depth	Recommendation (in priority order)
1. All substantial damage		1. elevate, relocate or sell, give *Protect Your Home* (*PYH*); if interested, give *Elevating and Relocating*; if insured, explain and give 1362 handout
2. Crawlspace	up to 3 ft	1. low levee/berm/floodwall, give *PYH*
		2. elevate or relocate, give *PYH*; if interested, give *Elevating and Relocating*
		3. Flood Shield
	over 3 ft	1. elevate or relocate, give *PYH*; if interested, give *Elevating and Relocating*
3. Slab	up to 3 ft	1. dry floodproof, give *PYH*
		2. low levee/berm/floodwall, give *PYH*
	over 3 ft	1. relocate, give *PYH*; if interested, give *Elevating and Relocating*
4. Garage or outbuilding		1. wet floodproof, give *PYH*
5. Basements		Give *Flooded Basements*
Sump backup		1. check pump, get more pumps, drain out on top of ground (check local code)
Sewer backup	up to 3 ft	1. plug or standpipe
	over 3 ft	1. backup valve, overhead sewers
	Seepage	1. seal walls
		2. subsurface drainage system
Surface flow	up to 3 ft	Treat bi-levels, split-levels, and walk out basements with less than 3 ft same as slab
	over 3 ft	1. wet floodproof, give *PYH*
		2. elevate or relocate, give *PYH*; if interested, give *Elevating and Relocating*

Typical Building Construction Drawings

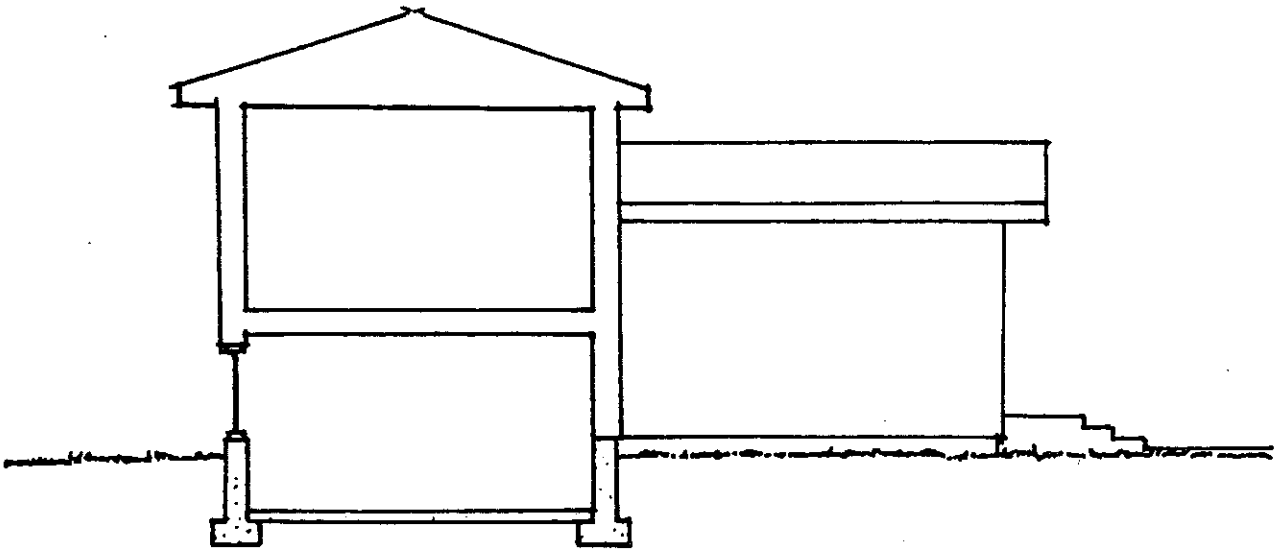
Note: The actual drawings used were larger, one to an 8½-x-11-inch piece of paper.



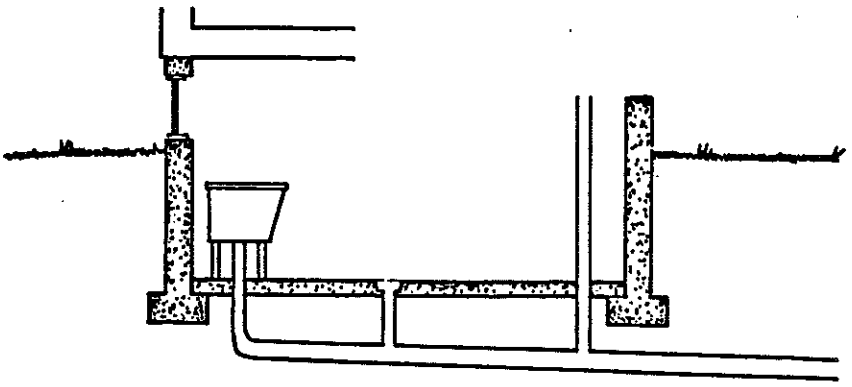
HOUSE ON SLAB



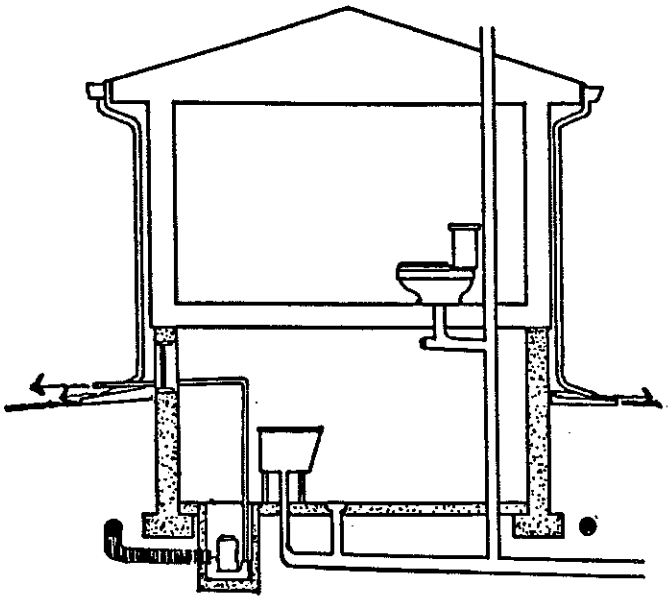
HOUSE ON CRAWLSPACE



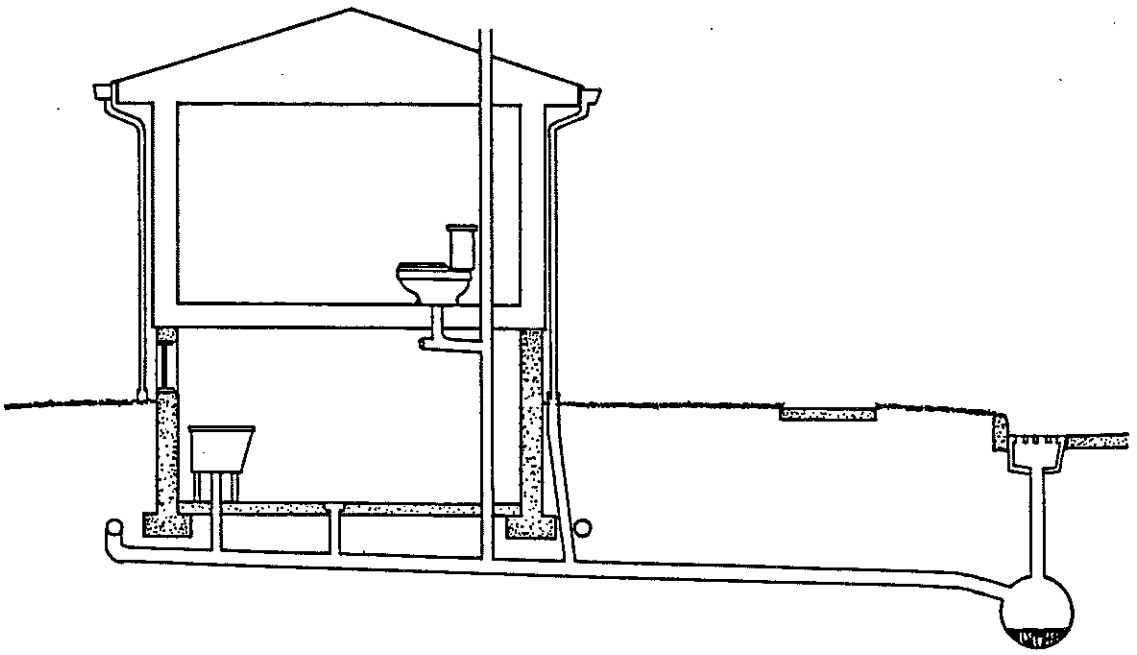
SPLIT-LEVEL HOUSE



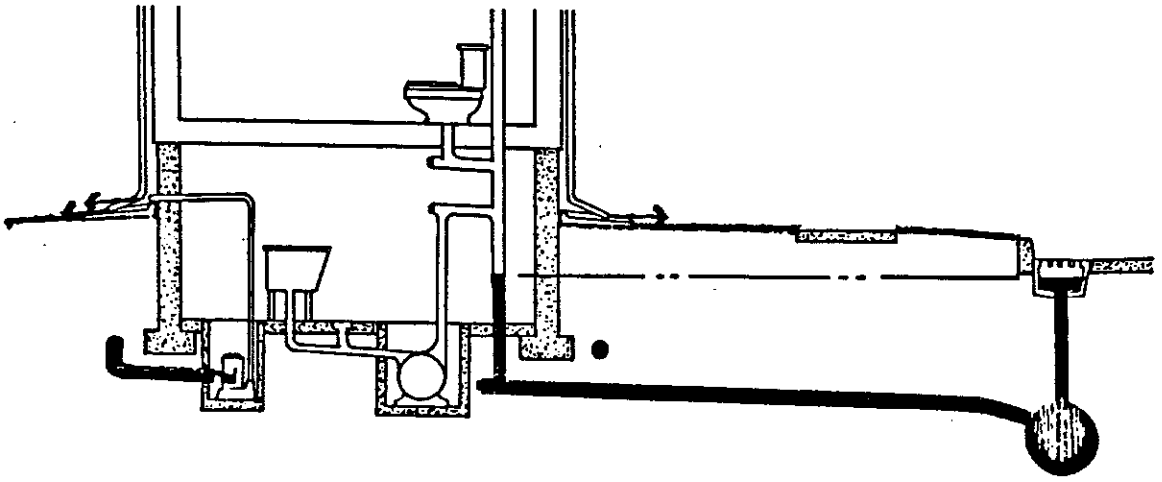
HOUSE WITH BASEMENT, SEPARATE SEWER, NO SUBSURFACE DRAINAGE



HOUSE WITH BASEMENT, SEPARATE SEWER
SUBSURFACE DRAINAGE WITH SUMP PUMP



HOUSE WITH BASEMENT, COMBINED STORM AND SANITARY SEWER



HOUSE WITH BASEMENT, COMBINED SEWER
STORM SEWER INTAKES DISCONNECTED, OVERHEAD SANITARY SEWER

Mitigation Table Record Form

DAC: #1

Date: 8/31/87

Name: _____

MITIGATION TABLE RECORD

Control No.	Community	Source	Depth	Manual	Recommendation	Follow up?
P-3337	Des Plaines	Surface Sewer	3' B	FB	NFI - Hook Downspouts - in Line Valve	NO
P-3268	D.	Surface	3" FF Full crawl	ERH	Elevate / relocate (Neighborhood drain in back yard)	Yes
P-3338	D.	Surface sewer	1' B	FB	Berm - stand pipe - br. wall - sump	NO
P-3328	D.	Surface sewer	2' B	FB	B.U. Sump. - check other h. sewer line	NO
P-2919	D.	drainage	3' B	FB	B.U. Sump - NFI	NO
P-3327	D.	surface	5" main crawl	ERH	NFI - elevate - Berm - Water shield Water barrier	NO
P-3376	D	surface	11" B	FB	B.U. Sump - check Valve -	NO
P-2921	D.	surface sewer	2' B	FB	Has had all done already check wall cracks yet	NO
O-5022	D	~~Surface~~ Surface	3" FF Full B.	ER	Elevate or Relocate	Yes
P-3250	C. Schaumberg	Surface	2F FF Slab	ERH	" "	Yes
P-3340	D.	surface	2' FF	ERH	" "	Yes
O-5044	D.	seepage sewer	3½' B	FB	Off sewer - sumps - seal Walls	NO
O-5053	D	surface	4" B	—	shallow wall around house next stairs	NO
P-3341	D.	surface	7' in. crawl	—	sump? / buy out - House already raised	Yes
O5065	D	surface	1½' FF	—	glass brick - don't want to improve	NO
P-2993	D	sewer	2' B	FB PHF	Xtra sump - Off sewer - stand pipe B.U. Valve	NO

