

## 2. Purpose and Methodology

### PURPOSE

The purpose of the study was to evaluate the personal damage and hardship experienced by the population of Dominica as a result of the cyclone, to examine the ways in which their lives were still affected in the medium-term aftermath, and to collect this information in such a way that it could be used to assist future planning.

### METHODS

It was decided to undertake a population-based retrospective survey using a questionnaire. Demographic, socio-economic and health-related questions were asked and the questionnaires were filled in by local interviewers who were specially trained for the purpose. The pre-selected households were visited and interviews took place at home. Answers covered the period from the day of the disaster until the time of the survey about 9 months later. A multi-stage proportionate random sampling method was chosen to obtain a representative 6 % sample (n = 5,977) of the total island population. The sample was stratified on the basis of the 1970 census into three settlement types, the main town of Roseau, small urban settlements and villages. Comprehensive lists for food distribution, compiled on a household basis a week to ten days after the disaster, were used as the basic sampling frame. Government and church registers of mortality, together with information from hospital files, were used to support and complete the survey data.

## 3. Results

### 3.1. RESPONSE

The response rate was excellent. The interviewers usually knew the sample families and achieved the best possible cooperation. Only 7 out of 1229 households interviewed refused to take part.

### 3.2. THE POPULATION SAMPLE

The sample was stratified by type of settlement (Table 1). The population structure shows the typical distribution of a young developing country (Figure 1). The slight surplus of females over males may be related to greater male outmigration in search for work (Figure 2).

### 3.3. SOCIO-ECONOMIC OVERVIEW

The purpose of this section is to describe the social and economic background necessary for an understanding of the detailed medical findings. It seeks to provide a comprehensive account of the ways in which Hurricane David affected people's lives and thus to place the problems of health (sickness, injury and death) in their proper perspective. The effects of the hurricane on housing and services, on employment, on agriculture and on food supplies are considered in turn. Then, the people's own perceptions of the consequences of the disaster are described.

#### 3.3.1. Hurricane damage and reconstruction

##### Accommodation and services

###### 1. Housing

Most houses in Dominica are of wood with galvanized roofs, although cement block construction is quite common in Roseau. Single-storey homes are the norm, often with wooden verandahs which in towns sometimes support upstairs quarters. Before the disaster struck over half the housing stock was estimated to be at least twenty-five years old. Three-quarters of the population in our survey lived in their own homes, a fifth were in rented accommodation and a few lived in houses belonging to other members of their family.

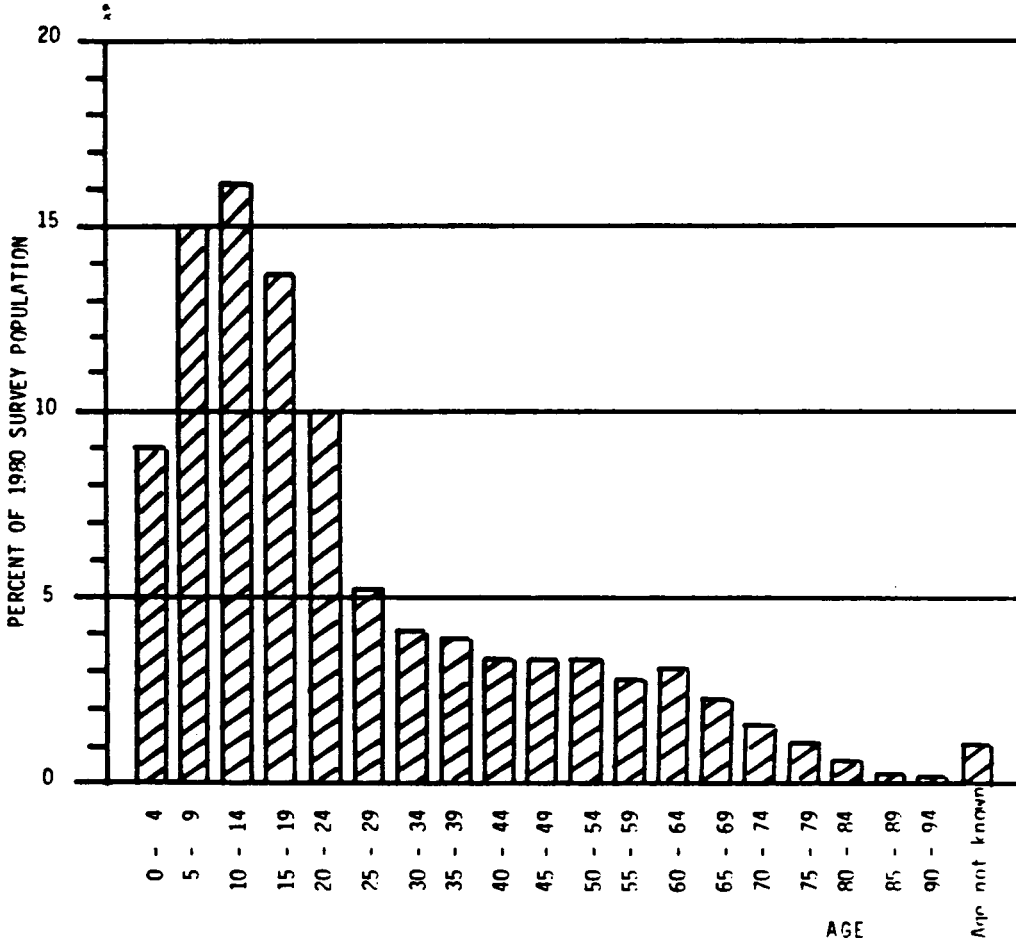
The hurricane inflicted severe damage on people's homes. Roofing was torn off, verandahs, doors and windows were blown out and, less often,

**Table 1:  
The Sample Population**

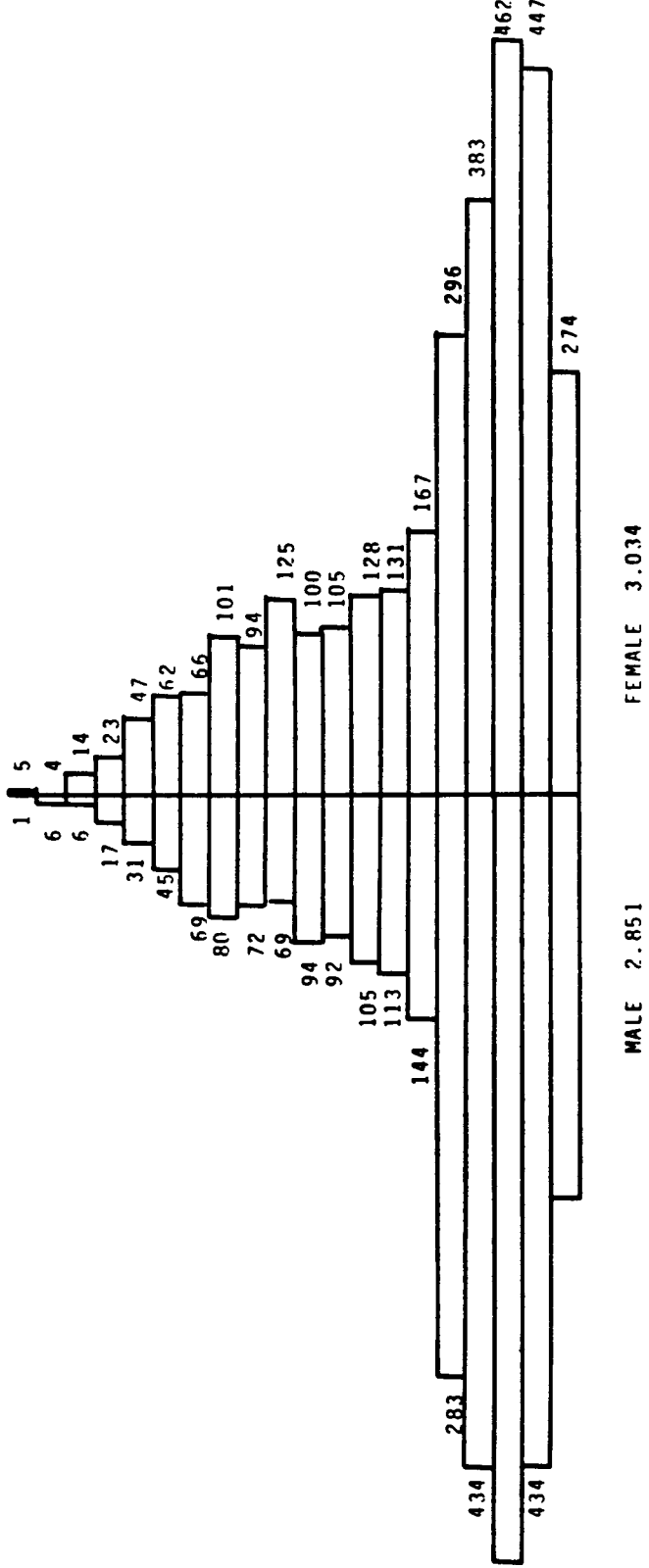
Settlement type	inhabitants census 1970	N° of households foodlist 1979	households surveyed	N° of persons surveyed	average household size (survey re- sults)
Main town Roseau	16,842	4,976	302	1,487	4.92
Small urban set- tlements	27,660	8,762	530	2,367	4.46
Villages	25,800	6,450	397	2,123	5.35
<b>Total Dominica</b>	<b>70,302</b>	<b>20,188</b>	<b>1,229</b>	<b>5,977</b>	<b>4.86</b>

