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# *Nutritional status of hospitalised pre-school children in Dominica, before and after Hurricane David*

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## INTRODUCTION

On 29th August 1979, Hurricane David swept through the Commonwealth of Dominica, subjecting the country to sustained 160 miles/hr winds gusting to 200 miles/hr. It left in its wake 42 deaths and widespread destruction to property. About a week later a wet but less fierce Hurricane Frederic drenched northern Dominica, flooded certain areas, and caused erosion on many exposed slopes.

Dominica has a total land area of 289.5 square miles and is part of the Windward Islands Group in the Caribbean. The island is rugged and mountainous with peaks up to 4,450 ft above sea level. The mid 1979 population was approximately 83,300, of which 39.5% were under 15 years of age (Statistical Office, 1980).

Hurricane David wrought extensive damage to the capital stock of Dominica and brought heavy (in many cases total) production losses for the remainder of the year. It is estimated that 38% of the buildings were left roofless and 13% were totally destroyed. The entire electrical power system was disrupted, as well as the whole telephone network.

Agriculture is the leading economic sector, contributing 37% of total Gross Domestic Product in 1977. The agricultural output is mainly bananas, grapefruit and copra. The greatest devastation occurred in the banana industry where almost 100% of cultivation was affected either through matt fall or breakage. Estimated losses were 90% of grapefruit, 80% of coconuts, and 100% of limes (Caribbean Development Bank, 1979).

With regard to the health facilities, the Princess Margaret Hospital (the only referral hospital in Dominica) and most rural health centres were seriously damaged. The water supply was affected by disruption of 19 of the 33 local water systems. Sewage disposal was hampered by the destruction of many public and private latrines.

The major consequences of a disaster include an immediate reduction in food availability and a maldistribution of available food. The major expected nutritional

Table 1. Tonnage of food aid landed at Woodbridge Bay after Hurricane David, from 1st September to 31st December 1979 [1] and corresponding amounts of energy and protein [2]

| Commodity | Tonnage | Energy | | Protein |
|---|---|---|---|---|
| | | ($10^3$ MJ) | ($10^6$ kCal) | ($10^3$ kg) |
| *Cerials* | | | | |
| Rice | 1,434 | 21,779 | 5,205.4 | 96.08 |
| Flour | 296 | 4,508 | 1,077.4 | 31.08 |
| Potatoes | 50 | 172 | 41.0 | 1.00 |
| Sugar | 56 | 874 | 208.9 | 0 |
| Biscuits | 16 | 297 | 71.0 | 1.12 |
| *Fats* | | | | |
| Soya bean oil | 270 | 9,986 | 2,386.8 | 0 |
| *Protein-foods* | | | | |
| Dried peas | 101 | 788 | 188.4 | 25.25 |
| Skimmed milk | 575 | 8,661 | 2,070.0 | 207.00 |
| Corn Soya Milk mix | 52 | 812 | 194.0 | 9.46 |
| Canned milk [3] | 153 | 1,466 | 350.4 | 11.55 |
| Dry/salted cod fish | 190 | 2,981 | 712.5 | 55.42 |
| Dried bloaters | 11 | 173 | 41.3 | 9.00 |
| Pickled pork products | 37 | 299 | 71.4 | 6.77 |
| Canned pork | 105 | 1,292 | 308.7 | 15.75 |
| Canned beef | 162 | 1,464 | 349.9 | 40.99 |
| Canned fish | 592 | 7,133 | 1,704.9 | 143.26 |
| Frozen poultry | 230 | 1,405 | 335.8 | 42.55 |
| *Various foods* | | | | |
| Onions | 46 | 77 | 18.4 | 0.64 |
| Canned tomato juice | 14 | 11 | 2.7 | 0.13 |
| Canned apple juice | 24 | 47 | 11.3 | 0.02 |
| Canned soup [4] | 24 | 80 | 19.2 | 0.72 |
| Dried soup mix | 81 | 1,298 | 310.2 | 11.75 |
| Canned vegetables [5] | 40 | 47 | 11.2 | 0.24 |
| Milo chocolate drink | 49 | 882 | 210.7 | 6.76 |
| 'General foodstuffs' | 80 | – | – | – |
| Total | 4,688 | 66,531 | 15,901.4 | 816.54 |
| Average per inhabitant per day [6] | | 6.5 MJ | 1,565 kCal | 80.3 g |

