Family Size and Malnutrition in Santo Domingo

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THE ROLE OF POVERTY as a causal factor in preschool child malnutrition is widely accepted (*1–3*). A variety of other factors have been implicated in the etiology of this disorder, notably lack of knowledge (*1,4*), intercurrent infections, particularly diarrhea (*5–7*), and demographic factors, especially family size (*8,9*). This paper is directed toward the latter issue.

In a study of 1,094 children under age 6 in Candelaria, Colombia, Wray and Aguirre found that in families with 4 or fewer children, 37.8 percent of the children were malnourished (*8*). In families with five or more children, 44.1 percent of the children were malnourished. The difference was significant at the 0.05 level. The authors noted that, among women with four or more pregnancies, preschool-child malnutrition was significantly more prevalent among mothers who reported no abortions than among women who reported one or more abortions. No effort was made to distinguish between spontaneous and induced abortion. Upon examining the total preschool-child population in a semirural community in Thailand, Wray (*9*) also found that 58 percent of the children in families with four or more children were malnourished, as opposed to 42 percent of the children in families with three or fewer children. The difference was statistically significant.

However, this association between family size and malnutrition in preschool children has not been confirmed in certain other studies. For example, in a cohort study of all children born in a Mexican village between March 1, 1966, and February 28, 1967, it was noted that 19 children developed severe clinical malnutrition before the age of 39 months (*10*). These children were matched at birth for gestational age, body weight, and total body length with a group who were never considered to be severely malnourished, and the number of living children failed to distinguish between families with and without severely malnourished children. Mothers of 60 randomly selected surviving children treated for kwashiorkor at a Zambian hospital were matched with mothers of clinically well-nourished children attending the same clinics for children under age 5, and no significant difference was seen between the two groups with regard to family size (*11*).

Ballweg studied a randomly selected sample in Fond Parisien, Haiti, of 30 families with a preschool child whose weight was normal, 30 with a child with first-degree malnutrition, 27 with a child with second-degree malnutrition, and 27 with a child with third-degree malnutrition (*12*). In families with four or fewer children, 75 percent of the children were malnourished to some degree, and in those with five or more children, 76 percent were malnourished.

Although the same methodology was employed in the research in Colombia and in Thailand, different approaches were used in the other studies cited. This difference may well account for the lack of consistency in the findings of these investigations. Wray has indicated that what is needed "to understand the effect of family size is a comparison of the prevalence of malnutrition or death rates in a substantial population of children grouped according to family size" (*9*).

No studies have been undertaken in the Dominican Republic with the primary purpose of identifying the determinants of malnutrition in preschool children. Hence, we elected to undertake a case-control study of preschool-child malnutrition to explore a series of hypotheses, which would be tested later in a large population of children if the initial findings suggested it would be useful to do so. We anticipated that the mothers of the well-nourished children would be of lower parity, as defined in terms of the number of live births they had experienced, than the mothers of malnourished children. We also expected that the mothers of the well-nourished children would have fewer living children, would have greater knowledge of contraceptive methods, would be using contraception to a greater extent, and would have experienced more abortions, spontaneous or induced, than the mothers of the malnourished children.

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Methodology

The case group consisted of the mothers of 82 malnourished children under age 5 who were referred from various clinics in the outpatient department of the Robert Reid Cabral Hospital to the Nutrition Clinic during October and November 1975. All of these children were suffering from third-degree malnutrition, according to the Gómez classification. Marasmus was overwhelmingly predominant in the children under age 1, and kwashiorkor was equally prevalent in the children over age 1.

The mother of each malnourished child was interviewed by one of three women who were recent medical graduates of the Autonomous University of Santo Domingo. The questionnaire was designed to test the hypotheses previously outlined; the portion of the questionnaire dealing with fertility, abortion, and contraception was adapted from the model questionnaire of the International Union for the Scientific Study of Population (*13*).