The difference in average household size is significant between all settlement groups ( $p < 0.001$ ).

**Figure 1:**  
**Dominica: Age Distribution of Surveyed Population**  
**By 5 Years Age Groups**



**Figure 2:  
Dominica: Age Distribution of Surveyed Population by Sex**



walls collapsed. (42 % of the population lost their entire roof, while 24 % had the walls of their houses destroyed).

Once the roof, or part of it was off, the interior was exposed to the elements. Heavy rain, as well as gale-force winds, damaged furniture and personal possessions, as well as soaking the occupants. (Table 2). In the days that followed, inability to secure the home sometimes resulted in further deterioration and losses.

**Table 2:  
Damage and Repair: Housing**

	% of total population affected			
	No damage	Unknown	Damaged <sup>*</sup>	Total
Roof	10 %	2 %	88 %	100 %
Walls	39 %	5 %	56 <sup>**</sup> %	100 %
Furniture	34 %	3 %	63 %	100 %
Personal effects	30 %	6 %	64 %	100 %

n = 5977

\* includes slight and partial damage as well as total loss.

\*\* Loss of doors, windows and verandahs was included in the category of slight damage to walls.

In order to have a single indicator of the degree of damage to homes, houses were put in four damage categories according to the extent of damage to their roof and walls. Damage to the roof was taken as the most significant indicator, since it was considered the most important element in shelter.

**Table 3:  
Houses According to Damage Categories**

	% of houses	% of population
1. Little or no damage to house	29.5	27.1
2. Moderate damage	24.7	26.5
3. Severe damage	17.0	17.6
4. Total destruction of house	22.0	23.2
5. Inadequate information	5.9	5.6
<b>Total</b>	<b>99.1 (n=5977)</b>	<b>100.0 (n=5977)</b>

Key :

1. Roof undamaged ; walls undamaged, slightly or partially damaged
2. Roof partially damaged ; walls undamaged, damaged or partially destroyed
3. Roof totally destroyed ; walls undamaged, slightly or partially damaged.
4. Roof and walls totally destroyed.

As shown in Table 4, there was some difference between settlement types as to the degree of damage sustained. The main reason for this is geographical. Roseau, the capital, was in the south of the island, which was most severely hit by the hurricane. In contrast, 5/11 of the urban units sampled were from Portsmouth, the second largest town, situated in the north-west of the island, which largely escaped the worst of the hurricane damage.

**Table 4:  
Damage to Houses According to Type of Settlement**

Settlement type	% of population with houses in categories				Total
	1. Undamaged	2.3. Damaged	4. Destroyed	Unknown	
Roseau	15.8	47.6	30.6	6.0	100.0
Towns	32.7	45.7	15.4	6.2	100.0
Villages	28.6	39.9	26.7	4.8	100.0
Total (n=5977)	27.1	44.1	23.2	5.6	100.0

**Table 5:  
Housing: Repair After 9 Months**

	Repair complete	Temporary repair	Not yet repaired	Total
Roof	26 %	59 %	15 %	100 %
Walls	19 %	45 %	36 %	100 %

Table 5 shows the slow rate at which homes were being restored to normal. After the disaster, repairs to roofs were a priority and over half were at least patched up in the month following the disaster. Nine months later, however, only a third of the population was living in houses with sound roofs and half were in houses where roof repairs were still only of a temporary nature. Similarly, most households had not completely repaired or replaced their furniture by May, 1980. A fifth of those who had lost personal effects replaced them in the month following the hurricane but over half had not done so nine months later. With such a high proportion of temporary repairs, there was a risk that many would become semi-permanent. While a few people remained optimistic that the



devastation brought by the hurricane would give them a chance to build a better home, it seemed more likely that the general result would be a long-term deterioration of the housing stock.

Underlying reasons for the delay in restoring homes included the generally low levels of savings and the fact that the vast majority has no household insurance. (It was asserted that insurance, would, at a maximum, cover 15 % of the damage to homes). Immediate causes included lack of money, resulting from loss of income in the post-disaster period, scarcity of building materials and, while there was ample informal assistance and self-help, shortage of skilled tradesmen.

## 2. Utilities

Table 6 shows the proportion of the sample population who had some domestic utilities - water, electricity and toilets - in their homes. It shows how these were damaged in the hurricane and the extent to which this damage had been repaired nine months after the hurricane.

### a. Electricity

Before the hurricane, well over half the population sample had electricity. Of the houses that had none, 41 % were in the villages, 35 % in the towns and 24 % in Roseau. The hurricane played havoc with the distribution lines (which were uninsured) and damaged power stations and equipment. Virtually the whole island was without electricity.

Nine months later, less than a quarter of those who had previously had electricity had their supplies restored. These were mainly people living in one area of Roseau and about half had been reconnected in December.

### b. Private water supplies

Four-fifths of the population of Dominica had access to piped water supplies, but half used public standpoints. 34 % of our sample had private water supplies in their homes. Of the houses without private supplies, 51 % were in the villages, 38 % in towns and only 11 % were in Roseau.

**Table 6:  
Damage and Repair: Utilities**

<u>Utility</u>	<u>Population having utility</u>		<u>Hurricane damage</u>		<u>Repair after 9 months</u>	
	No.	% of total	Undamaged	% of population with utility Damaged	% of population with utility Repaired	Not yet repaired Total
Electricity	3521	58.9	0.9	99.1	23.2	76.8
Private water supply	2050	34.3	17.8	82.2	88.7	11.3
Private W.C.	1020	17.1	44.6	55.4	79.5	20.5
Private pit toilet	2628	44.0	17.2	82.8	60.8	39.2
Public toilet	701	11.8	16.8	83.2	12.5	87.5

\* Private piped supply in house or yard or, in a few cases, private cisterns.