IDOT-DWR: 8129f

DAC Mitigation Table Depth of Flooding Data

DR 798: DAC Mitigation Table

Depth of Flooding Data as of September 18

Community	Basement Only	Over First Floor Under 3'	Over First Floor Over 3'
Addison	210	103	36
Arlington Heights	10	19	10
Bartlett	0	1	0
Bellwood	321	9	3
Bensenville	10	25	15
Berkeley	2	1	0
Bloomingdale	1	4	0
Brookfield	0	1	1
Carol Stream	6	29	2
Chicago	58	65	42
Cicero	1	0	0
Cook Co. Uninc.	26	54	12
Deerfield	0	0	1
Des Plaines	392	92	27
Downers Grove	0	1	0
Elgin	1	1	0
DuPage Co. Uninc.	1	26	7
Elk Grove Village	0	9	2
Elmhurst	265	91	17
Elmwood Park	1	3	0
Evanston	67	13	1
Forest Park	1	1	0
Franklin Park	3	8	1
Glencoe	1	1	0
Glen Ellyn	34	14	1
Glendale Heights	2	4	1
Glenview	6	9	1
Hanover Park	1	6	1
Harwood Heights	1	2	0
Hoffman Estates	0	3	0
Itasca	1	3	0
Lemont	0	1	0
Lincolnwood	6	2	1
Lisle	0	1	0
Lombard	8	29	6
Lyons	1	2	0
Maywood	54	1	0
Medinah	0	0	1
Melrose Park	0	15	1
Morton Grove	4	9	0
Mt. Prospect	142	21	12
Naperville	0	1	0
Niles	164	5	3
Norridge	3	4	0
Northbrook	2	3	1
Northfield	0	2	0
Northlake	0	5	1
Oak Brook	0	1	2
Oak Park	0	2	0
Oakbrook Terrace	0	1	0
Palatine	1	0	1
Park Ridge	105	35	2
Prospect Heights	0	9	2
River Grove	1	7	0
Riverside	0	1	2
Rolling Meadows	0	6	0
Roselle	2	16	5
Rosemont	2	15	9
Schaumburg	2	6	0
Schiller Park	0	8	2
Skokie	214	71	15
Stone Park	0	13	1
Streamwood	0	2	0
Villa Park	19	28	1
Warrenville	0	1	0
Westchester	2	10	1
Westmont	0	4	2
Wheaton	26	5	2
Wheeling	29	9	5
Wilmette	11	10	3
Winfield	4	4	0
Woodridge	0	0	1
Wood Dale	5	36	21
	2229	999	284

APPENDIX C

SURVEY INSTRUMENTS

Illinois Department of Transportation

Division of Water Resources
310 South Michigan Avenue/Room 1606
Chicago, Illinois 60604

About one year ago in August, 1987, your area was flooded. After the flood the Division of Water Resources (DWR) worked with many people to recommend ways to prevent future damage to their homes, what we call floodproofing.

We are interested in knowing whether you have made any floodproofing changes to your home. We are also interested in your evaluation of the efforts which the DWR undertook to inform homeowners about floodproofing.

You are one of a small number of people who are being asked to tell their experiences and give their opinion on these matters. Your name was selected from a list of area residents who dealt with the government after the 1987 flood. If you were flooded in 1986, you may have received a survey after the 1986 flood as well. Most of the questions in this survey are focused on different aspects of informing flood victims so we ask that you please complete this new survey as well.

In order that the results will truly represent the thinking of the people who experienced the flooding, it is important that each questionnaire be completed and returned. It is very important to the study that you complete the questionnaire even if you have not done any floodproofing measures.

The questionnaire should be filled out by the family member whose name appears on this letter, i.e. the one who made contact with the government in August, 1987 (who attended an Open House or Disaster Application Center).

You may be assured of complete confidentiality. The questionnaire has an identification number for mailing purposes only. This is so that we may check your name off the mailing list when your questionnaire is returned. Your name will never be placed on the questionnaire.

The research is being conducted for us by a sociologist who is an expert in disaster research, Dr. Shirley Laska of the University of New Orleans. We will review the results as will the Federal Emergency Management Agency.

You may receive a summary of results by writing "copy of results requested" on the back of the return envelope, and printing your name and address. I would be most happy to answer any questions you might have. Please write or call. The telephone number is (312) 705-4570.

Thank you for your assistance.

Sincerely,

Richard Roths

Richard J. Roths, Field Adviser
Floodplain Management

State of Wisconsin \ DEPARTMENT OF NATURAL RESOURCES

Carroll D. Besadny
Secretary

BOX 7921
MADISON, WISCONSIN 53707

October 31, 1988

File Ref:

About two years ago your area was flooded. After floods some flood victims make changes to their homes to prevent future flood damage, what we call **floodproofing.** The Wisconsin Floodplain Management Office of the Department of Natural Resources is interested in determining how many flood victims in the Milwaukee area have attempted to floodproof their homes. We are also interested in knowing flood victims' opinions about ways that the government--both state and federal--might assist homeowners in future floodproofing through the development of information programs on floodproofing.

You are one of a small number of people who are being asked to tell their experiences and give their opinion on these matters. Your name was selected from a list of area residents who dealt with the government after the 1986 flood.

In order that the results will truly represent the thinking of the people who experienced the flooding, it is important that each questionnaire be completed and returned. It is very important to the study that you complete the questionnaire even if you have not done any floodproofing measures.

The questionnaire should be filled out by the family member whose name appears on this letter, i.e. the one who made contact with the government in September, 1986 (who went to the Disaster Application Center).

You may be assured of complete confidentiality. The questionnaire has an identification number for mailing purposes only. This is so that we may check your name off the mailing list when your questionnaire is returned. Your name will never be placed on the questionnaire.

The research is being conducted for us by a sociologist who is an expert in disaster research, Dr. Shirley Laska of the University of New Orleans. We will review the results as will the Federal Emergency Management Agency.

You may receive a summary of results by writing "copy of results requested" on the back of the return envelope, and printing your name and address.

I would be most happy to answer any questions you might have. Please write or call. The telephone number is (608) 266-1926.

Thank you for your assistance.

Sincerely,

Larry A. Larson, Chief
Floodplain Management
^T^N^P^P

POSTCARD

Last week a questionnaire was mailed to you on the topic of home floodproofing actions you may have taken and ways that the government might assist homeowners in floodproofing.

If you have already completed and returned it to us please accept our sincere thanks. If not, please do so today.

You are one of only a small, but representative, sample of flood victims to whom the questionnaire was sent. It is extremely important that yours be included in the study to accurately represent the opinions of flood victims.

Richard Roths

Richard Roths, Field Adviser
Floodplain Management

State of Wisconsin \ DEPARTMENT OF NATURAL RESOURCES

Carroll D. Besadny
Secretary

BOX 7921
MADISON, WISCONSIN 53707

File Ref:

About three weeks ago I wrote to you seeking your help in telling us what flood victims are doing to prevent future damage and how the government might inform flood victims of floodproofing methods. As of today we have not yet received your completed questionnaire.

The Department of Natural Resources has undertaken this study because of the belief that citizen opinions should be taken into account in the formation of public policies to help prevent flood damage.

I am writing to you again because of the significance each questionnaire has to the usefulness of this study. Your name was selected through a scientific sampling process in which residents who made contact with the government at the Disaster Application Centers after the flood had an equal chance of being selected. In order for the results of this study to be truly representative of the opinions of all flood victims, it is essential that each person in the sample return their questionnaire.

The questionnaire should be filled out by the family member whose name appears on this letter. It is very important to the study that you complete the questionnaire even if you have taken no protective measures.

In the event that your questionnaire has been misplaced, a replacement is enclosed.

Your cooperation is greatly appreciated.

Cordially,

Larry Larson, Chief
Floodplain Management

P.S. A number of people have written to ask when results will be available. We hope to have them out as soon as the analysis is completed.

I.D. #_____

HOMEOWNER FLOODPROOFING
A SURVEY TO DETERMINE THE INTEREST OF HOMEOWNERS IN FLOODPROOFING THEIR HOMES

The Illinois Division of Water Resources is conducting this survey in order to obtain information on homeowner floodproofing (making changes to protect your home from future flood damage) and to evaluate programs implemented during the 1987 flood to inform victims about floodproofing.

Please answer all of the questions. Try to select from the answers provided. When you are asked to give only one answer to a question, please do not give more than one. When you are asked to give multiple answers, select as many answers as apply to you. It is very important that you answer the questions in order. Once you answer a question follow any GO TO instructions to the next appropriate question.

If you wish to comment on any question or qualify your answers, please feel free to do so in the space in the margins. Your comments will be read and taken into account.

Thank you for your help.

Illinois Department of Transportation
Division of Water Resources

Please return in enclosed stamped envelope to survey consultant:

Dr. Shirley Laska
Department of Sociology
University of New Orleans
New Orleans, LA 70148

YOUR FLOOD EXPERIENCES

Q-1 What kind of foundation does your house have? (Circle number next to the appropriate answer.)
- 1 FULL BASEMENT
- 2 SPLIT LEVEL OR BI-LEVEL (LOWEST FLOOR IS 3-4 FT. UNDERGROUND)
- 3 CONCRETE SLAB
- 4 CRAWLSPACE
- 9 OTHER (specify) _____

The next two questions ask about *surface* flooding. The two after that about *subsurface* flooding.

Q-2 Were you flooded in *August, 1987* by *surface* flooding from water on *top* of the ground? (Circle the appropriate number and follow instructions to the next question.)
- 0 NO WATER ENTERED MY PROPERTY ON TOP OF THE GROUND ▶ GO TO Q-4
- 1 SURFACE WATER FLOODED THE YARD ONLY BUT DIDN'T REACH ANY STRUCTURES ▶ GO TO Q-4
- 2 SURFACE WATER GOT INTO THE GARAGE, SHEDS AND/OR OTHER OUTBUILDINGS BUT DID NOT REACH THE HOUSE'S WALL ▶ GO TO Q-4
- 3 SURFACE WATER REACHED HOUSE'S WALLS BUT DID NOT GET IN ▶ GO TO Q-4
- 4 SURFACE WATER GOT INTO THE BASEMENT, OR OTHER LEVEL BELOW THE FIRST FLOOR ▶ GO TO Q-3
- 5 SURFACE WATER GOT INTO THE BASEMENT AND FIRST FLOOR ▶ GO TO Q-3
- 6 SURFACE WATER GOT INTO FIRST FLOOR (NO BASEMENT) ▶ GO TO Q-4

(If *surface* water got into your basement)

Q-3 How did it enter? (Circle as many answers as apply)
- 1 THROUGH CRACKS IN THE WALLS
- 2 THROUGH WINDOW(S) AND/OR DOOR(S)
- 3 FROM THE FIRST FLOOR
- 9 DON'T KNOW

Q-4 Did water enter the basement from *below* the surface? (Circle number.)
- 0 NO ▶ GO TO Q-6
- 9 DON'T HAVE A BASEMENT ▶ GO TO Q-6
- 1 YES

(If yes)

Q-5 How did it enter? (Circle as many answers as apply.)
- 1 WATER CAME UP THE SUMP BECAUSE THE PUMP BROKE OR CLOGGED
- 2 WATER CAME UP THE SUMP BECAUSE THE PUMP STOPPED DUE TO POWER OUTAGE
- 3 WATER CAME UP THE SUMP BECAUSE THE PUMP WAS OVERLOADED
- 4 SEWER BACKED UP BECAUSE THERE WAS NO STAND PIPE, PLUG OR SEWER BACK-UP VALVE
- 5 SEWER BACKED UP BECAUSE THE STAND PIPE, PLUG OR BACK UP VALVE WAS NOT INSTALLED BEFORE THE FLOOD THREATENED
- 6 SEWER BACKED UP BECAUSE THE STAND PIPE, PLUG OR VALVE BROKE OR DID NOT WORK
- 7 WATER CAME IN THROUGH CRACKS IN WALL OR FLOOR
- 8 DON'T KNOW HOW WATER GOT INTO THE BASEMENT FROM BELOW THE SURFACE
- 9 OTHER (Specify) _____

Q-6 How deep was the water in the house? (Circle *one* answer.)
- 0 NO WATER GOT INTO THE HOUSE
- 1 LESS THAN A FOOT IN THE BASEMENT OR OTHER LEVEL BELOW 1ST FLOOR
- 2 1-3 FEET DEEP IN THE BASEMENT OR OTHER LEVEL BELOW 1ST FLOOR
- 3 MORE THAN THREE FEET DEEP IN THE BASEMENT OR OTHER LEVEL BELOW 1ST FLOOR
- 4 LESS THAN A FOOT DEEP OVER THE 1ST FLOOR
- 5 1-3 FEET DEEP OVER THE 1ST FLOOR
- 6 MORE THAN 3 FEET DEEP OVER THE 1ST FLOOR

Q-7 What was damaged by the flood? (Cicle as many as apply.)
- 0 NOTHING WAS DAMAGED
- 1 YARD, AUXILIARY BUILDINGS, GARAGE
- 2 FURNITURE, CARPETING, APPLIANCES AND/OR OTHER CONTENTS
- 3 FURNACE, CENTRAL COOLING, WIRING, FUSE BOX
- 3 WINDOWS AND/OR DOORS DAMAGED
- 4 INSULATION, WALL BOARD, PANELING AND/OR INTERIOR FLOOR DAMAGED
- 5 STRUCTURAL DAMAGE: WALLS, CONCRETE FLOOR OR FOUNDATION CRACKED/BROKEN
- 6 OTHER (specify)

Q-7A What was the total cost of the damage $ _____

Q-8 Was your house flooded by the *October, 1986* flood? (Circle answer.)
- 0 NO ▶ GO TO Q-10
- 9 DON'T KNOW (DIDN'T LIVE IN HOUSE AT THAT TIME) ▶ GO TO Q-10
- 1 YES

(If your house was flooded in *October 1986*)

Q-9 Did you go to the Disaster Application Center in *October 1986?*
- 0 NO
- 1 YES

Q-10 Was your house flooded *before* the *October, 1986* flood?
- 0 NO
- 9 DON'T KNOW
- 1 YES

YOUR FLOODPROOFING ACTIVITIES

Floodproofing is any changes made to an existing house which helps protect it from being damaged in future floods. (Note: A house includes the furnace, air conditioner, plumbing, electrical wiring, yard.)