[1]Source: Dominica Port Authority.
[2]Calculations based on: Caribbean Food and Nutrition Institute, Food Composition Tables for use in the English-speaking Caribbean. CRNI, 1974. Table 1: Composition of foods in 100 g edible portion.
[3]Estimated as half evaporated unsweetened, and half condensed sweetened.
[4]Calculations based on the mean of 7 kinds of canned soups (80 kCal and 3 g protein per 100 g edible portion).
[5]Calculated as for canned carrots.
[6]Calculated for 83,300 inhabitants and 122 days.

consequence would be an increase in the prevalence of protein-energy malnutrition, particularly among children under 5 years of age (de Ville de Goyet *et al.*, 1978, McIntosh, 1980).

In Dominica the availability of food was seriously affected by the hurricane. In addition to loss of food crops and live stock, commercial supplies were affected by damage to buildings and stocks and widespread looting, as well as disruption at source. Furthermore, food distribution was hindered by damage to roads, bridges and vehicles. On the other hand, however, massive food aid from abroad was given in the first 4–6 months after the hurricane (Table 1). Within a short time a system of food distribution was set up which provided weekly rations to the whole population. Food rations were calculated per person and distributed per household. There was not generally any supplementary feeding for children under 5 years of age or other vulnerable groups.

Assessment and surveillance of nutritional status during a nutritional emergency is widely advocated as

Table 2. Nutritional status of hospitalized pre-school children (WHO classification)* by sex in a post-hurricane period of 2 months

| | A | B | C | D | E | F | Total |
|---|---|---|---|---|---|---|---|
| | > P97 | P50–P97 | P3–P50 | −3SD–P3 | −4SD to −3SD | < −4SD | |
| *Boys* | | | | | | | |
| Surgical | – | 2 | 6 | 2 | – | – | 10 |
| Medical | – | 4 | 14 | 2 | – | 1 | 21 |
| Diarrhoea | – | 2 | 13 | 6 | 1 | – | 22 |
| Total | – | 8 | 33 | 10 | 1 | 1 | 53 |
| *Girls* | | | | | | | |
| Surgical | – | 1 | 4 | 1 | 1 | – | 7 |
| Medical | – | 2 | 13 | 6 | – | 1 | 22 |
| Diarrhoea | – | 1 | 6 | 2 | 2 | – | 11 |
| Total | – | 4 | 23 | 9 | 3 | 1 | 40 |
| TOTAL | – | 12 | 56 | 19 | 4 | 2 | 93 |

*The World Health Organization classification of weight-for-age distinguishes one supranormal range (A), an upper (B) and a lower (C) normal range, and three degrees of 'malnutrition' (low weight-for-age) (D, E and F), using the 3rd percentile, −3 SD and −4 SD as cut-off points.

being useful (i.e. de Ville de Goyet *et al.*, 1978), but, in reality, is not always easy to carry out, mainly because of limited manpower, transport facilities and financial resources. In Dominica, it was not possible to conduct an assessment of the nutritional status of a random sample of pre-school children because of these constraints. Therefore, in the present study, the nutritional status of a more readily-available group of pre-school children, those admitted to the Paediatric Ward of the Princess Margaret Hospital, was investigated and compared with that of a similar group admitted 1 year earlier. Weight-for-age was chosen as the indicator of malnutrition, in order to permit comparison between the two groups.

## MATERIALS AND METHODS

In the period 8th October until 8th December 1979, 98 children between 6 months and 5 years of age were admitted to the Paediatric Ward of the Princess Margaret Hospital. Of these 98, 93 were weighed. Patients were classified as surgical (17), medical (excluding diarrhoea) (43), and diarrhoea patients (33), as it was expected that the surgical patients would be most similar to the general population, and that the patients with diarrhoea would show the highest prevalence of malnutrition. Nude weights were obtained on a balance scale by a single investigator (P.G.).