The hurricane caused considerable disruption to water supplies ; pipelines were washed out, inlets blocked and reservoir roofs and some of the few chlorination plants damaged. 88.7 % of the sample who had private water supplies found them cut off. However, because of the potential risk to health from contaminated water, the authorities acted swiftly in the wake of the disaster.

Thus, 41.7 % of homes with damaged supplies were reconnected within a month and only 11.3 % had not had their water restored nine months later.

c. Toilet facilities

Just over half the sampled population had private toilets, a relatively small percentage used public toilets and over a quarter had no formal facilities.

Nearly half the flush toilets were undamaged following the disaster. This surprisingly high figure is possibly due to the fact that such toilets were to be found in well-constructed homes that withstood the force of the hurricane. Many were useable again as soon as water supplies were restored. The high proportion of pit latrines damaged was unexpected. But in many cases it was the building around the pit rather than the pit itself which was demolished. Four-fifths of those using public toilets found that their facilities were damaged or destroyed. Unlike toilets in private homes, the vast majority had not been repaired or replaced nine months later.

3. The effect on employment

The occupational structure of the population of Dominica (shown in Table 7) is typical of a young developing country. There is a fair degree of overlap between occupations, particularly those involving the self-employed. (For example, a woman may class herself as a housewife when she is also growing much of the family's food in her garden). Moreover, much of the work available is casual or seasonal and 10 % of people with an employment had secondary jobs, which were often part-time. The agricultural sector is important. If secondary jobs are included, 42.2 % of those employed were farmers or workers on

**Table 7:  
Jobs Lost and Gained After the Hurricane**

<u>a) Population according to main occupation</u>		<u>b) Employed population according to main job</u>	
	People		People
	<u>No</u>	<u>%</u>	<u>No</u>
Employed	1923	32.2	350
Schoolchildren, students, apprentices	1889	31.6	336
Housewives	533	8.9	187
Unemployed	505	8.4	130
No occupation *	954	16.0	79
Unknown	173	2.9	54
			787
<b>TOTAL</b>	<b>5977</b>	<b>100.0</b>	<b>1923</b>
			<b>100.0</b>

\* Includes those under-school age, the elderly, infirm and retired etc.

the land. Those in the very small industrial sector were almost all engaged in agricultural processing or packing.

**Table 8:  
Occupation and Employment**

	No of people	% of employed
Main job lost	356	18.5
Secondary job lost	78	4.1
Main job gained	117	6.1
Secondary job gained	9	0.5

After the hurricane (Table 8), over a fifth lost their job (18.5 % of main jobs were lost). About half of those who lost jobs were land labourers. The main reason they gave for losing work was the destruction of crops on the estates. For the others, the main reason for losing their jobs was damage to the place of work and to equipment. The local fishery activities were badly affected as 45 out of 69 boats were totally destroyed and only 20 were undamaged. However, at least some new jobs were created in the wake of the hurricane. Initially there was extra work to be done in clearing agricultural land of fallen trees and in repairing roads. Building tradesmen were in considerable demand.

#### 4. Agriculture

##### a. Crops

No questions were asked about the extent of crop production. Households were only asked which crops they grew. No distinction can therefore be made between the small-scale cultivator and the large plantation owner. Replies to a question about land ownership (not analyzed here) indicated that almost all those sampled had holdings of a few hectares. (This is in agreement with an official estimate that 75 % of owners have less than 3 hectares, while 1.4 % own over half the land in large estates).

Nearly half the households grew bananas, the main export and a steady year-round source of income to the farmer. Over a third had coconuts and nearly a third had ground provisions, the traditional staple food. Cocoa (together with coffee) and citrus were next in importance (20 % of all families).

Households reported very heavy crop losses caused by the hurricane (Table 9). 90 % of those growing bananas lost all their plants. 72 % of those growing cocoa or coffee and 65 % of those growing coconuts lost all their trees (not merely the current harvest). Only few cultivators had crops which suffered little or no damage. The high proportion of growers who reported total loss of ground provision was unexpected, since public authority reports, written in the first few months after the disaster, had estimated a reduction in production of 50 % or less.

After the disaster, householders were quick to restore their banana plants. Bananas are rehabilitated relatively easily and official aid (fertilizers, pesticides, etc.) was concentrated on this key crop. Other cash crops were replaced much more slowly, although a third of those who lost coconut palms had re-established them nine months later. In the case of other tree crops there was little replanting ; simple vegetative reproduction was impossible and it was often unclear whether trees which had not been uprooted had any prospect of recovery. As in the case of bananas, about three-quarters of those with ground provisions had rehabilitated their plants nine months later.

b. Domestic animals

Households were asked what types of domestic livestock they owned. No distinction could be made between, for example, households with a few hens for family use and those who used poultry to provide a subsidiary income.

Over 40 % of households had poultry, over a fifth kept goats and nearly as many had pigs. Cows, then rabbits, were next in importance. Although over half the households owning livestock were in

**Table 9:  
Crops, Losses and Replacement**

Type of crop	Proportion growing crop	% of crop growers with Little or Partial* no damage losses	Total loss	9 months later. Percentage of those with crop losses who had not replaced crop	
Bananas	47.5	2.6	7.4	90.0	25.9
Coconuts	37.2	5.5	29.5	65.0	66.7
Ground provisions	29.4	8.3	23.0	68.7	27.6
Cocoa or coffee	19.3	5.9	22.3	71.8	80.7
Citrus	17.8	10.9	24.1	65.0	73.1
Other fruit trees (mangoes etc)	11.6	12.2	21.1	66.7	76.2
Other crops	10.9	8.1	25.9	66.0	80.6

\* Particularly in the case of ground provisions, there may have been some confusion over how to record loss of yield as distinct from the destruction of plants. This may have led to some exaggeration of losses.

the countryside, around a third were in the towns (indeed these smaller urban settlements have kept many rural characteristics). Livestock ownership was not unusual even in Roseau ; notably, 14 % of poultry-owning households were in the capital. In general households owning animals tended to be larger than average.

Animal losses in the hurricane varied greatly between species (Table 10). Fewer than 15 % of cattle owners lost part or all of their stock. This was important since cattle represent considerable capital investment and, as was shown, are slow to be replaced. A third of pig-owners lost animals. The figure rose to around a half where goat and poultry ownership was concerned and was highest of all for those with rabbits. Not all losses were caused by death. Animals were also blown away or strayed and some of these were not recovered by their owners. Nine months later only a small percentage of owners had replaced all their lost stock. Around 60 % of poultry and pig owners still had few animals and around three quarters of those owning rabbits and goats were in the same position.

**Table 10:**  
**Domestic Animals, Losses and Replacement**

Type of animals	proportion of people with animals % of house- holds	% of popu- lation	No losses	Partial or total losses	9 months after hurricane : proportion who had <u>not</u> replaced stock
Cattle	10.3	13.0	85.8 %	14.2 %	99.2 %
Pig	18.0	23.7	67.0 %	33.0 %	59.9 %
Goat	21.2	26.5	52.2 %	47.8 %	73.1 %
Rabbits	5.3	8.3	18.5 %	81.5 %	75.5 %



In Dominica, domestic livestock, particularly poultry, pigs and goats, are a useful source of animal protein. Failure to replace stocks must be of concern to nutritionists in an area where starchy roots and tubers, low in protein, are still important as staples. Massive provisions of food aid were brought into the island after the hurricane.

4. The effect of Hurricane David on food supplies

The cyclone resulted in an immediate reduction in the amount of food available locally. Food crops were damaged, mainly through exfoliation. Consequently, green vegetables were lost though ground provisions (root crops) recovered toward the end of the year. Livestock, particularly poultry, were killed and hens moulted and temporarily ceased to lay. Food stores whether in warehouses or in homes were spoilt by rainwater and several commercial premises were looted. Additionally, broken bridges and cut roads disrupted the distribution system.