Q-11 Have you made any floodproofing changes to your house since the *August, 1987* flood? (Circle answer.)
- 0 NO Why not? _____ ▶ GO TO Q-19
- 1 YES

(If yes)

Q-12 What changes have you made? (Circle the numbers next to *all* that you have done since August, 1987.)

1 MOVED DAMAGEABLE CONTENTS PERMANENTLY OUT OF THE BASEMENT
2 RAISED THE FURNACE, WATER HEATER OR MAJOR APPLIANCES
3 RAISED WIRING, FUSE BOX
4 REPLACED BASEMENT WINDOWS WITH GLASS BRICKS
5 BUILT PROTECTION AROUND BASEMENT WINDOWS/DOORWAYS/DRIVEWAY
6 PURCHASED/MADE STAND PIPE/PLUG TO PREVENT SEWER BACKUP
7 INSTALLED VALVE TO PREVENT SEWER BACKUP
8 RAISED SEWER PIPES
9 INSTALLED A SUMP PUMP
10 INSTALLED BATTERY-OPERATED SUMP PUMP
11 WATERPROOFED BASEMENT WALLS
12 STOPPED USING BASEMENT AS FINISHED ROOM
13 IMPROVED DRAINAGE NEXT TO THE HOUSE
14 ADDED DIRT FILL NEXT TO HOUSE
15 BUILT CONCRETE OR BRICK WALL OUTSIDE THE HOUSE
16 BUILT A LEVEE/BERM OUTSIDE THE HOUSE
17 ELEVATED HOUSE
18 OTHER (specify) _____

Q-13 Please tell us how you *first* learned about the possibility of floodproofing and then how you got *additional* information. (Circle only *one* number for each column—the most important information source.)

(Circle only one number for each column)	1ST LEARNED	MORE INFORMATION
SOMEONE WHO HAD ALREADY MADE THE CHANGE OR HAD IT DONE	1	1
A CONTRACTOR	2	2
SOMEONE KNOWLEDGEABLE ABOUT FLOODPROOFING	3	3
NEWSPAPER, RADIO OR TV	4	4
BOOKLET "PROTECT YOUR HOME FROM FLOODING" OR "FLOODED BASEMENTS"	5	5
DISCUSSION WITH A FLOODPROOFING EXPERT AT THE DISASTER CENTER	6	6
OPEN HOUSE WITH SLIDE SHOW, GOVT. OFFICIALS & CONTRACTORS	7	7
OTHER GOVERNMENT OR NEIGHBORHOOD MEETING	8	8
CITY OR COUNTY OFFICIAL	9	9
NO SOURCE, I KNEW HOW OR FIGURED IT OUT AS I WENT ALONG	10	10
OTHER (Specify) _____	11	11
DON'T REMEMBER	12	12

Q-14 Why did you select the floodproofing measure(s) that you did? (Circle the number next to the *one* which was most important.)

1 PERMANENT (WON'T REQUIRE REPAIR OR REPLACEMENT)
2 APPROPRIATE FOR MY HOUSE AND FLOODING CONDITIONS
3 COST EFFECTIVE
4 LITTLE EFFORT TO DO
5 RECOMMENDED BY AN EXPERT
6 INEXPENSIVE
7 AUTOMATIC (REQUIRES NO ACTION JUST BEFORE FLOOD)
8 SAW AN ACTUAL EXAMPLE OF THE MEASURE IN PLACE
9 OTHER (Specify) _____

Q-15 What was the timing of your floodproofing?

1 DID IT AT THE SAME TIME I WAS REPAIRING DAMAGE WHICH OCCURRED FROM THE FLOOD
2 DID IT SEPARATELY FROM FLOOD REPAIRS
3 DID SOME WITH FLOOD REPAIRS AND SOME SEPARATELY

Q-16 Were you the person in your family in charge of seeing that the floodproofing was done?

1 YES, I WAS THE PERSON
2 NO, ANOTHER PERSON IN THE HOUSEHOLD WAS
3 I SHARED RESPONSIBILITY ABOUT EQUALLY

Q-17 Did you or another family member do the work themselves or did you pay someone else to do it?

1 I OR ANOTHER FAMILY MEMBER MADE CHANGE
2 PAID CONTRACTOR TO DO IT
3 DID PART, CONTRACTOR DID PART

Q-18 If you ever put your house up for sale, will you mention the floodproofing change(s) you have made as a positive feature of the house?

0 NO
1 YES
9 DON'T KNOW

Q-19 Had you made any floodproofing changes *before* the August, 1987, flood? (Circle answer.)

0 NO ..... ▶ GO TO Q-23
1 YES

Q-20 Was the change(s) you made tested by the flooding on your property during the *August, 1987* flood? (Circle answer.)

0 NO ..... ▶ GO TO Q-23
1 YES

(If yes)

Q-21 How much did the change(s) as a whole help to protect your home from damage during the August, 1987 flood? (Circle *one* answer.)

1 CHANGE(S) WAS VERY EFFECTIVE
2 CHANGE(S) HELPED SOMEWHAT
3 CHANGE(S) DID NOT HELP AT ALL

Q-22 Please indicate the effectiveness of each floodproofing change tested by the 1987 flood by writing the change on the line next to the phrase reflecting how you feel about the change.

EFFECTIVENESS EDUCATION — CHANGE YOU MADE BEFORE AUG., 1987

CHANGE WHICH WAS VERY EFFECTIVE IN AUG., 1987 _____

CHANGE WHICH HELPED SOMEWHAT IN AUG., 1987 _____

CHANGE WHICH DID NOT HELP AT ALL IN AUG., 1987 _____

Why do you think the change failed to protect you from damage? _____

_____

Q-23 To what extent do you believe that it is your responsibility as a homeowner to protect your home from future flood damage? (Circle the number which reflects your opinion.)

NOT AT ALL MY RESPONSIBILITY				COMPLETELY MY RESPONSIBILITY
1	2	3	4	5

Q-24 Would you like to floodproof your house in the future? (Circle the answer.)

0 NO ▶ GO TO Q-29

1 YES

(If yes)

Q-25 What floodproofing change would you like to do the *most*? _____

_____

Q-26 Is there something you would like to know that you don't already know about this floodproofing change or floodproofing in general? (Circle number.)

0 NO ▶ GO TO Q-28

1 YES

(If yes)

Q-27 Please describe what you would like to know. _____

_____

Q-28 Please rate the qualities of floodproofing changes listed below according to how important they are to you. (Circle number for each quality.)

Floodproofing should be:

	NOT IMPORTANT				VERY IMPORTANT
PERMANENT (WON'T REQUIRE REPAIR OR REPLACEMENT)	1	2	3	4	5
APPROPRIATE FOR MY HOUSE AND FLOODING CONDITIONS	1	2	3	4	5
COST EFFECTIVE	1	2	3	4	5
LITTLE EFFORT TO DO	1	2	3	4	5
ONE RECOMMENDED BY AN EXPERT	1	2	3	4	5
INEXPENSIVE	1	2	3	4	5
AUTOMATIC (REQUIRES NO ACTION JUST BEFORE FLOOD)	1	2	3	4	5
ONE THAT I COULD SEE A LOCAL EXAMPLE OF	1	2	3	4	5
ONE INDIVIDUALLY DESIGNED FOR MY HOUSE AND SITE	1	2	3	4	5

OPEN HOUSE FLOODPROOFING MEETING

Our records indicate that shortly after the August, 1987, flood you attended one of the Open House meetings, either at either Addison, Brookfield or Park Ridge. The next questions ask about that experience. I would like to begin this section by re-asking the question about whether you floodproofed since August, 1987 in order to direct you through the questions about the Open House.

Q-29 Have you made any floodproofing changes to your house since the *August, 1987* flood? (Circle appropriate number.)

0 NO ▶ GO TO Q-35

1 YES

(If yes)

Q-30 Did you make the decision to floodproof before or after you attended the Open House. (Circle appropriate number.)

1 BEFORE ▶ GO TO Q-33

9 DON'T REMEMBER ▶ GO TO Q-35

2 AFTER

(If after)

Q-31 Did the Open House assist you in making your decision? (Circle number.)

0 NO ▶ GO TO Q-35

9 DON'T REMEMBER ▶ GO TO Q-35

1 YES

(If yes)

Q-32 How did the advice assist you? (please explain) _____

_____ ▶ Important: GO TO Q-35

(If you decided before attending)

Q-33 Did the Open House help you with your floodproofing? (Circle number.)

0 NO ▶ GO TO Q-35

9 DON'T REMEMBER ▶ GO TO Q-35

1 Yes

(If yes)

Q-34 Please explain how the Open House helped if you had already decided to floodproof before you attended.

_____

_____

Q-35 Which of the following best represents your evaluation of the Open House. (Circle number.)

NOT USEFUL AT ALL				VERY USEFUL
1	2	3	4	5

If you answered 1 or 2, please ▶ GO TO Q-37

(If you answered 3, 4 or 5)

Q-36 Which of the following best describes the way it was useful? (Select only *one* answer.)

1 *INTRODUCED* ME TO THE IDEA OF FLOODPROOFING WHICH I REALLY HADN'T THOUGHT ABOUT BEFORE.
2 GAVE ME MORE *GENERAL* KNOWLEDGE ABOUT FLOODPROOFING TO ADD TO WHAT I ALREADY KNEW.
3 GAVE ME *SPECIFIC* DETAILS ABOUT THE EXACT FLOODPROOFING THAT I WANTED TO CARRY OUT.
4 OTHER (Specify) _____

Q-37 What change(s) would you recommend in the Open Houses to make them more useful for encouraging floodproofing?

_____

_____

Q-38 Below is a list of possible changes for the Open House. Please indicate your opinion about the possible changes by circling the *number* under the word which represents your opinion.

Characteristics of Open House:	Less	Same	More	No Opinion
a. NUMBER OF CONTRACTORS PRESENT SHOULD BE	1	2	3	9
b. INDIVIDUAL ATTENTION TO ATTENDEES SHOULD BE	1	2	3	9
c. FLOODPROOFING DISPLAYS SHOULD BE	1	2	3	9
d. EXPLANATION OF THE MANUAL SHOULD BE	1	2	3	9
e. EXPERTISE OF ADVISERS SHOULD BE	1	2	3	9
f. MATERIALS DISTRIBUTED SHOULD BE	1	2	3	9

Family Decision Making

Q-39 Are you more likely than your spouse to attend meetings such as public meetings, PTA, church activities, etc?

1 LESS LIKELY THAN MY SPOUSE
2 ABOUT EQUALLY AS LIKELY AS MY SPOUSE
3 MORE LIKELY THAN MY SPOUSE
9 HAVE NO SPOUSE

Q-40 Did you go to the Open House by yourself or with someone? (Circle appropriate number.)

1 WITH YOUR SPOUSE ▸ GO TO Q-46
2 WITH ANOTHER ADULT FAMILY MEMBER ▸ GO TO Q-46
3 BY YOURSELF, HAVE NO SPOUSE ▸ GO TO Q-46
4 BY YOURSELF, HAVE SPOUSE

(If you are married but went by yourself)

Q-41 Why did you go to the Open House instead of your spouse or without your spouse?

_____

_____

Q-42 When you returned from the Open House did you discuss with your spouse what you had learned at the Open House? (Circle number.)