A control group was formed by studying the records of all children in the same age group who were admitted to the Paediatric Ward between 3rd November 1978 and 3rd March 1979. Of a total of 161 patients, 28 records were not found and for 33 patients no weights had been recorded. Of the 100 patients studied, 20 were surgical, 60 medical, and 20 diarrhoea. Nude weights had been obtained on the same balance scale by the nursing staff of the ward.

Weight-for-age was compared with the reference standards as proposed by the World Health Organization, and nutritional status was classified according to their scheme (World Health Organization, 1978). This classification distinguishes one supranormal range (A), an upper (B) and a lower normal range (C), and three degrees of malnutrition (D, E and F), using the 3rd percentile, −3 SD and −4 SD as cut-off points. These limits are close to 80, 70 and 60% of the 50th percentile of the reference population (U.S. Department of Health, Education and Welfare, National Center for Health Statistics, 1976). For the statistical analysis the chi-square test was used.

## RESULTS

The nutritional status of hospitalized pre-school children in the post-hurricane period is shown in Table 2, and the same for the pre-hurricane period is shown in Table 3. The prevalence of malnutrition after the hurricane (26% for D,E and F combined) was slightly lower than before the hurricane (34% for D, E and F combined), but the difference was not significant. Of these malnourished children, the fraction in the least severe group in the post-hurricane period (19/25 = 76%) was greater than in the pre-hurricane period (22/34 = 64%).

The incidence of diarrhoea after the hurricane was significantly higher than before the hurricane ($P < 0.05$).

Table 3. Nutritional status of hospitalized pre-school children (WHO classification)* by sex in a pre-hurricane period of 4 months

| | A | B | C | D | E | F | |
|---|---|---|---|---|---|---|---|
| | > P97 | P50–P97 | P3–P50 | –3SD–P3 | –4SD to –3SD | < –4SD | Total |
| *Boys* | | | | | | | |
| Surgical | – | 1 | 5 | 1 | 1 | – | 8 |
| Medical | – | 6 | 14 | 10 | 2 | 1 | 33 |
| Diarrhoea | – | – | 8 | 3 | 3 | – | 14 |
| Total | – | 7 | 27 | 14 | 6 | 1 | 55 |
| *Girls* | | | | | | | |
| Surgical | – | 3 | 8 | 1 | – | – | 12 |
| Medical | – | 6 | 12 | 5 | 3 | 1 | 27 |
| Diarrhoea | – | 1 | 2 | 2 | 1 | – | 6 |
| Total | – | 10 | 22 | 8 | 4 | 1 | 45 |
| TOTAL | – | 17 | 49 | 22 | 10 | 2 | 100 |

*See footnote Table 2.

When the prevalence of malnutrition (group D, E and F combined) in the surgical, medical and diarrhoea patients were compared (post- and pre-hurricane groups combined), the diarrhoea patients showed most malnutrition and the surgical patients the least, although none of the differences were significant.

## DISCUSSION

In hospitalized pre-school children the prevalence of malnutrition, in terms of weight-for-age, after the hurricane was slightly lower than, but not significantly different from that before the hurricane.

It seems likely that the malnutrition rate in the pre-hurricane group is somewhat over-estimated, as the number of children excluded because of no recorded weights was large (33 over 133) compared with the 5 over 98 in the post-hurricane sample. The nursing staff would presumably be less likely to record weights of children who clinically do not appear malnourished, thereby biasing the results in favour of malnourished children

A group of hospitalized children is certainly not representative of the population at large. The prevalence of malnutrition is expected to be higher in sick children than in the general population. However, it can be assumed that this bias towards higher rates of malnutrition is the same for the pre- and post-hurricane groups. The criteria for admission were the same in both periods. Therefore, it seems reasonable to assume that the results of this study reflect the situation in the population.

Malnutrition and diarrhoea are known to have a strong inter-relationship: malnourished children often have diarrhoea, and diarrhoea leads to malnutrition. In the post-hurricane period the incidence of diarrhoea was significantly higher. It could have been expected that this would have been associated with a higher prevalence of malnutrition. The fact that the data show the opposite trend, makes it more likely that the small improvement of the nutritional status could be a real phenomenon. Furthermore, of the malnourished children, the fraction in the most severe group in the post-hurricane period was smaller than in the pre-hurricane period.