Not surprisingly four-fifths of the population sampled reported that they were short of food in the week following the disaster. Admittedly, in the first few days after the hurricane, there were often ample supplies of individual foodstuffs, such as fallen fruit or damp grain, which would be wasted if not immediately consumed, but housewives, often in a state of shock, their kitchens damaged, could not make best use of these gluts.

Shortly after the disaster, massive food aid from abroad began to arrive and continued on a large scale for four to six months. It then dwindled but in some areas ceased only a few weeks before the survey began. During the first four months the average daily

ration was 1565 calories and 80 grams of protein. Since some local foodstuffs were still available, the quantity was more than enough. It is, however, a credit to the distribution system that virtually the whole population sampled (99,2 %) reported having ample food in the months following the disaster.

### 3.3.2. Perception of the effects of hurricane David

Questions were asked to find out people's personal views on how their households had been affected by the disaster. Such questions elicit highly subjective answers but they are valuable in indicating broad areas of hardship which could be reduced on a future occasion by sensitive disaster planning.

The views expressed are those of the respondents to the questionnaire, and, although they were asked to take their whole household into account when replying, their opinions are not necessarily typical of the whole population. As far as possible field-workers were asked to interview household heads and this was done in two-thirds of cases. But where this was impracticable, they had to select any responsible householder with the appropriate knowledge. As a result, very few respondents were under 20, just over two-thirds were in the active age groups 20-59 and a quarter were over 60. Over 60 % were women.

The questions asked in this section were open-ended.

#### Questions :

"What were the worst things that happened to you and your family at the time of the disaster and in the first week afterwards ?"

and

"What have been the worst things over the last eight months as far as your family is concerned ?" In each case, respondents were asked to name up to three things, listing them in order of importance. In this report, we deal only with the most important point mentioned by each household.

**Table 11:**  
**Perception of Events at the Time Of and Immediately After the Disaster**

<u>The worst things that happened</u>	<u>% people affected</u>
Damage to house, no home	53
No food	11
Damage caused by water (rain and flood)	6
Bad health (sickness and injury)	<u>6</u>
Shock, fright, worry	5
Loss of crops	4
Furniture and personal effects lost	3
No water or only dirty water supply	1
Nothing, nothing special	4
Other	7
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TOTAL (n = 5977)	100

As shown in Table 11, for over half the population the worst immediate result of the disaster was the damage to their houses and, associated with this, damage to furniture and personal effects. Second in importance was the lack of food. Health problems were the main worry for only a small minority and were almost equalled in importance by the problems of shock and anxiety.

**Table 12:  
Perception of Events 8 Months After the Disaster**

<u>The worst things that happened</u>	<u>% people affected</u>
No money, rise in prices	18
Damage to house, no home	18
The wrong kind of food to eat	13
Bad health	<u>7</u>
No electricity	6
No employment	4
Loss of crops	4
Disruption to water supplies	3
Education interrupted	2
Fear and anxiety	2
Nothing, nothing special	8
Other	15
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TOTAL (n = 5977)	100

In the immediate wake of the hurricane people were preoccupied with the concrete needs of shelter and food. In the months that followed other factors became more important. Looking back at the whole period since the disaster (Table 12), lack of money seemed to be the chief concern. Jobs were lost and income expected from crops was severely reduced, at a time when extra cash was needed for rebuilding and the replacement of damaged possessions. At the same time, shortages of many goods and materials caused prices to rise. Food aid was free but people complained that they were not accustomed to eating some of the items supplied.

Damage to the home was virtually as important as lack of funds when the medium-term effects of hurricane David were considered. This reflected the slow pace of rebuilding and frustration when seeing the difficulty of getting houses "back to normal".

Bad health is the fourth most important cause for concern. More people cited health problems as their major worry in the months following the disaster than they had done in the immediate post disaster period.

The low figures for those who said they were relatively unaffected by the disaster, either at the time or in the medium term, illustrate the island-wide nature of the hurricane damage.

Question :

"Do you think any good has come from the disaster ? If yes, which one ?"

The aim of this question was to balance the previous question which had dealt only with the negative aspects of the disaster.

Four-fifths thought that no good had come of the disaster. One fifth considered that there had been some positive aspects.

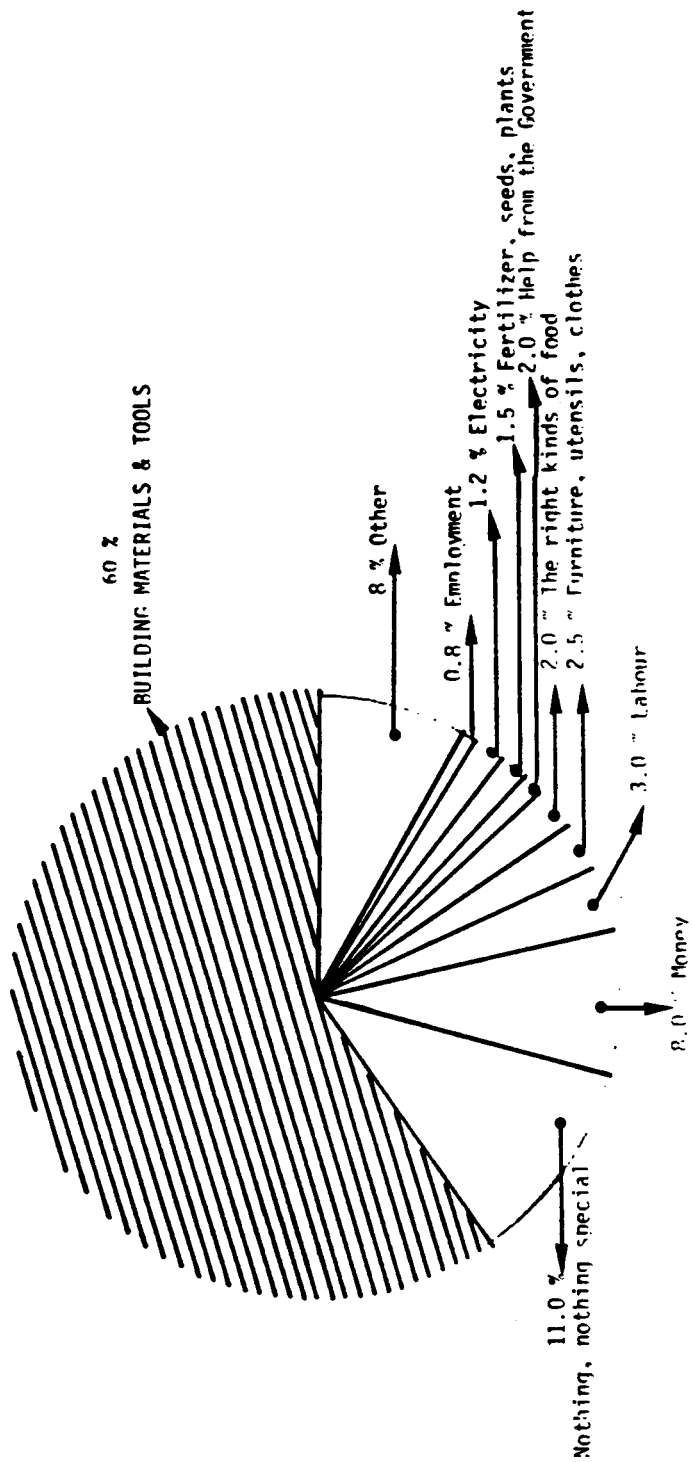
It was not easy to classify the replies. However, roughly three-quarters of the good consequences mentioned concerned aid received - food, clothing, medical care etc. In particular, it was thought that some of those who had been very poor before the disaster had improved their lot. The second most important group of replies said that the disaster had brought people closer together, that family ties had been strengthened and that people had co-operated to a new degree. A few replies emphasized the increased attention given to Dominica by the international community. And others dealt with the religious and spiritual value of the disaster.