0 NO ▸ GO TO Q-46
9 CAN'T REMEMBER ▸ GO TO Q-46
1 YES

(If you told your spouse about what was said at the Open House)

Q-43 Was your spouse interested in what you had to tell him/her?

0 NO ▸ GO TO Q-46
9 CAN'T REMEMBER ▸ GO TO Q-46
1 YES

(If yes)

Q-44 Was there something about floodproofing which your spouse asked you about that was unanswered at the Open House? (Circle number.)

0 NO ▸ GO TO Q-46
9 CAN'T REMEMBER ▸ GO TO Q-46
1 YES

(If yes)

Q-45 What questions weren't answered about floodproofing at the Open House that your spouse was interested in?

_____

_____

THE MITIGATION TABLE IN THE DISASTER APPLICATION CENTER

Q-46 Did you attend the Disaster Application Center after the *August, 1987* flood? (Circle number.)

0 NO ▸ GO TO Q-48
1 YES

(If yes)

Q-47 Did you discuss floodproofing with a floodproofing expert at the Mitigation Table?

0 NO
1 YES

BASIC CHARACTERISTICS

Q-48 What is your sex?

1 MALE
2 FEMALE

Q-49 What is your family type?

1 COUPLE HEADED HOUSEHOLD
2 SINGLE HEADED HOUSEHOLD

Q-50 What is *your* employment status?

1 I WORK OUTSIDE OF THE HOME
2 I DON'T WORK OUTSIDE OF THE HOME

Q-51 What is the employment status of your spouse?

1 HE/SHE WORKS OUTSIDE OF THE HOME
2 HE/SHE DOESN'T WORK OUTSIDE OF THE HOME
9 NO SPOUSE

Q-52 What is your approximate total household income?

1 0 to $19,000
2 $20,000 to $29,000
3 $30,000 to $39,000
4 $40,000 to $49,000
5 $50,000 to $59,000
6 $60,000 to $69,000
7 $70,000 to $79,000
8 $80,000 to $89,000
9 $90,000 or more

Q-53 What is the highest level of your education?

1 LESS THAN HIGH SCHOOL GRADUATE
2 HIGH SCHOOL GRADUATE
3 SOME COLLEGE
4 COLLEGE GRADUATE
5 GRADUATE WORK, NO DEGREE
6 GRADUATE DEGREE

Q-54 What is your age?

1 LESS THAN 29
2 30-39
3 40-49
4 50-59
5 60+

We would appreciate any additional comments you wish to make that you think may help the government learn how to assist homeowner flood victims with floodproofing.

WISCONSIN QUESTIONNAIRE

WAYS OF INFORMING HOMEOWNER FLOOD VICTIMS ABOUT FLOODPROOFING

Q-29 The following is a list of ways which the government might use to provide flood victims with information about floodproofing. Please evaluate each according to whether you think you would have been interested in it right after the September, 1986 flood. (Circle number for each activity.)

	NOT INTERESTED				VERY INTERESTED
RECEIVE A HANDBOOK ON HOW TO FLOODPROOF	1	2	3	4	5
VIEW AN EDUCATIONAL TELEVISION PROGRAM ON FLOODPROOFING	1	2	3	4	5
PURCHASE OR RENT A VIDEO ON HOW TO FLOODPROOF	1	2	3	4	5
ATTEND A PRESENTATION OR WORKSHOP ON FLOODPROOFING MEASURES IN YOUR COMMUNITY	1	2	3	4	5
SEE DEMONSTRATION OF MEASURES IN NEARBY HOMES	1	2	3	4	5
DISCUSS MY HOUSE'S FLOODPROOFING NEEDS WITH A GOVT PROVIDED FLOODPROOFING EXPERT	1	2	3	4	5
HAVE A GOVT PROVIDED FLOODPROOFING EXPERT VISIT MY HOUSE TO RECOMMEND FLOODPROOFING MEASURES	1	2	3	4	5

OTHER (Please specify.) _____

Your contribution to this effort is very greatly appreciated. If you would like a summary of results, please print your name and address on the back of the return envelope (NOT on this questionnaire). We will see that you get it.

APPENDIX D

TABLES

Table 1. Crosstabulation of Household Income (Q52B) By Location (IL_WIS)

	Location		
	Illinois	Wisconsin	Row Total
Household Income			
$0-19,000	58 (18.3)	70 (51.1)	128 (28.2)
$20,000-39,000	115 (36.3)	49 (35.8)	164 (36.1)
$40,000+	144 (45.4)	18 (13.1)	16 (35.7)
Column Total	317 (69.8)	137 (30.2)	454 (100.0)

Chi-Square = 64.45170 Significance = 0.0000
Gamma = -0.61749

Table 2. Crosstabulation of Respondents' Education (Q53A) By Location (IL_WIS)

	Location		
	Illinois	Wisconsin	Row Total
Education			
Thru High School	108 (32.4)	82 (57.3)	190 (39.9)
Some College	94 (28.2)	42 (29.4)	136 (28.6)
College Graduate	131 (39.3)	19 (13.3)	150 (31.5)
Column Total	333 (70.0)	143 (30.0)	476 (100.0)

Chi-Square = 37.14481 Significance = 0.0000
Gamma = -0.48190

Table 3. Crosstabulation of Respondents' Age (Q54B) By Location (IL_WIS)

	Location		
	Illinois	Wisconsin	Row Total
Age			
Less than 40	90 (27.2)	46 (31.9)	136 (28.6)
40 to 49	101 (30.5)	29 (20.1)	130 (27.4)
50 to 59	67 (20.2)	23 (16.0)	90 (18.9)
Over 60	73 (22.1)	46 (31.9)	119 (25.1)
Column Total	331 (69.7)	144 (30.3)	475 (100.0)

Chi-Square = 9.62167 Significance = 0.0221
Gamma = 0.05732

Table 4. Crosstabulation of Respondent's Sex (Q48) By Location (IL_WIS)

	Location		
	Illinois	Wisconsin	Row Total
Sex			
Male	203 (60.8)	55 (37.9)	258 (53.9)
Female	131 (39.2)	90 (62.1)	221 (46.1)
Column Total	334 (69.7)	145 (30.3)	479 (100.0)

Chi-Square = 20.32848 Significance = 0.0000
Gamma = 0.43435

Table 5. Crosstabulation of Family Types (Q49A) By Location (IL_WIS)

	Location		
	Illinois	Wisconsin	Row Total
Family Types			
Couple Headed	249 (75.2)	79 (55.2)	328 (69.2)
Male Single Head	23 (6.9)	11 (7.7)	34 (7.2)
Female Single Head	59 (17.8)	53 (37.1)	112 (23.6)
Column Total	331 (69.8)	143 (30.2)	474 (100.0)

Chi-Square = 21.48014 Significance = 0.0000
Gamma = 0.41298

Table 6. Crosstabulation of House Foundation (Q1) By Location (IL_WIS)

	Location		
	Illinois	Wisconsin	Row Total
House Foundation			
Full Basement	209 (67.2)	127 (93.4)	336 (75.2)
Split/Bi-Level	71 (22.8)	2 (1.5)	73 (16.3)
Concrete Slab	13 (4.2)	6 (4.4)	19 (4.3)
Crawlspace	18 (5.8)	1 (.7)	19 (4.3)
Column Total	311 (69.6)	136 (30.4)	447 (100.0)

Chi-Square = 40.75479 Significance = 0.0000
Gamma = -0.69178

Table 7. Crosstabulation of Flooded by Surface Water (Q2A) By Location (IL_WIS)

	Location		
	Illinois	Wisconsin	Row Total
Flooded By Surface Water			
Basement or Less	250 (80.1)	114 (91.9)	364 (83.5)
First Floor	62 (19.9)	10 (8.1)	72 (16.5)
Column Total	312 (71.6)	124 (28.4)	436 (100.0)

Chi-Square = 8.13682 Significance = 0.0043
Gamma = -0.47742

Table 8. Crosstabulation of Source of Surface Water (Q3) By Location (IL_WIS)

	Location		
	Illinois	Wisconsin	Row Total
Source			
Cracks in Walls	27 (15.2)	24 (39.3)	51 (21.3)
Windows and Doors	93 (52.2)	15 (24.6)	108 (45.2)
From First Floor	6 (3.4)	1 (1.6)	7 (2.9)
Cracks and Windows	42 (23.6)	20 (32.8)	62 (25.9)
Cracks and First	1 (.6)	0 (0.0)	1 (.4)
Windows/Doors	5 (2.8)	0 (0.0)	5 (2.1)
Cracks, Windows	4 (2.2)	1 (1.6)	5 (2.1)
Column Total	178 (74.5)	61 (25.5)	239 (100.0)

Chi-Square = 24.21453 Significance = 0.0005
Gamma = -0.19171

Table 9. Crosstabulation of Flooded by Surface Water (Q2B) By Location (IL_WIS)

	Location		
	Illinois	Wisconsin	Row Total
Flooded By Surface Water			
No Surface Water	125 (36.5)	60 (40.8)	185 (37.8)
Surface Water	217 (63.5)	87 (59.2)	304 (62.2)
Column Total	342 (69.9)	147 (30.1)	489 (100.0)

Chi-Square = 0.62468 Significance = 0.4293
Gamma = -0.08977

Table 10. Crosstabulation of Subsurface Water Entered Home (Q4A) By Location (IL_WIS)

	Location		
	Illinois	Wisconsin	Row Total
Subsurface Water			
No	97 (28.4)	40 (27.2)	137 (28.0)
Yes	245 (71.6)	107 (72.8)	352 (72.0)
Column Total	342 (69.9)	147 (30.1)	489 (100.0)