The difference between the hospitalized group and a random sample of the population can be estimated when the above data are compared to the results of a survey of nutritional status in Dominica, conducted in 1976 (Caribbean Food and Nutrition Institute, 1978). In a random sample of 339 children, 14% of children between 6 months and 5 years of age had malnutrition grade II or III ('Gomez-classification,' Gomez *et al.*, 1956), compared to 24% in the pre-hurricane hospital sample.

Assuming that the nutritional status of pre-school children did not get worse after the hurricane, the question arises why did it not do so. The food aid, resulting in the general distribution of food, was probably the main factor. Dry food rations were distributed to the whole population in a relatively well organized way from 1 week until 6 months after the hurricane.

It can be seen in Table 1 that the average daily ration per inhabitant in the first 4 months contained 1,565 kCal (6.55 MJ) and 80 g protein. The energy content was approximately 75% of the recommended 'full ration', but the protein more than 150% of the recommendation (de Ville de Goyet *et al.*, 1978; Gueri, 1980). As some locally produced food items, particularly rootcrops, were not severely affected by the hurricane, it seems likely that this ration was sufficient to cover the energy requirements. Furthermore, the rations were distributed certainly more equally than the income is distributed in normal circumstances.

While the food distribution probably prevented an increase of malnutrition, some other remarks about it can be made. Firstly, it proved to be very difficult to coordinate the efforts of the various agencies and donor countries with those of local government. This was mainly caused by the absence of a Nutrition Officer. The food distribution was completely managed by lay personnel, and reports by foreign experts went direct to ministerial level, and therefore had no chance of being seen or implemented by anyone directly involved. One of the clearest examples of this was that among the 'swarm of advisers, experts, consultants, co-ordinators and fact-finders descending upon the country' (Gueri, 1980), 3 nutrition officers from different agencies spent a few days in Dominica to assess the need for food aid and to advise on the composition of the food rations, 3 reports were prepared, but no qualified local official was available to assess them and to manage their implementation. Technical assistance in making a nutrition officer available for a few months would have been a key to better management of the food distribution, and thus to better utilization of the donated food. Secondly, planning the food distribution was complicated by the fact that the local government was often not aware either of what food would be sent or when it would arrive. Furthermore, the irregular arrivals of ships hampered planning. Notwithstanding these problems, however, the Dominican food distribution office succeeded in distributing weekly or biweekly rations of acceptable quantity and quality over the entire island. Thirdly, relatively large quantities of protein foods were donated, resulting in rations containing 150% of the recommended amounts. Considering the 'protein-gap' in many other countries, this protein surplus might have been more useful elsewhere. Fourthly, the indiscriminate distribution of free food for about 6 months deprived the government of its usual income in the form of import duties, and it reduced incentives to work and to produce, especially in agriculture and fisheries. Moreover, the revival of the private commercial and trading sectors, a process usually seen as vital to both the economy and public revenue, was further delayed (Caribbean Development Bank, 1979). Finally, it is widely felt (de Ville de Goyet *et al.*, 1978; Gueri, 1980) that, whenever possible, vulnerable groups should receive a food supplement in addition to the basic ration. In Dominica, from the second month after the hurricane, efforts were made by a number of people to shift at least part of the general food distribution towards a supplementary feeding program for vulnerable groups. A small supplementary feeding program was attempted on a village level, covering only approximately a fourth of the country, by groups like the Red Cross, the Canadian Save the Children Fund, and Catholic organizations. However, for a number of organizational and political reasons, coordination and expansion was not realized. Such a program could have improved the utilization of the donated food.

In conclusion, this study suggests that food distribution following Hurricane David prevented an increase of protein-energy-malnutrition. The various problems associated with food distribution underline the importance of proper management. It is suggested that, in the absence of a local Nutrition Officer, international assistance at such a level could improve the utilization of food aid and prevent adverse consequences for the economy.

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