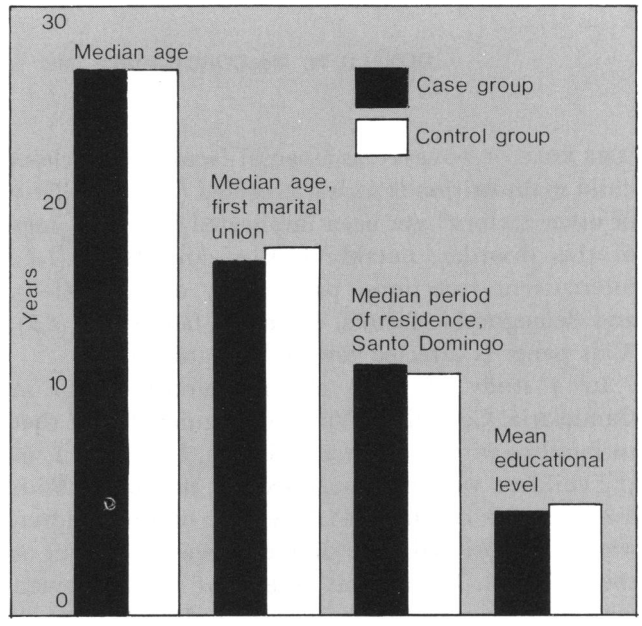
In view of the reluctance of Latin American women to admit to having undergone an induced abortion, no effort was made to distinguish between a spontaneous or induced abortion. Such events were identified by the responses of the women to questions concerning whether they had any pregnancies that did not terminate in a live birth; and if so, the respondents were asked in what months of pregnancy these events occurred.

Before this study was started, the survey questionnaire was translated into Spanish and pretested by using it to interview 12 women who had brought malnourished children to the Robert Reid Cabral Hospital. We then modified the questionnaire as necessary. The women interviewed during the pretest were not included in the sample upon which this study is based.

After each of the 82 women with malnourished children was interviewed, she was taken by car to the neighborhood in which she lived—invariably one of the slums of Santo Domingo. Then a child of the same age and sex and living in the same neighborhood as the malnourished child was selected for height and weight measurement. If the child's nutritional status was normal according to the Gómez classification, and if his or her siblings were clinically well nourished—that is, they showed no observable signs suggesting malnourishment—the mother was interviewed by means of the same questionnaire used to interview the mother of the malnourished child.

If the child thus selected proved to be malnourished or if one of the siblings showed clinical evidence of malnutrition, another child of the same age and sex as the index malnourished child was sought in the immediate neighborhood, and the process described in the previous paragraph was repeated. In no instance was it necessary to seek a third child as a control. The final sample consisted of 82 mothers with a malnourished child and 82 mothers with a well-nourished child of the same age, sex, and place of residence.

Selected social characteristics of the women of the case and control groups



In view of the effect of income on both fertility and the nutritional status of preschool children, it was clearly desirable to attempt to select women in the control group of the same income level as the women in the case group. Income inequalities are difficult to measure accurately (*14,15*), however, and indeed it has been suggested that to do so such data might best be obtained through special income-expenditure surveys repeated at 2- to 3-year intervals (*15*). This technique was clearly impossible for our study, and we believed that the approach described would assure that the socioeconomic status of the women in the control group would approximate that of the women in the case group. As discussed later, however, additional efforts were made to estimate the socioeconomic status of the women of the two groups.

Results

The matching process was successful in our selection of two groups of women who were remarkably similar with regard to certain important characteristics. There were no significant differences in median age,

median age at first marital or consensual union, median period of residence in Santo Domingo (only 13 mothers of the case group and 14 mothers of the control group were born in the National District, which includes Santo Domingo and its immediate environs), and mean level of educational attainment (see chart).

However, significant differences were seen in other respects between the women of the case group and those of the control group. The mothers of the well-nourished children (control group) had a mean of 3.95 live births, and the mothers of the malnourished children (case group) had a mean of 4.66 live births. This difference could, of course, reflect a difference in the age composition of the case group and the control group, but when parity is standardized for age (table 1), a significant difference is apparent.

The indirect age-standardized relative parity (822.5 ÷ 616.68) is 1.33. Thus, when standardized for age, the parity of the mothers of the malnourished group is 33 percent higher than that of the mothers of the well-nourished children.

Difference in the parity of two groups of women can be explained in some instances by differences in age at first marital union. In this case, such an explanation seems unlikely. As noted earlier, the median age at first marital or consensual union was 17.1 years for the case group and 17.6 years for the control group; the difference is not significant.

The mothers of the case group had a mean of 4.1 living children, and the mothers of the control group had a mean of 3.6 living children. The difference is significant at the 0.05 level when one standardizes for age of the mothers (table 2).

The indirect age-standardized relative number of living children (730.5 ÷ 559.22) is 1.31. The women of the case group had 31 percent more living children when age is standardized.

Table 1. Age-standardized (indirect) parity, case and control groups

Age group (years)	Number			Parity rates		Expected number [1]	
	Case	Control	Total	Case	Control	Case	Control
15–19	8	8	16	1.38	1.50	22.08	24.00
20–24	31	21	52	2.90	2.52	150.80	131.04
25–29	25	23	48	5.16	3.78	247.68	181.44
30–34	7	17	24	7.00	4.88	168.00	117.12
35–39	9	9	18	8.33	6.56	149.94	118.08
40 and over	2	4	6	14.00	7.50	84.00	45.00
Total	82	82	164	.....		822.5	616.68

[1] $F = 29.46$, $df = 5/5$, $P = < 0.01$.