Chi-Square = 0.02257 Significance = 0.8806
Gamma = 0.02869

Figure 1. Depth of Water in House by Flood Location

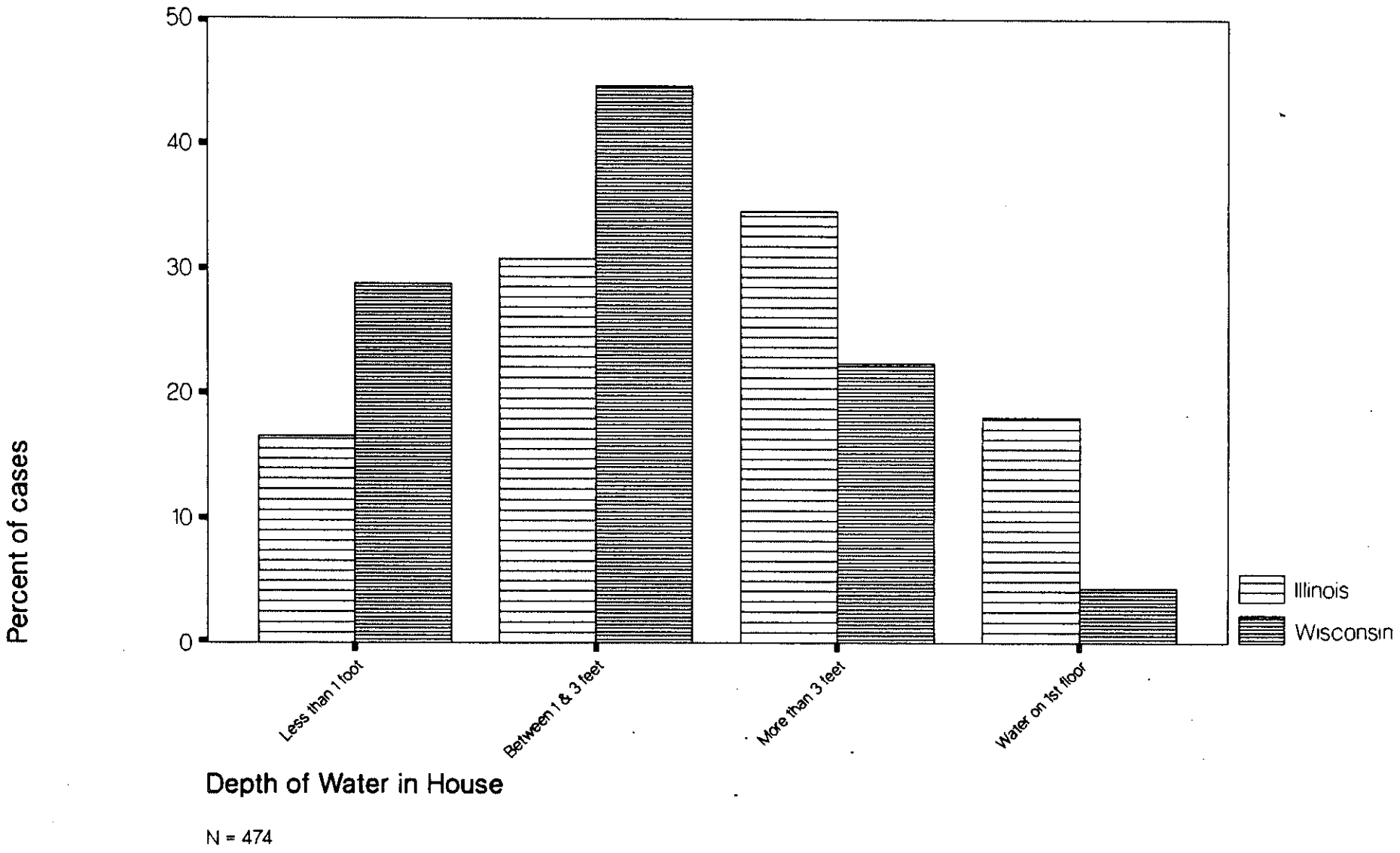


Figure 2. Total Amount of Flood Damage by Flood Location

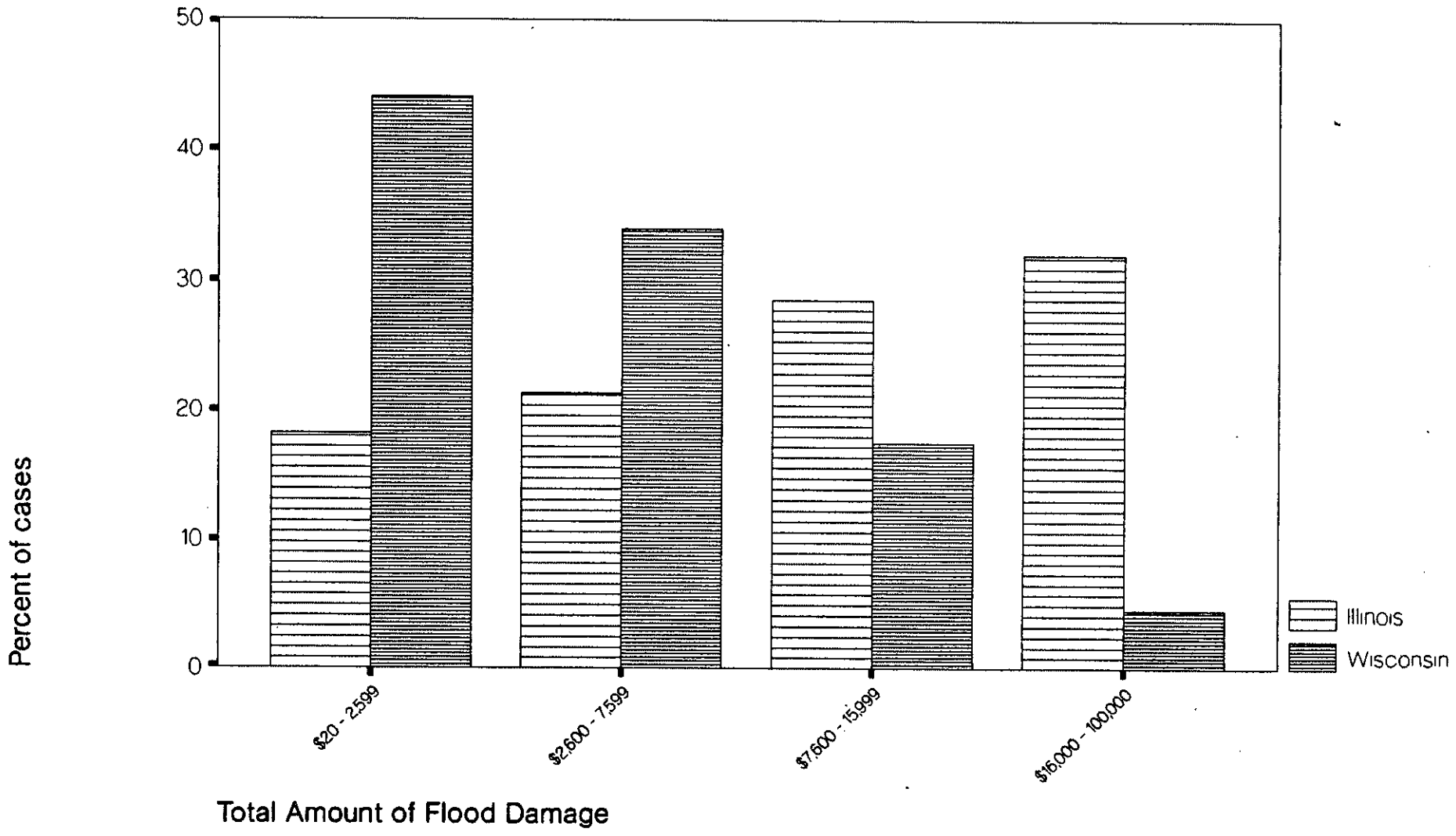


Table 11. Crosstabulation of Attendance at Disaster Assistance Center After Previous Flood (Q9REVISE) by Location (IL_WI6)

	Location		
	Illinois	Wisconsin	Row Total
Attended DAC in Previous Flood			
No	315 (91.3)	101 (68.7)	416 (84.6)
Yes	30 (8.7)	46 (31.3)	76 (15.4)
Column Total	345 (70.1)	147 (29.9)	492 (100.0)

Chi-Square = 38.58716 Significance = 0.0000
Gamma = 0.65411

Table 12. Retrofitted After Last Flood (Q11A)

	Frequency	Percent	Cum Percent
No	183	37.0	37.0
Yes	312	63.0	100.0
	495	100.0	

Table 13. Ever Retrofitted (Q11B)

	Frequency	Percent	Cum Percent
No	144	30.1	30.1
Yes	335	69.9	100.0
	479	100.0	

Table 14. Floodproofed Before the Last Flood (Q19)

	Frequency	Percent	Cum Percent
No	376	79.5	79.5
Yes	97	20.5	100.0
	473	100.0	

Table 15. Retrofitting Measures (Group Q12ALL)

	Count	Pct Of Responses	Pct Of Cases
Moved Damaged Contents out of Basement	141	15.6	44.1
Raised Furnace, Water Heater, Appliances	67	7.4	20.9
Raised Wiring, Fuse Box	26	2.9	8.1
Glass-Bricked Basement Windows	30	3.3	9.4
Protected Basement Openings	47	5.2	14.7
Bought Stand Pipe/Plug	59	6.5	18.4
Installed Sewer Back-up Valve	45	5.0	14.1
Raised Sewer Pipes	12	1.3	3.8
Installed Sump Pump	95	10.5	29.7
Installed Battery-Operated Sump Pump	34	3.8	10.6
Waterproofed Basement Walls	86	9.5	26.9
Stopped Using Basement	63	7.0	19.7
Improved Drainage Around House	88	9.7	27.5
Added Dirt Fill Around House	87	9.6	27.2
Built Wall Around House	15	1.7	4.7
Built Levee/Berm	10	1.1	3.1
Elevated House	1	0.1	0.3
Total Responses	906	100.0	283.1

Table 16. Timing of Floodproofing (Q15A)

	Frequency	Percent	Cum Percent
With Flood Repairs	108	37.8	37.8
Did Some Alone and Some With Flood Repairs	112	39.2	76.9
Did Floodproofing Separately	66	23.1	100.0
	286	100.0	

Table 17. Crosstabulation of Timing of Floodproofing (Q15A) By Attended DAC in Previous Flood (Q9REVISE)

	Attended DAC in Previous Flood		
	No	Yes	Row Total
Timing of Floodproofing			
With Flood Repairs	90 (37.0)	18 (41.9)	108 (37.8)
Did Some Alone and Some With Flood Repairs	91 (37.4)	21 (48.8)	112 (39.2)
Did Floodproofing Separately	62 (25.5)	4 (9.3)	66 (23.1)
Column Total	243 (85.0)	43 (15.0)	286 (100.0)

Chi-Square = 5.59624 Significance = 0.0609
Gamma = -.021619

Table 18. Crosstabulation of Timing of Floodproofing (15A) By Floodproofed Before the Last Flood (Q19)

	Floodproofed Before Last Flood		
	No	Yes	Row Total
Timing of Floodproofing			
With Flood Repairs	89 (41.0)	17 (25.4)	106 (37.3)
Did Some Alone and Some With Flood Repairs	75 (34.6)	37 (55.2)	112 (39.4)
Did Floodproofing Separately	53 (24.4)	13 (19.4)	66 (23.2)
Column Total	217 (76.4)	67 (23.6)	284 (100.0)

Chi-Square = 9.45248 Significance = 0.0089
Gamma = 0.13470

Table 19. Crosstabulation of Family Member or Contractor Did Floodproofing (Q17A) By Total Amount of Flood Damage (DAMAGE$A)

	Total Amount of Flood Damage				
	$20 to $2,599	$2,600 to $7,599	$7,600 to $15,999	$16,000 to $100,000	Row Total
Who Did Floodproofing					
I or Another Family Member	35 (55.6)	19 (30.2)	20 (31.3)	13 (24.5)	87 (35.8)
Did Part, Contractor Did Part	15 (23.8)	24 (38.1)	18 (28.1)	20 (37.7)	77 (31.7)
Paid Contractor	13 (20.6)	20 (31.7)	26 (40.6)	20 (37.7)	79 (32.5)
Column Total	63 (25.9)	63 (25.9)	64 (26.3)	53 (21.8)	243 (100.0)

Chi-Square = 17.08256 Significance = 0.0090
Gamma = 0.25269

Table 20. Crosstabulation of Family Member or Contractor Did Floodproofing (Q17A) By Flooded by Surface Water (Q2A)

	Flooded by Surface Water		
	Basement or Less	First Floor	Row Total
Who Did Floodproofing			
I or Another Family Member	100 (42.7)	6 17.6	106 (39.6)
Did Part, Contractor Did Part	61 (26.1)	17 (50.0)	78 (29.1)
Paid Contractor	73 (31.2)	11 (32.4)	84 (31.3)
Column Total	234 (87.3)	34 (12.7)	268 (100.0)

Chi-Square = 10.57855 Significance = 0.0050
Gamma = .25852

Table 21. Retrofitting Measures in Order of Use of a Contractor

Measure	Score*	Cost Order**
Elevate	200.0	1
Raised Sewer Pipes	136.3	***
Raised Wiring	126.1	8
Sewer Backup Valve	126.1	2
Floodwall	113.3	3
Glass Bricked Windows	103.5	7
Waterproofed	102.3	6
Installed Sump Pump	100.0	10
Levee/Berm	100.0	5
Improved Drainage	91.9	13
Protected Basement Openings	88.6	4
Moved Contents	85.1	4
Added Dirt Fill	84.2	12
Battery Sump Pump	82.3	***
Raised Furnace, Applicances, etc.	81.9	9
Stopped Using Basement	80.0	11
Standpipe	65.5	14

* Score Calculation:
Score: 0 points for respondents doing the work, 1 point for respondent and contractor sharing the work, and 2 points for the contractor doing all the work.