Question :

"Was there any help you would have particularly liked but did not receive ?"

Sixty per cent of all respondents expressed a need for building materials or tools (Fig. 3). This illustrates the widespread failure to repair houses satisfactorily in the nine months following the disaster. The second largest group of respondents would have liked to have received money, thus emphasizing the financial hardship felt in the wake of

**Figure 3:  
Help One Would Have Liked but Did Not Receive**



the hurricane.

Apart from the top priorities as building materials, tools or financial aid, the many other possible types of expected but not received help were only mentioned by very small proportions of the surveyed population. For example, only 0.4 % mentioned medicines and no other health needs were expressed. It will be appreciated that failure to mention a need may mean either that damage was slight, that it could readily be put right with self-help or that adequate outside assistance was obtained.

### 3.4. INJURIES

#### 3.4.1. Characteristics of the injured population

Of the 5,885 people in the survey (with known age and sex) 254 (4.3 %) were reported injured (Table 13). This gives an estimated number of 5,953 cases of injury for the whole population of the island.

**Table 13:**  
**Injuries by Major Age Groups**

Age	Number of people	Number injured	Injury rate (%)
0-19	3,190	79	24
20-39	1,367	84	61
40-59	751	61	81
60	577	30	51
unknown	92	2	
<b>Total</b>	<b>5,977</b>	<b>256</b>	<b>43</b>

( $\chi^2$ ,  $p < 0.01$ )

The age and sex of the injured

The overall injury rate for males and females was the same. (Figure 4). Differences in age specific injury rates were statistically significant (Table 13). The detailed graph in five year age groups (Figure 5) shows that injury rates ranged from less than 10 per thousand for the under-fives to over 120 per thousand for men aged 45-49.

Position in the household and occupation

A comparison was made between the position in the household and the occupation of those who were injured and those who were unharmed.

**Table 14:**  
**Position in Household and Injury**

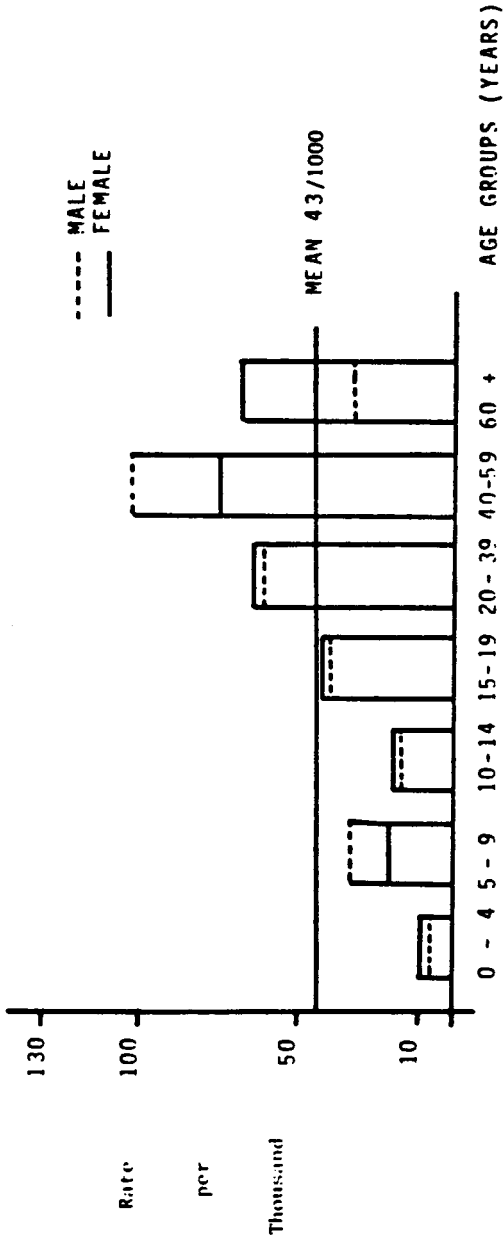
	Injured	Not injured	Injury rate (%)
Heads of households	101	1120	84
Other household members	155	4601	33
Total population	256	5661	43

( $\chi^2$ ,  $p < 0.001$ )

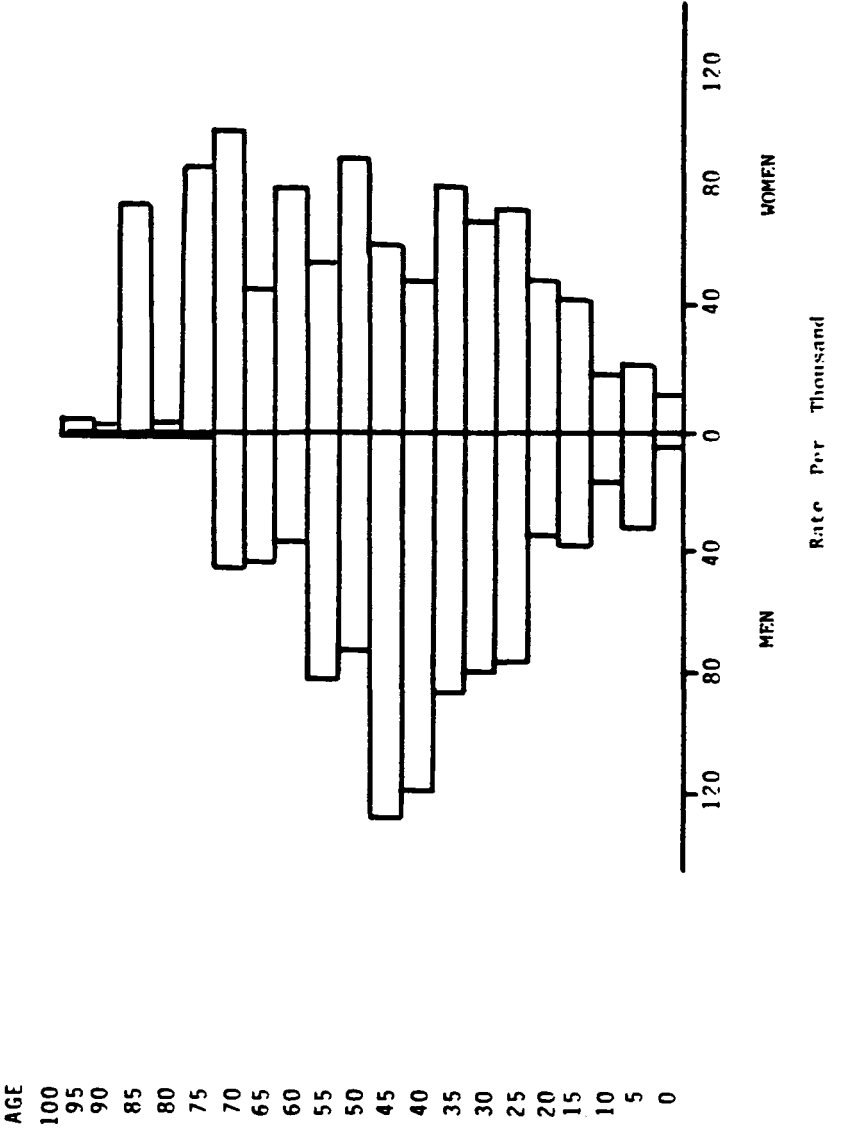
Heads of households formed just over 20 % of the population. As table 14 shows, household heads were 2 1/2 times as likely as other household members to be injured.