Table 2. Age-standardized (indirect) number of living children, case and control groups

Age group (years)	Number of women			Mean number of living children		Expected number [1]	
	Case	Control	Total	Case	Control	Case	Control
15–19	8	8	16	1.38	1.50	22.08	24.00
20–24	31	21	52	2.61	2.24	135.72	116.48
25–29	25	23	48	4.44	3.30	213.12	158.40
30–34	7	17	24	6.57	4.35	157.68	104.40
35–39	9	9	18	7.22	6.33	129.96	113.94
40 and over	2	4	6	12.00	7.00	72.00	42.00
Total	82	82	164	.....		730.56	559.22

[1] $F = 8.1$, $df = 5/5$, $P = < 0.05$.

Of the 385 children born alive to the mothers of the case group, 47 (12.2 percent) died before they were 5 years old. Of the 324 children born alive to the mothers of the control group, 27 (8.3 percent) died before the age of 5. The difference is not significan $\chi^2 = 2.83$, $df = 1$, $P = <0.1$).

Significantly more women in the control group, 29, than those in the case group, 22, had experienced one or more abortions ($\chi^2 = 5.14$, $df = 1$, $P = <0.05$). The mean number of abortions for women in the control group, 0.54, however, did not differ significantly from the mean number for the women in the case group, 0.39.

Each woman was asked if she knew a method or methods that couples use to avoid pregnancy. Those women who replied affirmatively were also asked to name the methods of which they had heard. Seven women in the case group and seven in the control group stated they did not know any method. The mean number of methods given by those women who knew one or more methods was identical in the case and control groups, 2.5 methods.

Of the women in the case group, 56 or 68.3 percent had used contraception at some time, whereas 41 or 50 percent in the control group had done so. The difference is significant ($\chi^2 = 13.1$, $df = P < 0.001$). There was no noteworthy difference between the two groups in the numbers of women currently using contraception. At the time of the interviews, women in the case group relied on the IUD to a greater extent than those in the control group, but the control group made somewhat greater use of the pill and tubal ligation than the case group. The contraception histories of the two groups are shown in table 3.

Three indicators of socioeconomic status were used: the level of educational attainment of the mothers, the types of conveniences in their homes, and whether the children included in this study were delivered in a public or private hospital. As noted earlier, there was no significant difference in educational attainment between the two groups of women.

An analysis of the conveniences in the homes of the mothers of the two groups revealed no striking differences. Each respondent was asked if her home had any of the following conveniences: electricity, a latrine, a flush toilet, and piped water. A value of 1 was assigned to electricity and to a latrine, and a value of 2 to a flush toilet and to piped water. An index of conveniences was established for each home. The mean value for these indices was 2.3 for the mothers of the case group, and it was 2.6 for the mothers of the control group. The difference is not significant.

Table 3. Contraception history, case and control groups

History	Case group (N=82)	Control group (N=82)
Any knowledge of contraception [1]	75	75
Ever used contraception [2]	56	41
Currently using contraception	26	29
Method:		
Tubal ligation	8	12
Pill	5	9
IUD	10	1
Condom	1	4
Withdrawal	1	2
Douche	0	1
Ever had an abortion [3]	22	29
Percent aborted pregnancies	7.7	12.0

[1] Not significant. [2] $P < 0.001$. [3] $P < 0.05$.

On the other hand, only 4 mothers in the case group delivered the study child in a private hospital, whereas 17 of those in the control group delivered the comparable child in a private hospital. The difference is significant ($\chi^2 = 11.1$, $df = 1$, $P = 0.001$), as shown in the following summary of the findings regarding socioeconomic status of the two groups.

Indicator	Case group (N=82)	Control group (N=82)
Child born in private hospital	4	17
Index of housing conveniences	2.3	2.6
Mean educational attainment	3.8	4.1

Discussion

Although the findings of this study must be regarded as tentative due to the limitations of the methodology employed, they tend to confirm the association noted between family size and preschool-child malnutrition in Colombia and Thailand (*9,10*). In this study, however, the difference in mean parity between the case and control groups, 4.7 and 4.0 respectively, is somewhat more striking than that of the mean number of living children of the mothers of the case group, 4.1, and that of the mothers of the control group, 3.6, although the differences are significant in both instances.

The findings of this study also suggest that the difference in parity between the mothers of the case group and the mothers of the control group is not due to the extent to which contraception is used by the women of the two groups. Although there was no difference in the mean number of abortions un-

dergone by the women of each group, significantly more women in the control group reported having undergone one or more abortions. It seems much more likely, therefore, that this difference is due to the extent to which women in the control group resorted to induced abortion, although the evidence is far from certain.