** The cost order is taken from Note 3: 1 = most expensive.

*** Not asked on first survey.

Table 22. Like to Floodproof in Future (Q24)

	Frequency	Percent	Cum Percent
No	155	34.2	34.2
Yes	298	65.8	100.0
	453	100.0	

Table 23. Most Desired Floodproofing Change (Q25)

Measure	Frequency	Percent	Cum Percent
Raise the Furnace	4	2.2	2.2
Replace Basement Windows	15	8.4	10.7
Build Protection Around Opening	9	5.1	15.7
Purchase/Made Standpipe	5	2.8	18.5
Install Sewer Valve	38	21.3	39.9
Raise Sewer Pipes	20	11.2	51.1
Install a Sump Pump	22	12.4	63.5
Install Battery Sump	5	2.8	66.3
Waterproof Basement Walls	20	11.2	77.5
Improve Drainage	14	7.9	85.4
Add Dirt Fill Next to House	5	2.8	88.2
Build Concrete or Brick Wall	2	1.1	89.3
Build Levee/Berm	9	5.1	94.4
Elevate House	5	2.8	97.2
Other	5	2.8	100.0
	178	100.0	

Table 24. Comparison of Percent of Measures Done By Percent and Desired for Cost Ranking

Cost	Measure	% Did	% Desire	% Change
$43	Standpipe or Plug	6.5	2.8	-2.3
150	Improve Drainage	9.7	7.9	-1.2
200	Dirt Fill	9.6	2.8	-3.4
200	Moved Contents	15.6	0.0	0.0
290	Stopped Using Basement	7.0	0.0	0.0
300	Sump Pump	10.5	12.4	+1.2
400	Raise Furnace, etc.	7.4	2.2 *	-3.4
400	Raise Wiring	2.9	0.0	0.0
500	Glass Brick	3.3	8.4	+2.5
500	Waterproof Basement Walls	9.5	11.2	+1.2
500	Levee or Berm	1.1	5.1	+4.6
600	Protect Openings	5.2	5.1	0.0
1,000	Wall Around House	1.7	1.1 *	-0.6
2,350	Sewer Backup Valve	5.0	21.3	+4.3
8,000	Elevate	0.1	2.8	+28.0

*Very low frequency (<5 cases)

Table 25. Crosstabulation of Like to Floodproof in Future (Q24) By Attended DAC in Previous Flood (Q9REVISE)

	Attended DAC in Previous Flood		
	No	Yes	Row Total
Like to Floodproof			
No	141 (36.6)	14 (20.6)	155 (34.2)
Yes	244 (63.4)	54 (79.4)	298 (65.8)
Column Total	385 (85.0)	68 (15.0)	453 (100.0)
Chi-Square = 5.90867	Significance = 0.0151		
Gamma = 0.38060			

Table 26. Like to Floodproof in Future (Q24) By Expert Evaluation of Mitigation Measures (FRENCH)

	Evaluation of Mitigation Measures			
	No	Okay	Yes	Row Total
Like to Floodproof in Future				
No	13 (38.2)	39 (27.7)	47 (44.3)	99 (35.2)
Yes	21 (61.8)	102 (72.3)	59 (55.7)	182 (64.8)
Column Total	34 (12.1)	141 (50.2)	106 (37.7)	281 (100.0)
Chi Square = 7.53079	Significance = 0.0232			
Gamma = -0.20065				

Table 27. How Much Floodproofing Helped in 1987 Flood (Q21)

	Frequency	Percent	Cum Percent
Change Effective	9	12.2	12.2
Change Helped Somewhat	33	44.6	56.8
Change Didn't Help	32	43.2	100.0
Total	74	100.0	

Table 28. Reasons for Selecting Floodproofing Measures (Q14)

	Frequency	Percent	Cum Percent
Permanent	17	7.6	8.1
Appropriate for House	111	49.8	57.8
Cost Effective	24	10.8	68.6
Little Effort to Do	4	1.8	70.4
Recommended by Expert	27	12.1	82.5
Inexpensive	21	9.4	91.9
Automatic	13	5.8	97.8
Saw an Example	5	2.2	100.0
Total	223	100.0	

Table 29. Floodproofing Qualities (Q28)
(1=Not Important,5=Very Important)

	Mean
Permanence	4.637
Appropriate for House and Flood Conditions	4.657
Cost Effective	4.496
Little Effort to Do	3.487
Recommended by an Expert	4.140
Inexpensive	3.925
Automatic	4.398
Can See a Local Example	3.557
Designed for My House and Site	3.807

Table 30. Whether Will Mention Floodproofing if Respondent Sells House (Q18)

	Frequency	Percent	Cum Percent
No	41	11.4	11.4
Yes	177	58.1	69.5
Don't know	87	28.5	100.0
Total	305	98.0	

Table 31. Whether Will Mention Floodproofing if They Sell Home (Q18A) By How Much Floodproofing Helped in 1987 Flood (Q21)

	How Floodproofing Helped in 1987 Flood			
	Change Very Effective	Change Helped Somewhat	Change Did Not Help	Row Total
Whether Will Mention Floodproofing				
No, Don't Know	0 (0.0)	13 (44.8)	14 (58.3)	27 (47.4)
Yes	4 (100.0)	16 (55.2)	10 (41.7)	30 (52.6)
Column Total	4 (7.0)	29 (50.9)	24 (42.1)	57 (100.0)

Chi-Square = 4.83250 Significance = 0.0893
Gamma = -0.43723

Table 32. Perceived Responsibility of Homeowner to Floodproof (Q23)

Responsibility		Frequency	Percent	Cum Percent
Not At All	1	68	15.2	15.2
	2	70	15.7	30.9
	3	157	35.1	66.0
	4	62	13.9	79.9
Completely Mine	5	90	20.1	100.0
	Total	447	100.0	

Table 33. Crosstabulation of Perceived Responsibility of Homeowner to Floodproof (Q23A) By Age (Q54A)

		Age		
		49 or Less	50 or More	Row Total
Responsibility				
Not At All	1-2	63 (25.0)	70 (38.3)	133 (30.6)
	3	92 (36.5)	60 (32.8)	152 (34.9)
Completely Mine	4-5	97 (38.5)	53 (29.0)	150 (34.5)
Column Total		252 (57.9)	183 (42.1)	435 (100.0)

Chi-Square = 9.30112 Significance = 0.0096
Gamma = -0.22725

Table 34. Crosstabulation of Perceived Responsibility of Homeowner to Floodproof (Q23A) By Household Income (Q52B)

		Household Income			
		0-$19K	$20-39K	$40+K	Row Total
Responsibility					
Not At All	1-2	43 (38.7)	40 (27.0)	42 (26.3)	125 (29.8)
	3	42 (37.8)	59 (39.9)	49 (30.6)	150 (35.8)
Completely Mine	4-5	26 (23.4)	49 (33.1)	69 (43.1)	144 (34.4)
Column Total		111 (26.5)	148 (35.3)	160 (38.2)	419 (100.0)

Chi-Square = 13.54611 Significance = 0.0089
Gamma = 0.20997

Table 35. Crosstabulation of Perceived Responsibility of Homeowner to Floodproof (Q23A) By Attended DAC in Previous Flood (Q9REVISE)

		Attended DAC in Previous Flood		
		No	Yes	Row Total
Responsibility				
Not at All	1-2	109 (28.5)	29 (45.3)	138 (30.9)
	3	138 (36.0)	19 (29.7)	157 (35.1)
Completely Mine	4-5	136 (35.5)	16 (25.0)	152 (34.0)
Column Total		383 (85.7)	64 (14.3)	447 (100.0)

Chi-Square = 7.45424 Significance = 0.0241
Gamma = -0.27228

Table 36. Crosstabulation of Perceived Responsibility (Q23A) By Flooded by the Previous Flood (Q8ILA)

		Flooded By the Previous Flood		
		No, Don't Know	Yes	Row Total
Responsibility				
Not At All	1-2	67 (31.0)	24 (32.4)	91 (31.4)
	3	83 (38.4)	20 (27.0)	103 (35.5)
Completely Mine	4-5	66 (30.6)	30 (40.5)	96 (33.1)
Column Total		216 (74.5)	74 (25.5)	290 (100.0)

Chi-Square = 5.79483 Significance = 0.1563
Gamma = 0.08793

Table 37. Crosstabulation of Retrofitted After Last Flood (Q11A) By Source of Flood Waters (SOURCE)

Sub-group = Illinois

	Source of Flood Waters				
	No Water Entered	Surface Water	Subsurface Water	Surface & Subs.	Row Total
Retrofitted					
No	9 (40.9)	46 (61.3)	27 (26.2)	43 (30.3)	125 (36.5)
Yes	13 (59.1)	29 (38.7)	76 (73.8)	99 (69.7)	217 (63.5)
Column Total	22 (6.4)	75 (21.9)	103 (30.1)	142 (41.5)	342 (100.0)

Chi-Square = 27.19521 Significance = 0.0000
Gamma = 0.29708

Table 38. Crosstabulation of Retrofitted After Last Flood (Q11A) By Depth of Water in House (Q6A)

Sub-group = Illinois

	Depth of Water in House				
	<1 ft.	In Basement 1-3 ft.	>3 ft.	Water on 1st Floor	Row Total
Retrofitted					
No	21 (37.5)	23 (22.3)	39 (33.9)	36 (59.0)	119 (35.5)
Yes	35 (62.5)	80 (77.7)	76 (66.1)	25 (41.0)	216 (64.5)
Column Total	56 (16.7)	103 (30.7)	115 (34.3)	61 (18.2)	335 (100.0)

Chi-Square = 22.75267 Significance = 0.0000
Gamma = -0.26302

Table 39. Crosstabulation of Retrofitted After Last Flood (Q11A) Total Cost of Damage (DAMAGE$B)

Sub-group = Illinois

	Total Cost of Damage					
	$20 to $1,000	$1001 to $5,000	$5001 to $10,000	$10,001 to $25,000	$25,001+	Row Total
Retrofitted						
No	11 (45.8)	21 (30.0)	16 (28.6)	29 (34.9)	23 (48.9)	100 (35.7)
Yes	13 (54.2)	49 (70.0)	40 (71.4)	54 (65.1)	24 (51.1)	180 (64.3)
Column Total	24 (8.6)	70 (25.0)	56 (20.0)	83 (29.6)	47 (16.8)	280 (100.0)

Chi-Square = 6.91078 Significance = 0.1407
Gamma = -0.11031

Table 40. Crosstabulation of Floodproofed Before the Last Flood (Q19) By Flooded by the Previous Flood (Q8ILA)

Sub-group = Illinois

	Flooded by Previous Flood		
	No, Don't Know	Yes	Row Total
Floodproofed			
No	202 (82.8)	51 (65.4)	253 (78.6)
Yes	42 (17.2)	27 (34.6)	69 (21.4)
Column Total	244 (75.8)	78 (24.2)	322 (100.0)

Chi-Square = 9.62274 Significance = 0.0019
Gamma = 0.43602

Table 41. Crosstabulation of Retrofitted After Last Flood (Q11A) By Attended DAC in Previous Flood (Q9REVISE)

Sub-group = Illinois

	Attended DAC in Previous Flood		
	No	Yes	Row Total
Retrofitted			
No	118 (37.8)	7 (23.3)	125 (36.5)
Yes	194 (62.2)	23 (76.7)	217 (63.5)
Column Total	312 (91.2)	30 (8.8)	342 (100.0)

Chi-Square = 1.89155 Significance = 0.1690
Gamma = 0.33301

Table 42. Crosstabulation of Retrofitted After Last Flood (Q11A) By Floodproofed Before the Last Flood (Q19)

Sub-group = Illinois

	Floodproofed Before Last Flood		
	No	Yes	Row Total
Retrofitted			
No	100 (38.2)	18 (25.4)	118 (35.4)
Yes	162 (61.8)	53 (74.6)	215 (64.6)
Column Total	262 (78.7)	71 (21.3)	333 (100.0)

Chi-Square = 3.46970 Significance = 0.0625
Gamma = 0.29017

Table 43. Crosstabulation of Retrofitted After Last Flood (Q11A) By How Much Floodproofing Helped in 1987 Flood (Q21)

Sub-group = Illinois

	How Much Floodproofing Helped in 1987 Flood			
	Change Very Effective	Change Helped Somewhat	Change Did Not Help	Row Total
Retrofitted				
No	5 (62.5)	1 (4.3)	8 (33.3)	14 (25.5)
Yes	3 (37.5)	22 (95.7)	16 (66.7)	41 (74.5)
Column Total	8 (14.5)	23 (41.8)	24 (43.6)	55 (100.0)

Chi-Square = 11.97093 Significance = 0.0025
Gamma = 0.00733

Table 43a. Crosstabulation of Total Number of Retrofitting Measures Taken (Q12TOTLC) by Household Income (Q52D)

Sub-group = Illinois

	Household Income		
	$0 to 39,999	$40,000 +	Row Total
Total Number of Measures Taken			
1-2	92 (61.3)	19 (40.4)	111 (56.3)
3 or More	58 (38.7)	28 (59.6)	86 (43.7)
Column Total	150 (76.1)	47 (23.9)	197 (100.0)

Chi-Square = 6.35990 Significance = 0.0117
Gamma = 0.40076

Table 43b. Crosstabulation of Total Amount Spent on Retrofitting (Q12TOT$A) by Household Income (Q52D)

Sub-group = Illinois

	Household Income		
	$0 to 39,999	$40,000 +	Row Total
Total Number of Measures Taken			
$42-699	74 (49.0)	15 (31.3)	89 (44.7)
$700 +	77 (51.0)	33 (68.8)	110 (55.3)
Column Total	151 (75.9)	48 (24.1)	199 (100.0)

Chi-Square = 4.64525 Significance = 0.0311
Gamma = 0.35780

Table 43c. Crosstabulation of Expert Evaluation of Mitigation Measures (FRENCH) by Household Income (Q52C)

Sub-group = Illinois

	Household Income		
	$0 to 39,999	$40,000 +	Row Total
Expert Evaluations of Mitigation Measures			
No	11 (10.5)	15 (16.3)	26 (13.2)
Okay	61 (58.1)	39 (42.4)	100 (50.8)
Yes	33 (31.4)	38 (41.3)	71 (36.0)
Column Total	105 (53.3)	92 (46.7)	197 (100.0)

Chi-Square = 4.97128 Significance = 0.0833
Gamma = 0.07984

Table 44. Crosstabulation of Retrofitted After Last Flood (Q11A) By Age (Q54A)

Sub-group = Illinois

	Age		
	49 or Less	50 or More	Row Total
Retrofitted			
No	60 (31.4)	58 (41.4)	118 (35.6)
Yes	131 (68.6)	82 (58.6)	213 (64.4)
Column Total	191 (57.7)	140 (42.3)	331 (100.0)