**Figure 4:  
Dominica: Injury Rate by Age and Sex**



**Figure 5:**  
**Dominica: Injury Rate by Sex and 5 Years Age Groups**



About a third of household heads were 60 or older, but their injury rate was only 40 per thousand, compared with 99 per thousand and 105 per thousand for younger heads in the age groups 20-39 and 40-59 respectively. (Few household heads were under 20). (Table 15).

**Table 15:**  
**Heads of Household Surveyed with Age Specific Injury Rates**

INJURY RATES			
	Injured	Not injured	Injury rate per thousand
<hr/>			
age groups			
0-19	3	20	130
20-39	37	335	99
40-59	46	390	105
60	15	355	40
<hr/>			
Total	101	1120	84

The difference in proportion of heads of households among injured and non injured people was significant in all age groups except in those over 60 years of age. (Table 16).

Being head of a household at the time of the disaster thus seems to be a risk factor.

**Table 16:  
Household Heads and Injury by Major Age Groups**

<u>Age group</u>	<u>Injured</u>			<u>Not injured</u>			<u>SND</u>
	Head of household	Total injured (all positions)	Proportion of heads of household	Head of household	Total not injured population	Proportion of heads of households	
0-19	3	79	3.8	20	3133	0.6	p < 0.01
20-39	37	85	43.5	335	1288	26.0	p < 0.01
40-59	46	61	75.4	390	693	56.3	p < 0.01
60 and over	15	31	48.4	355	547	64.9	p > 0.05
<b>Total</b>	<b>101</b>	<b>256</b>	<b>39.5</b>	<b>1120</b>	<b>5661</b>	<b>19.8</b>	<b>p &lt; 0.01</b>

**Table 17:  
Occupation and Injury**

	Injured	Not injured	Injury rate per thousand
Land labourers	34	315	94 *
Housewives	40	484	67 **
Total population	256	5661	43

\*  $\chi^2$ ,  $p < 0.001$

\*\*  $\chi^2$ ,  $p < 0.005$

Land labourers and housewives were significantly more exposed to injury than those in other occupation groups. They were the only major occupation groups found to be significantly risky. (Table 17).

Farmers with an injury rate of 47 per thousand, were not markedly more at risk than the general population.

There was no significant difference in ages between housewives and land labourers who were injured and those who were not. It is interesting to note, however, that housewives and land labourers each formed over a quarter of those injured in the 40-59 age group.

#### Damage to the home

The hypothesis was that people from homes that had been badly damaged in the hurricane were more likely to have been injured than those from homes that had sustained only minor damage.

Houses were grouped into four categories according to the amount of damage of roof and walls.

**Table 18:  
Damage to House and Injury**

Damage to house	Occupants injured		Occupants not injured	
	No.	%	No.	%
None or minor	63	26.0	1555	28.6
Moderate	63	26.0	1523	28.2
Severe	40	16.5	1009	18.7
Total destruction	76	31.4	1311	24.3
Total	242	100.0	5398	100.0

There was no significant difference between the injured and the uninjured persons in relation to the extent to which their houses had been damaged (Table 18). Nonetheless, injury rates were somewhat higher for those whose houses had been completely destroyed. Nearly a third of the injured came from such homes.

As a further indicator of the severity of the impact of the hurricane on the home, damage to water and electricity supplies was examined. There was no significant association between injuries and the degree of disruption of either of these facilities.

The lack of association between damage to the home and personal injury may be partly because (as shown later) most injuries happened to people who were outside at the time of the disaster. Nevertheless, the amount of damage to housing, in general, did give an indication of how fiercely the hurricane had struck a particular area.

Evacuation and migration.

After the hurricane about 39 % of the population had to leave their homes for a night or longer (Table 19).

**Table 19:**  
**Evacuation and Injury**

JURY

	Injured		Not injured	
	No.	%	No.	%
Left home	101	44.1	1995	39.0
Stayed	128	55.9	3121	61.0
Total	229	100.0	5116	100.0

Overall, there was no significant difference between the injured and the uninjured people as to whether they left or stayed at home.

Looking into the age groups of the injured persons (Table 20), it was found that the 20-39 years age group was significantly more likely to have stayed than to have left home. For the other age groups, the difference between staying and leaving was not significant.

**Table 20:  
Evacuation and Injury by Major Age Groups**

Age group	Injured who left		Injured who stayed		Total injured	
	No.	%	No.	%	No.	%
0-19	37	50.7	36	49.3	73	100.0
20-39	27*	37.5	49*	64.5	76	100.0
40-59	22	42.3	30	57.7	52	100.0
60 and over	15	53.6	13	46.4	28	100.0
<b>Total</b>	<b>101</b>		<b>128</b>		<b>229</b>	

\* (SND  $p < 0.01$ )



**Table 21:  
Length of Absence and Injury**

JURY

Length of absence	Evacuees			
	Injured		Not injured	
	No.	%	No.	%
Less than 1 week	27	26.7	674	33.7
More than 1 week	49	48.6	773	38.7
Not yet returned	25	24.7	548	27.4
<b>Total</b>	<b>101</b>	<b>100.0</b>	<b>1995</b>	<b>100.0</b>

There was no significant difference in the length of absence between the injured persons and the others who had to evacuate their homes (Table 21). However, the number of injured people who were absent for more than a week was important.

Settlement types

**Table 22:  
Type of Settlement and Injury**

Settlement type	Injured	
	No.	%
Roseau	82	32.0
Towns	104	40.6
Villages	70	27.3
<b>Total</b>	<b>256</b>	<b>100.0</b>

There was no significant difference in the distribution of the injured according to the type of settlement in which they lived (Tableau 22). Injury rates were 39 per thousand for Roseau, 44 per thousand for smaller towns and 47 per thousand for the village.

### 3.4.2. The occurrence, causes and nature of the injuries

#### When did the injuries occur ?

**Table 23:**  
**Time of Injury**

Time	No. of cases	% of total	
Disaster day a.m.	101	39.5	59.6 %
p.m.	52	20.3	
2-7 days later	68	26.6	40.2 %
8 days - 1 month later	35	13.7	
<b>Total</b>	<b>256</b>	<b>100.0</b>	

On the 29th August, the hurricane swept Dominica from mid-morning until late afternoon, and while 40 % were injured in the first few hours, 20 % were injured later in the day (Table 23). A surprisingly large proportion of injuries, 40 %, occurred after the cyclone had passed, in the days and even in the following weeks.

#### Where did the injuries occur ?

Three-quarters of all injuries happened to people who were outside in the open air. One quarter occurred inside. Of these, 4/5 were in the home and 1/5 in other, public buildings.

What were people doing when they were injured ?**Table 24:  
Activity and Injury**

Activity	No. of cases	% of total
Running to safety or escaping from falling house	95	43.4
Clearing debris, putting roof back on	47	21.5
Looking at damage	23	10.5
Helping others (to safety etc...)	13	5.9
Closing windows and doors	8	3.7
Other (playing, cultivating, travelling, sleeping etc...)	33	15.0
<b>Total</b>	<b>219</b>	<b>100.0</b>

As shown in Table 24, most of the injuries occurred when people were trying to seek protection from the force of the hurricane. Next in frequency came injuries that occurred during the process of clearing up and reconstructing homes. The third most common group of injuries were to those who were carrying out normal activities unconnected with the disaster as such.