Wray and Aguirre have suggested that even relatively minor variations in income are important determinants of preschool-child malnutrition (*9*). These authors found that among families whose weekly expenditures for food were more than 15 pesos (in late 1963, 1 Colombian peso equaled approximately 10 cents) per person, the rates of preschool child malnutrition were consistently lower than the community average, and the difference was significant. They commented that "what is truly remarkable is the fact that such slight increases (less than 8 cents (U.S.) per person per day) seemed to make a difference." Hence, the question must be raised as to whether such variations in income may have been present in the groups we studied.

The women of both the case and control groups were obviously poor by almost any reasonable standards; it is most unlikely that anyone would tolerate the living conditions in which these women existed for any reason other than sheer necessity. Nonetheless, the fact that 17 mothers of the control group were able to pay for delivering their children in a private hospital as opposed to only 4 of the mothers of the case group strongly suggests that the average family income of the women of the control group may have been higher than that of women in the case group. Hence, what could be interpreted as an association between parity and preschool-child malnutrition may to some extent simply reflect the influence of higher family income. A careful inquiry into expenditures for food for the family during the 24 hours before the interviews might have been a more adequate approach to estimating family income.

Summary

A case-control study of 82 urban Dominican women with a malnourished child and 82 women with a well-nourished child of the same age, sex, and neighborhood of residence revealed that the women of the control group had significantly lower parity and also had fewer living children. More women in the case group had used contraception at one time. Nevertheless, the prevalence of current contraceptive use was identical in the two groups. More women in the control group had undergone one or more spontaneous or induced abortions. Although the women in both groups were selected from the same neighborhoods, there is evidence to suggest that the women in the control group may have had higher family incomes. The higher incomes could well account, at least in part, for the difference in parity between the two groups as well as for the difference in nutritional status in the preschool children of the mothers of these groups.

References

1. Berg, A.: The nutrition factor. The Brookings Institution, Washington, D.C., 1973, p. 40.
2. Goldsmith, G. A.: Food and population. Am J Clin Nutr 28: 938–940, August 1975.
3. Shulry, A. S., and Kanel, L. M.: Classification and epidemiology of protein-calorie malnutrition. Gaz Egypt Paediatr 22: 1–5, January 1974.
4. Béhar, M.: Characteristics and epidemiology of protein malnutrition in childhood. Paper presented at Symposium on Protein Malnutrition in Childhood, Tenth Scientific Congress of the Pacific Science Association, Honolulu, August 21–September 26, 1961.
5. Béhar, M., Ascoli, W., and Scrimshaw, N. S.: An investigation into the causes of death in children in four rural communities of Guatemala. Bull WHO 19: 1092–1102 (1958).
6. Scrimshaw, N. S.: The effect of nutrition and infection of the preschool child. *In* Preschool child malnutrition: primary deterrent to human progress. Publication 1282, National Academy of Sciences-National Research Council, Washington, D. C., 1965, pp. 63–73.
7. Puffer, R. R., and Serrano, C. V.: Patterns of mortality in childhood. Scientific Publication No. 262, Pan American Health Organization, Washington, D. C., 1973, pp. 81–83.
8. Wray, J. D., and Aguirre, A.: Protein-calorie malnutrition in Candelaria, Colombia. I. Prevalence: social and demographic factors. J Trop Pediatr 15: 76–98, September 1969.
9. Wray, J. D.: Population pressure on families: family size and child spacing. *In* Rapid population growth: consequences and policy implications. Johns Hopkins Press, Baltimore and London, vol. 2, 1971, pp. 406–408.
10. Cravioto, J., and DeLicardie, E.: Environmental correlates of severe clinical malnutrition and language development in survivors of kwashiorkor or marasmus. Bol Of Sanit Panam 7: 50–70 (1973).
11. Stephens, A. J.: The impact of health care and nutritional education on an urban community in Zambia through the under five clinics. J Trop Med Hyg 78: 97–105, May 1975.
12. Ballweg, J. A.: Family characteristics and nutrition problems of preschool children in Fond Parisien, Haiti. J Trop Pediatr, Monograph 23, September 1972.
13. The Population Council: A manual for surveys of fertility and family planning: knowledge, attitudes, and practice. New York, 1970.
14. Myrdal, G.: Asian drama: an inquiry into the poverty of nations. Pantheon, New York, 1968, pp. 531–536.
15. Sirageldin, I. A.: The demographic aspects of income distribution. *In* Population and development planning, edited by Warren C. Robinson. The Population Council, New York, 1975, pp. 153–187.