Chi-Square = 3.10897 Significance = 0.0779
Gamma = -0.21393

Table 45. Crosstabulation of Retrofitted After Last Flood (Q11A) By Source of Flood Waters (SOURCE)

Sub-group = Control (Milwaukee)

	Source of Flood Waters				
	No Water Entered	Surface Water	Subsurface Water	Surface & Subs.	Row Total
Retrofitted					
No	7 (53.8)	10 (37.0)	19 (40.4)	19 (31.7)	55 (37.4)
Yes	6 (46.2)	17 (63.0)	28 (59.6)	41 (68.3)	92 (62.6)
Column Total	13 (8.8)	27 (18.4)	47 (32.0)	60 (40.8)	147 (100.0)

Chi-Square = 2.52911 Significance = 0.4701
Gamma = 0.17105

Table 46. Crosstabulation of Retrofitted After Last Flood (Q11A) By Depth of Water in House (Q6A)

Sub-group = Control (Milwaukee)

	Depth of Water in House				
	<1 ft.	In Basement 1-3 ft.	>3 ft.	Water on 1st Floor	Row Total
Retrofitted					
No	19 (47.5)	21 (33.9)	10 (32.3)	1 (16.7)	51 (36.7)
Yes	21 (52.5)	41 (66.1)	21 (67.7)	5 (83.3)	88 (63.3)
Column Total	40 (28.8)	62 (44.6)	31 (22.3)	6 (4.3)	139 (100.0)

Chi-Square = 3.52215 Significance = 0.3179
Gamma = 0.24062

Table 47. Crosstabulation of Retrofitted After Last Flood (Q11A) By Total Cost of Damage (DAMAGE$B)

Sub-group = Control (Milwaukee)

	Total Cost of Damage					
	$20 to $1,000	$1,001 to $5,000	$5,001 to $10,000	$10,001 to $25,000	$25,001+	Row Total
Retrofitted						
No	10 (38.5)	19 (38.0)	5 (27.8)	3 (21.4)	0 (0.0)	37 (33.9)
Yes	16 (61.5)	31 (62.0)	13 (72.2)	11 (78.6)	1 (100.0)	72 (66.1)
Column Total	26 (23.9)	50 (45.9)	18 (16.5)	14 (12.8)	1 (.9)	109 (100.0)

Chi-Square = 2.40058 Significance = 0.6625
Gamma = 0.20859

Table 48. Crosstabulation of Retrofitted After Last Flood (Q11A) By Attended DAC in Previous Flood (Q9REVISE)

Sub-group = Control (Milwaukee)

	Attended DAC in Previous Flood		
	No	Yes	Row Total
Retrofitted			
No	38 (37.6)	17 (37.0)	55 (37.4)
Yes	63 (62.4)	29 (63.0)	92 (62.6)
Column Total	101 (68.7)	46 (31.3)	147 (100.0)

Chi-Square = 0.00000 Significance = 1.0000
Gamma = 0.01427

Table 49. Crosstabulation of Retrofitted After Last Flood (Q11A) By Floodproofed Before the Last Flood (Q19)

Sub-group = Control (Milwaukee)

	Floodproofed Before the Last Flood		
	No	Yes	Row Total
Retrofitted			
No	42 (38.2)	5 (19.2)	47 (34.6)
Yes	68 (61.8)	21 (80.8)	89 (65.4)
Total	110 (80.9)	26 (19.1)	136 (100.0)

Chi-Square = 2.55412 Significance = 0.1100
Gamma = 0.44354

Table 50. Crosstabulation of Total Number of Retrofit Measures Taken (Q12TOTLC) By Household Income (Q52A)
Sub-Group = Control (Milwaukee)

	Household Income		
	$0 to $29,999	$30,000 +	Row Total
Retrofit Measures			
1-2	42 (70.0)	10 (40.0)	52 (61.2)
3 or More	18 (30.0)	15 (60.0)	33 (38.8)
Column Total	60 (70.6)	25 (29.4)	85 (100.0)

Chi-Square = 6.68706 Significance = 0.0097
Gamma = 0.55556

Table 51. Crosstabulation of Total Amount Spent for Retrofitting (Q12TOT$A) By Household Income (Q52A)
Sub-group = Control (Milwaukee)

	Household Income		
	$0 to $29,999	$30,000 +	Row Total
Amount Spent			
$42 - 699	32 (52.5)	7 (28.0)	39 (45.3)
$700 +	29 (47.5)	18 (72.0)	47 (54.7)
Column Total	61 (70.9)	25 (29.1)	86 (100.0)

Chi-Square = 4.28039 Significance = 0.0386
Gamma = 0.47882

Table 52. Crosstabulation of Expert Evaluations of Mitigation Measures (FRENCH) By Household Income (Q52A)

Sub-group = Control (Milwaukee)

	Household Income		
	$0 to $29,999	$30,000+	Row Total
Expert Evaluations of Mitigation Measures			
No	7 (11.7)	1 (4.2)	8 (9.5)
Okay	36 (60.0)	10 (41.7)	46 (54.8)
Yes	17 (28.3)	13 (54.2)	30 (35.7)
Column Total	60 (71.4)	24 (28.6)	84 (100.0)

Chi-Square = 5.26801 Significance = 0.0718
Gamma = 0.47653

Table 53. Crosstabulation of Retrofitted After Last Flood (Q11A) By Experimental Groups (EXPGROUP)

	Experimental Groups			
	Open House	Mitigation Table	Control (Milwaukee)	Row Total
Retrofitted				
No	62 (38.5)	63 (34.8)	55 (37.4)	180 (36.8)
Yes	99 (61.5)	118 (65.2)	92 (62.6)	309 (63.2)
Column Total	161 (32.9)	181 (37.0)	147 (30.1)	489 (100.0)

Chi-Square = 0.53532 Significance = 0.7652
Gamma = 0.01741

Table 54. Crosstabulation Retrofitted After Last Flood (Q11A) By Experimental Groups (EXPGRP4)

	Experimental Groups				
	Open House	Mitigation Table	Both	Control (Milwaukee)	Row Total
Retrofitted					
No	34 (43.6)	49 (34.3)	36 (35.0)	55 (37.4)	174 (36.9)
Yes	44 (56.4)	94 (65.7)	67 (65.0)	92 (62.6)	297 (63.1)
Column Total	78 (16.6)	143 (30.4)	103 (21.9)	147 (31.2)	471 (100.0)

Chi-Square = 2.10870 Significance = 0.5502
Gamma = 0.03427

Table 55. Crosstabulation of Retrofitted After Last Flood (Q11A) By Experimental Groups (EXPGRP4) Controlling for Household Income = $40,000 +

	Experimental Groups				
	Open House	Mitigation Table	Both	Control (Milwaukee)	Row Total
Retrofitted					
No	20 (51.3)	18 (29.5)	12 (31.6)	10 (55.6)	60 (38.5)
Yes	19 (48.7)	43 (70.5)	26 (68.4)	8 (44.4)	96 (61.5)
Column Total	39 (25.0)	61 (39.1)	38 (24.4)	18 (11.5)	156 (100.0)

Chi-Square = 4.52153 Significance = 0.2104
Gamma = -0.29457

Table 56. Crosstabulation of Retrofitted After Last Flood (Q11A) By Experimental Groups (EXPGRP4)

Controlling For
Q48 By Q49 By Q54A

Respondent's Sex	= Female
Family Type	= Single Headed House
Age	= 50 or Older

	Experimental Groups				
	Open House	Mitigation Table	Both	Control (Milwaukee)	Row Total
Retrofitted					
No	2 (40.0)	4 (26.7)	1 (11.1)	14 (46.7)	21 (35.6)
Yes	3 (60.0)	11 (73.3)	8 (88.9)	16 (53.3)	38 (64.4)
Column Total	5 (8.5)	15 (25.4)	9 (15.3)	30 (50.8)	59 (100.0)

Chi-Square = 4.52153 Significance = 0.2104
Gamma = -0.29457

Table 57. Crosstabulation of Retrofitted After Last Flood (Q11A) By Experimental Groups (EXPGRP4)

Controlling for Source of Flood Waters = Subsurface Water Only

	Experimental Groups				
	Open House	Mitigation Table	Both	Control (Milwaukee)	Row Total
Retrofitted					
No	10 (35.7)	9 (23.1)	8 (24.2)	19 (40.4)	46 (31.3)
Yes	18 (64.3)	30 (76.9)	25 (75.8)	28 (59.6)	101 (68.7)
Column Total	28 (19.0)	39 (26.5)	33 (22.4)	47 (32.0)	147 (100.0)

Chi-Square = 4.06524 Significance = 0.2545
Gamma = -.11605

Table 58. Crosstabulation of Retrofitted After Last Flood (Q11A) By Experimental Groups (EXPGRP4)

Controlling for Depth of Water in House (Q6A) = 1-3 Ft in Basement

	Experimental Groups				
	Open House	Mitigation Table	Both	Control (Milwaukee)	Row Total
Retrofitted					
No	2 (16.7)	12 (23.5)	9 (26.5)	21 (33.9)	44 (27.7)
Yes	10 (83.3)	39 (76.5)	25 (73.5)	41 (66.1)	115 (72.3)
Column Total	12 (7.5)	51 (32.1)	34 (21.4)	62 (39.0)	159 (100.0)

Chi-Square = 2.37830 Significance = 0.4977
Gamma = -0.21343

Table 59. Crosstabulation of First Source of Floodproofing Information (Q13.A) By Experimental Group (EXPGROUP)

	Experimental Groups			
	Open House	Mitigation Table	Control (Milwaukee)	Row Total
Source of Information				
Someone Had Already Made Change	11 (14.7)	5 (5.6)	9 (12.9)	25 (10.7)
Contractor	3 (4.0)	8 (9.0)	11 (15.7)	22 (9.4)
Someone Knowledgeable	4 (5.3)	4 (4.5)	5 (7.1)	13 (5.6)
Media	9 (12.0)	5 (5.6)	7 (10.0)	21 (9.0)
Booklet	5 (6.7)	10 (11.2)	2 (2.9)	17 (7.3)
Talked with Floodproofing Expert	14 (18.7)	27 (30.3)	0 (00.0)	41 (17.5)
DWR Open House	12 (16.0)	2 (2.2)	0 (00.0)	14 (6.0)
Other Government	2 (2.7)	0 (0.0)	2 (2.9)	4 (1.7)
City/County Officials	2 (2.7)	1 (1.1)	0 (0.0)	3 (1.3)
No Source	11 (14.7)	22 (24.7)	28 (40.0)	61 (26.1)
Other	1 (1.3)	1 (1.1)	1 (1.4)	3 (1.3)
Don't Remember	1 (1.3)	4 (4.5)	5 (7.1)	10 (4.3)
Column Total	75 (32.1)	89 (38.0)	70 (29.9)	234 (100.0)

Chi-Square = 71.10753 Significance = 0.0000
Gamma = 0.07610

Table 60. Crosstabulation of Additional Source of Floodproofing Information (Q13.B) By Experimental Group (EXPGROUP)

	Experimental Groups			
	Open House	Mitigation Table	Control (Milwaukee)	Row Total
Additional Source of Information				
Someone Had Already Made Change	7 (13.7)	1 (2.1)	3 (13.6)	11 (9.2)
Contractor	6 (11.8)	9 (19.1)	8 (36.4)	23 (19.2)
Someone Knowledgeable	2 (3.9)	7 (14.9)	3 (13.6)	12 (10.0)
Media	1 (2.0)	4 (8.5)	1 (4.5)	6 (5.0)
Booklet	8 (15.7)	10 (21.3)	2 (9.1)	20 (16.7)
Talked with Floodproofing Expert	10 (19.6)	7 (14.9)	2 (9.1)	19 (15.8)
DWR Open House	13 (25.5)	1 (2.1)	0 (0.0)	14 (11.7)
Other Government	0 (0.0)	1 (2.1)	0 (0.0)	1 (.8)
No Source	4 (7.8)	7 (14.9)	3 (13.6)	14 (11.7)
Column Total	51 (42.5)	47 (39.2)	22 (18.3)	120 (100.0)

Chi-Square = 34.21283 Significance = 0.0051
Gamma = -0.21978

Table 61. Crosstabulation of Family Member or Contractor Did Floodproofing (Q17) By First Source of Floodproofing Information (Q13.A)