Included in the category of those who were injured while running to safety was one person who was hurt while trying to obtain medical aid and three people injured while wading through flood water. Because of the steeply sloping nature of the land, there was comparatively little flooding associated with hurricane David. Nevertheless, storm waves destroyed roads and coastal facilities as well as, in some areas, houses close to the shore.

Table 25 shows what people were doing at different times. On disaster day, over 70 % of all the injuries for which we have details occurred

**Table 25:  
Injury According to Time and Activity**

Activity	Disaster day		Later			
	No. of cases			No. of cases		
	a.m.	p.m.				
			% of each activity			
			days 2-7			
			days 8-1 mth			
Running to safety or escaping from falling house	65	25	95	3	2	5
Clearing debris, putting roof back on	4	5	19	32	6	81
Looking at damage	2	1	13	16	4	87
Helping other (to safety etc...)	5	4	69	2	2	31
Closing windows and doors	5	3	100	-	-	-
Other (playing, cultivating etc...)	4	5	27	8	16	73
Total	85	43		61	30	

(X<sup>2</sup> p < 0.001 for the difference between disaster day and later)

when running for shelter. Later, over 40 % of the injuries happened during the process of clearing up and a further 20 % when examining the damage.

**Table 26:**  
**Injury According to Time and Place**

Time	PLACE			
	Outside		Inside House	
	No. of cases	% of total	No. of cases	% of total
Disaster day a.m.	68	36.4	28	54.9
p.m.	40	21.4	8	15.7
2-7 days later	52	27.8	11	21.6
8 days - 1 month later	27	14.4	4	7.8
<b>Total</b>	<b>187</b>	<b>100.0</b>	<b>51</b>	<b>100.0</b>

$\chi^2$  p < 0.05

Table 26 shows the difference in the proportion of injuries occurring outside and inside houses, according to the time at which the injury took place. 70 % of injuries inside the home occurred on the day of the disaster, while only 58 % of those outside happened then. The high proportion of injuries sustained outside and which occurred after the hurricane had passed may be partly explained by the number of injuries caused by wreckage lying on the ground and by the fact that most house repairs, notably re-roofing (when a fair number of injuries occurred), were carried out externally.

Table 26 excludes the 12 injuries that occurred in buildings other than houses. If these are included, the difference between injuries occurring inside and outside according to time ceases to be significant.

**Table 27:  
Injury According to Activity and Place**

Activity	Outside *		Inside house **	
	No. of cases	% of total	No. of cases	% of total
Running to safety or escaping from falling house	82	46	7	27
Clearing debris, putting roof back on	41	23	2	8
Looking at damage	21	12	2	8
Helping others (to safety etc..)	11	6	1	4
Closing windows and doors	2	1	4	15
Other (playing, cultivating, sleeping, travelling etc...)	22	12	10	38
<b>Total</b>	<b>179</b>	<b>100</b>	<b>26</b>	<b>100</b>

Note : This table based on partial information excludes the 12 injuries occurring in buildings other than houses.

\* Information not available for 8 cases (5 %)

\*\* Information not available for 25 cases (49 %)

The effects of age**Table 28:  
Time of Injury and Major Age Groups**

Time	Age group				Total
	0-19	20-29	40-59	60 +	
<u>Disaster day</u>					
a.m.	31	34	23	13	101
p.m.	15	17	12	8	52
Total	46	51	35	21	153
	58.2 %	60.0 %	57.4 %	67.7 %	59.8 %
<u>Later</u>					
days 2-7	21	19	19	9	68
days 8-1 month	12	15	7	1	35
Total	33	34	26	10	103
	41.8 %	40.0 %	42.6 %	32.2 %	40.2 %
Grand total	79	85	61	31	256
	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %

There was no significant difference in time, day of the disaster or later, according to age (Table 28). Compared with the rest of the population, however, those over 60 suffered a slightly higher proportion of their injuries on the disaster day itself.

**Table 29:**  
**Place of Injury and Major Age Groups**

Age groupe	Outside		Inside house	
	No. of cases	% of total	No. of cases	% of total
0-19	59	31.6	15	29.4
20-39	67	35.8	16	31.4
40-59	40	21.4	10	19.6
over 60	21	11.2	10	19.6
Total	187	100.0	51	100.0

There was no significant difference in the age distribution between those injured outside or inside, whether one considers houses alone or all buildings (of those injured in other buildings four were aged 0-19, one 20-39 and seven 40-59). However, those over 60 were rather less likely than the rest of the population to have been injured outside and somewhat more likely to have been hurt in their homes (Table 29).

The different age groups showed differences in activity at the time that injuries occurred (Table 30). Over half of those in the youngest and oldest age groups, for whom we have details, were injured while running away. Some youngsters said they got injured while looking at the damage.



**Table 30:  
Activity and Injury According to Major Age Groups**

Activity	Age group						Total	%
	0-19	20-39	40-59	60+	Total	%		
Running to safety etc...	35	25	21	14	95	43		
Clearing debris	9	17	16	5	47	21		
Looking at damage	10	8	3	2	23	11		
Helping others	1	7	5	-	13	6		
Closing windows etc...	-	4	4	-	8	4		
Other (playing etc...)	13	12	4	4	33	15		
<b>Total</b>	<b>68</b>	<b>73</b>	<b>53</b>	<b>25</b>	<b>219</b>	<b>100</b>	<b>100</b>	

( $\chi^2$  p < 0.05)

The nature of the injury**Table 31:  
The Immediate Cause of the Injury**

Cause	No. of cases	% of total
Nails	63	33.0
Galvanized roofing sheets	50	26.2
Glass	34	17.8
Falling Over	15	7.8
Pieces of wood	13	6.6
Tree	11	5.8
House collapsing	5	2.6
Total	219	100.0

A very high proportion of the injuries, over 80 %, were caused by building materials, which were scattered about when the hurricane-force winds blew houses apart (Table 31).

There was a significant difference in the cause of injuries according to age groups ( $X^2$ ,  $p < 0.005$ ). For example, youngsters were more often injured by nails, while those over 60 were hurt by falling over (or being blown over).

**Table 32:  
The Part of the Body Injured**

Part of body	No. of cases	% of total
Feet	116	45.0
Legs	51	19.8
Hands	34	13.2
Head	20	7.7
Arms	13	5.0
Back	10	3.9
Chest	6	2.3
Abdomen	6	2.3
Shoulders	2	0.8
Total	258 *	100.0

(\* Two people were injured in more than one part of the body).

most two-thirds of injuries affected the lower limbs. Injuries to the upper limbs, particularly the hands, were next in frequency.

**Table 33:  
Type of Injury**

Injury	No. of cases	% of total
Cut	109	42.2
Nail wound	82	31.8
Blow	39	15.1
Other	24	9.3
Unknown	4	1.6
Total	258	100.0

Most injuries were caused by cuts from galvanized roofing sheets and by nails fixed on them and on any loose building material.

The description of the nature of the injuries suffered (as given in the preceding paragraphs) suggests that a certain proportion are likely to have been relatively minor. This should be born in mind when reading the subsequent section on medical aid.

### 3.4.3. Medical help for the injured

Of all people injured, about 70 % obtained medical help and 30 % did not.

#### Why was medical help not obtained ?

It was clear that a variety of reasons, not least the severity of the injury itself, would influence whether or not medical aid was obtained. (Table 34). In particular, it was thought that people living in rural areas might have had difficulty in getting aid because of the disruption of transport caused by the hurricane.