	First Source of Floodproofing Information (cont.)					
	Someone Already Did It	Contractor	Someone Knowledge-able	Media	Booklet	Row Total
Who Did Floodproofing						
I or Another Family Member Made Change	11 (44.0)	4 (18.2)	7 (50.0)	9 (45.0)	4 (23.5)	98 (42.8)
Paid Contractor	11 (44.0)	15 (68.2)	4 (28.6)	7 (35.0)	4 (23.5)	69 (30.1)
Did Part, Contractor Did Part	3 (12.0)	3 (13.6)	3 (21.4)	4 (20.0)	9 (52.9)	62 (27.1)
Column Total	25 (10.9)	22 (9.6)	14 (6.1)	20 (8.7)	17 (7.4)	229 (100.0)

Table 61. Crosstabulation of Family Member or Contractor Did Floodproofing (Q17) By First Source of Floodproofing Information (Q13.A)

	First Source of Floodproofing Information (cont.)					
	Talked With Expert	Open House	Other Govt. or Neigh. Meeting	City/ County Official	No Source	Row Total
Who Did Floodproofing						
I or Another Family Member Made Change	16 (41.0)	4 (28.6)	1 (25.0)	0 (0.0)	38 (63.3)	98 (42.8)
Paid Contractor	6 (15.4)	4 (28.6)	3 (75.0)	3 (100.0)	9 (15.0)	69 (30.1)
Did Part, Contractor Did Part	17 (43.6)	6 (42.9)	0 (0.0)	0 (0.0)	13 (21.7)	62 (27.1)
Column Total	39 (17.0)	14 (6.1)	4 (1.7)	3 (1.3)	60 (26.2)	229 (100.0)

Table 61. Crosstabulation of Family Member or Contractor Did Floodproofing (Q17) By First Source of Floodproofing Information (Q13.A)

	First Source of Floodproofing Information		
	Other	Don't Remember	Row Total
Who Did Floodproofing			
I or Another Family Member Made Change	2 (100.0)	2 (22.2)	98 (42.8)
Paid Contractor	0 (0.0)	3 (33.3)	69 (30.1)
Did Part, Contractor Did Part	0 (0.0)	4 (44.4)	62 (27.1)
Column Total	2 (.9)	9 (3.9)	229 (100.0)

Chi-Square = 61.13316 Significance = 0.0000
Gamma = -0.06152

Table 62. Crosstabulation of Family Member or Contractor Did Floodproofing (Q17) By Additional Source of Floodproofing Information (Q13.B)

	Additional Source of Floodproofing Information					
	Someone Already Did It	Contractor	Someone Knowledge-able	Media	Booklet	Row Total (cont.)
Who Did Floodproofing						
I or Another Family Member Made Change	5 (45.5)	6 (24.0)	4 (33.3)	4 (66.7)	10 (50.0)	50 (41.3)
Paid Contractor	4 (36.4)	11 (44.0)	4 (33.3)	1 (16.7)	5 (25.0)	35 (28.9)
Did Part, Contractor Did Part	2 (18.2)	8 (32.0)	4 (33.3)	1 (16.7)	5 (25.0)	36 (29.8)
Column Total	11 (9.1)	25 (20.7)	12 (9.9)	6 (5.0)	20 (16.5)	121 (100.0)

Table 62. Crosstabulation of Family Member or Contractor Did Floodproofing (Q17) By Additional Source of Floodproofing Information (Q13.B)

	Additional Source of Floodproofing Information				
	Talked With Expert	Open House	Other Govt. or Neigh. Meeting	No Source	Row Total
Who Did Floodproofing					
I or Another Family Member Made Change	7 (38.9)	8 (57.1)	0 (0.0)	6 (42.9)	50 (41.3)
Paid Contractor	6 (33.3)	3 (21.4)	0 (0.0)	1 (7.1)	35 (28.9)
Did Part, Contractor Did Part	5 (27.8)	3 (21.4)	1 (100.0)	7 (50.0)	36 (29.8)
Column Total	18 (14.9)	14 (11.6)	1 (.8)	14 (11.6)	121 (100.0)

Chi-Square = 15.31390 Significance = 0.5018
Gamma = -0.02375

Table 63. Retrofitting and Intervention Selection Rates By Depth of Water for Intervention Exposures

Open House

	Depth of Water			
	< 1 ft.	In Basement 1-3 ft.	> 3 ft.	Water on 1st floor
Rates				
Retrofitting Rate	57%	83%	63%	29%
Intervention Selection Rate	40%	39%	60%	**

Evaluation: Does not demonstrate pattern.

Mitigation Table

	Depth of Water			
	< 1 ft.	In Basement 1-3 ft.	> 3 ft.	Water on 1st floor
Rates				
Retrofitting Rate	80%	77%	61%	42%
Intervention Selection Rate*	46%	50%	24%	33%

Evaluation: Demonstrates pattern somewhat.

Both

	Depth of Water			
	< 1 ft.	In Basement 1-3 ft.	> 3 ft.	Water on 1st floor
Rates				
Retrofitting Rate	56%	74%	73%	50%
Intervention Selection Rate	**	67%	72%	**

Evaluation: Does not demonstrate pattern.

* Interventions include retrofitting booklet, mitigation table and open house.

** N is too small for analysis.

Table 64. Retrofitting and Intervention Selection Rates By Source of Water for Intervention Exposures

Open House

	Source of Water			
	No Flooding	Surface	Sub-Surface	Both
Rates				
Retrofitting Rate	67%	29%	64%	63%
Intervention Selection Rate	**	**	39%	40%

Evaluation: Demonstrates pattern.

Mitigation Table

	Source of Water			
	No Flooding	Surface	Sub-Surface	Both
Rates				
Retrofitting Rate	70%	39%	77%	70%
Intervention Selection Rate	**	31%	45%	40%

Evaluation: Demonstrates pattern.

Both

	Source of Water			
	No Flooding	Surface	Sub-Surface	Both
Rates				
Retrofitting Rate	**	36%	76%	73%
Intervention Selection Rate	**	**	52%	78%

Evaluation: Does not demonstrate pattern.

Interventions include retrofitting booklet, mitigation table and open house.
N is too small for analysis

Table 65. Evaluation of Possible Information Sources--Wisconsin: (1=Not Interested, 5=Very Interested)

Handbook	3.8
TV Program	3.3
Video	2.7
Handouts	3.1
Demonstration	3.0
Discuss Needs With Expert	3.3
Have Expert Visit Home	3.4

Table 66. Crosstabulation of Decided to Floodproof Before/After Exposure to Information (Q30) By Open House Versus Mitigation Intervention (OH_MIT)

	Open House vs. Mitigation		
	Open House	Mitigation Table	Row Total
Decided to Floodproof			
Before	44 (50.6)	36 (42.4)	80 (46.5)
After	43 (49.4)	49 (57.6)	92 (53.5)
Column Total	87 (50.6)	85 (49.4)	172 (100.0)

Chi-Square = 0.86110 Significance = 0.3534
Gamma = 0.16415

Table 67. Crosstabulation of Whether Information Intervention Assisted in Floodproofing Decision (Q31) By Open House vs. Mitigation Intervention (OH_MIT)

Sub-group = Decided After Attending

	Open House vs. Mitigation Intervention		
	Open House	Mitigation Table	Row Total
Whether Information Intervention Assisted in Floodproofing Decision			
No	5 (12.5)	18 (36.0)	23 25.6)
Yes	35 (87.5)	32 (64.0)	67 (74.4)
Column Total	40 (44.4)	50 (55.6)	90 (100.0)

Chi-Square = 5.27458 Significance = 0.0216
Gamma = -0.59494

Table 68. Crosstabulation of Whether Information Intervention Assisted in Floodproofing Decision (Q33) By Open House vs. Mitigation Intervention (OH_MIT)

Sub-group = Decided Before Attending

	Open House vs. Mitigation Intervention		
	Open House	Mitigation Table	Row Total
Whether Information Intervention Assisted in Floodproofing Decision			
No	19 (48.7)	19 (61.3)	38 (54.3)
Yes	20 (51.3)	12 (38.7)	32 (45.7)
Column Total	39 (55.7)	31 (44.3)	70 (100.0)

Chi-Square = 0.65179 Significance = 0.4195
Gamma = -0.25000

Figure 3. Evaluation of Information by Open House versus Mitigation Intervention

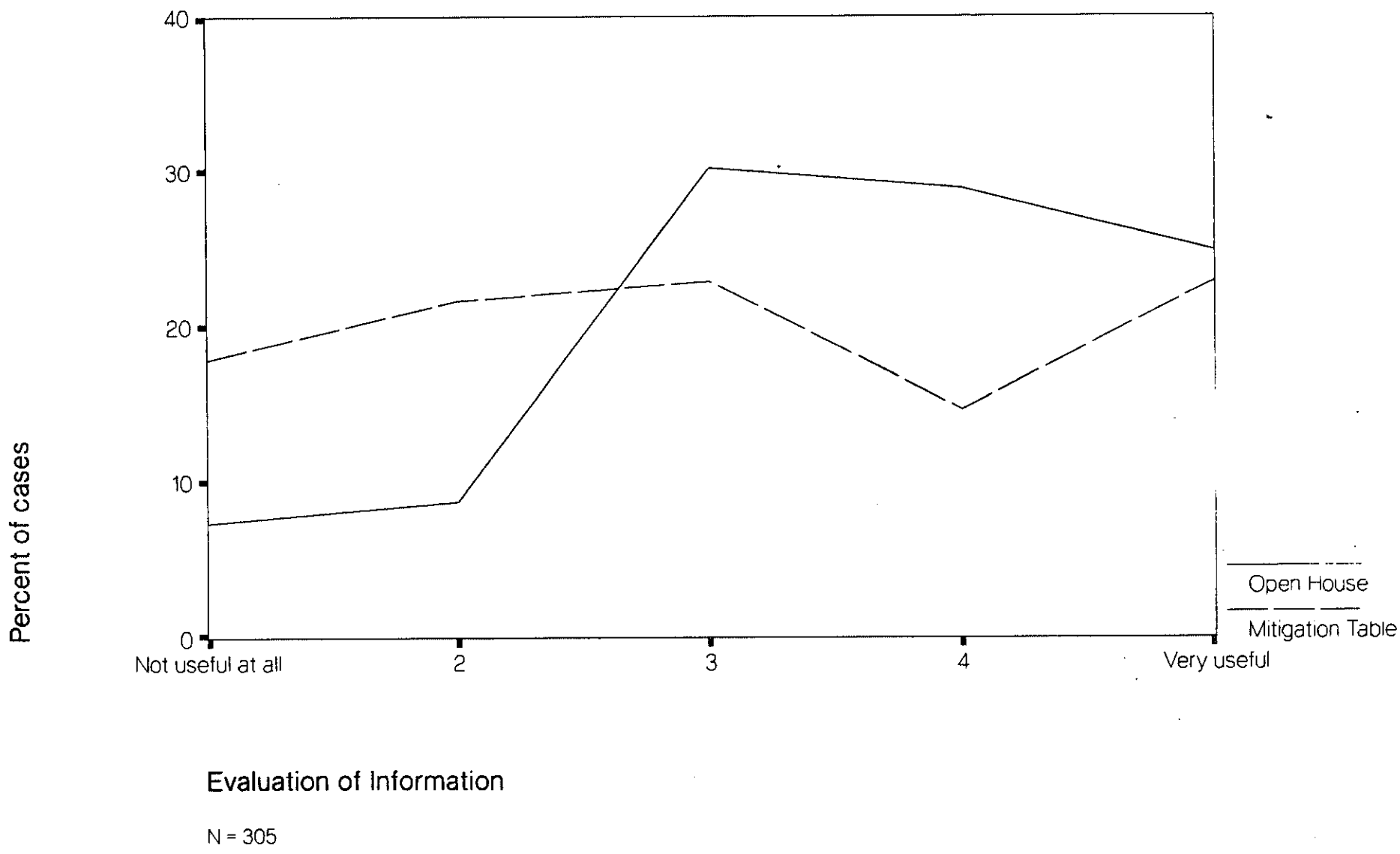


Table 69. Crosstabulation of How Information Intervention was Useful (Q36) By Open House vs. Mitigation Intervention (OH_MIT)

	Open House vs. Mitigation Intervention		
	Open House	Mitigation Table	Row Total
How Information Intervention was Useful			
Introduced Me To Floodproofing	26 (23.0)	25 (28.7)	51 (25.5)
Gave Me More General Knowledge	65 (57.5)	52 (59.8)	117 (58.5)
Gave Me Specific Knowledge	22 (19.5)	10 (11.5)	32 (16.0)
Column Total	113 (56.5)	87 (43.5)	200 (100.0)

Chi-Square = 2.62847 Significance = 0.2687
Gamma = -0.18939

Table 70. Assessment of Interventions

	Open House	Mitigation Table
	(% Wanting More)	
Technical Advice (O-H Contractors)*	62%	49%
Individual Attention	60%	30%
Displays	63%	77%
Explanation of Manual	41%	43%
Expertise of Advisers	55%	48%
Handouts	41%	57%

* Open house attendees were asked specifically about the presence of contractors at the open houses.