**Table 34:**  
**Reasons for Not Getting Medical Help According to Settlement Type**

Reason	Villages	Towns	Roseau	Total
Could manage themselves	12	15	10	37
No medical help available	11	2	2	15
No transport, road blocked	5	5	1	11
Not keen to see doctor	4	3	-	7
Other	2	1	2	5
<b>Total</b>	<b>34</b>	<b>26</b>	<b>15</b>	<b>75</b>

Note : Of the five in the "Other" category, two villagers said they lacked money to seek help and two from Roseau were, apparently, too shocked and confused.

11/15 of those who said that no medical help was available came from villages. Similarly, 10/11 of those who cited transport difficulties as a reason for not obtaining aid were from villages or smaller towns.

There was no differences between settlement types in the proportion of injuries that people felt they could manage to treat themselves. In each instance self-help was the preferred method of treatment for about 15 % of all injuries (37/256).

Of those who did not get medical help, the vast majority did not try to obtain it for the kind of reasons given above (Table 34). Ten people however, made active efforts to obtain aid but failed. Five were from villages, four from small towns and only one from Roseau.

**Table 35:**  
**Place Where Medical Help was Obtained According to Medical Type**

Place	Villages		Towns		Roseau		Total
	No.	%	No.	%	No.	%	
Health centre	21	(47)	32	(40)	7	(11)	60
Locally (village nurse, visiting personnel, temporary post, etc...)	20	(46)	30	(38)	6	(10)	56
Hospital	3	(7)	13	(16)	37	(60)	53
Health centre & hospital	-		1	(2)	-		1
Other	-		3	(4)	11	(19)	14
<b>Total</b>	<b>44</b>	<b>(100)</b>	<b>79</b>	<b>(100)</b>	<b>61</b>	<b>(100)</b>	<b>184</b>

Three-quarters of those getting help who lived in villages and small towns were seen locally or at health centres. The numbers being treated in these ways were almost equal. Very few villagers went to hospital (Table 35). The same was true for the people living in the towns, except for those in or around Portsmouth, where there was a small hospital. In contrast, around 60 % of those injured in Roseau went to hospital. It seems likely that Roseau's hospital was not only serving as the country's central hospital but also as a centre of primary health care for the population of the capital.

#### Medical care received according to age

There was no significant difference in the age distribution between those who did and those who did not obtain medical aid following injury. There was, however, a difference in the type of professional care received (Table 36).

**Table 36:**  
**Care of Injured According to Age Groups**

Professional personnel	Age group									
	0-19		20-30		40-59		60 +		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%
Doctors	17	(35)	11	(22)	8	(22)	9	(45)	45	(29)
Nurses	31	(65)	40	(78)	28	(78)	11	(55)	110	(71)
Total	48		51		36		20		155	

(SND,  $p < 0.01$ )

Treatment by a doctor was significantly more frequently given to the youngest or eldest age groups. Over three-quarters of the persons in the active age groups 20-39 and 40-59 were seen by nurses.

**Table 37:**  
**Transport for the Injured According to Settlement Type**

Means of transport	Villages		Towns		Roseau		Total	
	No	%	No	%	No	%	No	%
On foot	28	(71)	47	(70)	33	(70)	108	(70)
Carried by person	3	(8)	2	(3)	1	(2)	6	(4)
By car or bus	8	(21)	17	(25)	13	(28)	38	(26)
Helicopter (special emergency aid team)	-		1	(2)	-		1	(1)
Total	39	(100)	67	(100)	47	(100)	153	(100)

Seventy per cent of those who were injured and for whom we have information walked to get medical help (Table 37). This percentage was virtually the same for villagers, townsfolk and those from the capital. A quarter used motor transport. Only one member of the sample was air-lifted to hospital by an emergency medical rescue team.

It is interesting to note that over half of those seeking medical treatment for leg or foot injuries arrived at the medical facility on foot.

**Table 38:**  
**Time Taken for the Injured to Get Medical Aid**  
**According to Settlement Type**

Time taken	Villages		Towns		Roseau		Total	
	No.	%	No.	%	No.	%	No.	%
Less than 5 hours	18	(41)	33	(46)	23	(50)	74	(46)
5 hours - 1 day	1	(3)	11	(15)	10	(22)	22	(36)
2 - 7 days	13	(30)	25	(35)	10	(22)	48	(30)
More than 1 week	11	(26)	3	(4)	3	(6)	17	(11)
Total	43	(100)	72	(100)	46	(100)	161	(100)

Over 45 % of all persons obtaining medical help got it within five hours after injury (Table 38). Even for the villages the figure was over 40 % (compared with 50 % for Roseau). On the other hand, a quarter of villagers who got aid did so only after a delay of more than a week. (See the cumulative figures below, Table 39).

**Table 39:**  
**Time Taken to Get Medical Aid: Cumulative Percentages**

Proportion getting aid	Villages	Towns	Roseau	Total
Within 5 hours	41.9 %	45.8 %	50.0 %	46.0 %
Within 1 day	44.2 %	61.1 %	71.7 %	59.6 %
Within 1 week	74.4 %	95.8 %	93.5 %	89.4 %
Proportion NOT getting aid within 1 week	25.6 %	4.2 %	6.5 %	10.6 %
Total	100.0 %	100.0 %	100.0 %	100.0 %



### 3.5. PREGNANCY

In the sample, 94 women were pregnant at the time of the disaster. To them an additional series of questions were asked. (See Annex). This was meant to test the hypothesis that the shock, possible injury and stress occasioned by the hurricane, might have adversely affected the outcome of their pregnancies.

**Table 40:  
Reported Outcome of Pregnancy**

	No.
Live births	90
Early miscarriage	1
Late miscarriages	2
Stillbirth	1
<b>Total</b>	<b>94</b>

Table 40 suggests that the disaster did not seem to induce miscarriages. This is interesting in view of the relatively large number of injuries reported by these women. Nine out of 94 said they had suffered injury at the time of the disaster, giving an injury rate of 96 per thousand. As with the rest of the population<sup>\*</sup>, most of the injuries occurred outside. Five of the seven so injured were at least six months pregnant at the time.

<sup>\*</sup> In general, the pregnant women did not seem to have different experiences of the disaster from the rest of the population. For example, the houses in which they lived suffered the same degree of damage as those of the rest of the population.

Two pregnant women from Roseau left the island after the disaster and delivered their babies abroad. Such overseas deliveries may help to explain the slight decline in government birth registrations in the months following the disaster. (The average number of monthly births registered for January to August 1979 was 130, while the average number of monthly births for September 1979 to March 1980 was 118).

### 3.6. COMMUNICABLE DISEASES

Following the hurricane, there was an island-wide campaign against typhoid fever. It is thought that roughly 20,000 doses of vaccine were used.

#### Laboratory findings

The laboratory records for the months following the disaster were compared with the records for the previous three years. The criterion was the number of new cases reported as having positive stool cultures (Figure 6).

It should be pointed out that there was only one laboratory on the island, at the central hospital, and that the laboratory staff were the same both before and after the disaster. Following the hurricane an increased number of patients came for checking and since there was an increased expectation of a disease outbreak, stool samples were probably examined especially carefully.

There was no evidence of any increase in typhoid fever in the months following hurricane David. (See Figure 6). There were far fewer cases than in the outbreak of 1978.

On the other hand, there was a clear outbreak of bacillary dysentery, which peaked in the second and third months after the disaster. (See Figure 7). This might have been associated with the destruction and slow repair of latrines together with an increase in the number of flies which was frequently reported in the months following the outbreak.



**Figure 7:**  
**Incidence of Reported New Cases of Dysentery**



Our preliminary survey results indicate that "diarrhea cases" occurred in 90 (7.3 %) households. One hundred and seventy people (2.8 % of the surveyed population) were affected. Eighty per cent of these cases occurred during the first three months following the hurricane. This parallels, and thus lends support to, laboratory findings for dysentery.