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Nutrition, lactation, and postpartum amenorrhea[1, 2]

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Chronic protein-calorie malnutrition and prolonged lactation are characteristics of poor societies in developing nations. These societies are also characterized by rapid population growth rates.

Most developing nations are in a state of flux. With increasing westernization and migration to urban centers, both the prevalence and the duration of lactation are rapidly decreasing (1). At the same time, nutrition and health conditions are changing, improving in some and deteriorating in other regions of the world. Lastly, population growth rates continue to be high, the enormous investment that has gone into family planning programs having proven to be largely unsuccessful.

Viewed simply, population growth is determined by both birth and death rates. Birth rate is affected by the biological capacity to conceive (fecundity) and by the extent to which this potential is realized (i.e., age of first union, coital frequency, contraception, etc.).

In many regions of the developing world, population growth rates are such that fecundity is almost maximal; therefore, factors which affect fecundity are key determinants of population changes in these societies.

Menarche and menopause circle the reproductive life of a woman. In developing nations, this roughly corresponds to the ages of 15 and 45 years, respectively, yielding a reproductive life of nearly 30 years. Two periods of infertility may repeatedly occur throughout the reproductive life, pregnancy and postpartum amenorrhea. The latter period is that immediately following birth during which menstruation is absent. Postpartum amenorrhea is the most variable component of the interval between births (2). For instance, means of 2 months have been reported for some populations, while for others, means as high as 14 months have been observed (3). This variability appears to be almost entirely determined by biological factors, such as the nutritional status of the mother or hormonal mechanisms.

The aim of this paper is to summarize existing but otherwise dispersed findings on the influence of two factors, nutritional status and length of lactation, on the length of postpartum amenorrhea. The hypothesis entertained is that poor nutritional status as well as the presence of lactation, prolong the period of postpartum amenorrhea and consequently reduce fecundity.

Nutrition and postpartum amenorrhea

Several authors have postulated that malnutrition lowers the reproductive capacity of populations (4–6).

Some experimental evidence supports the plausibility of the above hypothesis. Chávez and Martínez (7), working with a small sample of Mexican women, report findings which suggest that one of the effects of supplementing the diet of pregnant and lactating women is to significantly reduce the duration of postpartum amenorrhea in nursing women. In their study, mothers receiving food supplementation (about 300 cal/day) began menstruating 7.5 months after delivery as compared to control mothers, who began 14 months after having given

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EFFECTS OF NUTRITIONAL STATUS ON FERTILITY

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The notion that a woman's nutrition affects her fertility is repeatedly encountered in the demographic and medical literature. Perhaps best known are the substantial reductions in birth rates associated with periods of food deprivation. In historical studies of 17th and 18th century European populations, a close correlation between the price of grain and rates of conception has been observed.[1] Similarly, birth rates reached a minimum nine months after famines in recent world wars.[2] Additional evidence for a nutrition-fertility link is available in studies relating nutrition to various intermediate factors that affect

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[1] E. LeRoy Ladurie, "L'aménorrhée de famine (XVII-XX siècles)", *Annales*, Vol. 24 , No.7, Nov./Dec. 1969, pp. 1589-1601. J. Meuvret, "Les crises de subsistance et la démographie de la France d'Ancien Régime", *Population*, Vol.1, 1946, pp. 643-650. E. Wrigley, *Population and History*, World University Library, McGraw Hill, New York 1969.

[2] A. Antonov, "Children born during the siege of Leningrad in 1942", *The Journal of Pediatrics*, March 1947, pp. 250-259. E. LeRoy Ladurie, "L'aménorrhée de famine (XVII-XX siècles)", *Annales*, Vol. 24 , No.7, Nov./Dec. 1969, pp. 1589-1601. Z. Stein et al., *Famine and Human Development*, Oxford University Press, London 1975.

fecundity, such as menarche,[3] postpartum amenorrhea,[4] and fecundability.[5]

It seems likely, therefore, that nutrition has some influence on fecundity, but the magnitude of the overall effect and the relative importance of each of the fecundity components remains uncertain. It is the aim of the present study to contribute towards a resolution of these issues. To this end, an analysis is made of a set of detailed nutritional and reproductive data from 400 married women aged 15-49 in four rural Guatamalan villages during the five-year period 1970-74. The data were collected by the Division of Human Development at INCAP (Instituto de Nutricion de Centro America y Panama) as part of a larger study of the physical and mental development of children.

THE STUDY AREA

The ethnic background of the population is Ladino (mixed Spanish and Indian), and Spanish is the principal language. Virtually all household heads (97 %) report their religion as Roman Catholic. Of the population aged 7 and over, 53 % are illiterate and only 2 % have had some secondary education. Agriculture is the dominant economic activity, with corn and beans as the main crops. Median annual income is approximately US$ 200 per family. Sanitary conditions are

[3] R. Frisch, "Menstrual cycles : Fatness as a determinant of minimum weight for height necessary for their maintenance or onset", *Science*, Vol. 185, 1974, pp. 949-951. R. Frisch, "Weight at menarche : Similarity for well-nourished and undernourished girls at different ages, and evidence for historical constancy", *Pediatrics*, Vol. 50, No.3, September 1972, pp. 445-450.

[4] A. Chavez et al., "Nutrition and development of infants from poor rural area, III. Maternal nutrition and its consequences on fertility", *Nutrition Reports International*, Vol. 7, 1973, pp. 1-8. H. Delgado et al., "Effect of improved nutrition on the duration of postpartum amenorrhea in moderate malnourished populations", *Abstracts of the Xth International Congress of Nutrition*, Kyota, Japan (in press). G. Mayer, "Undernutrition, prolonged lactation, and female infertility", *Journal of Tropical Pediatrics*, Vol. 12, 1966, pp. 58-59.

[5] R. Frisch, "Demographic implications of the biological determinants of female fecundity", *Social Biology*, Vol. 22, No.1, 1975, pp. 17-22. A. Keys et al., *The Biology of Human Starvation*, University of Minnesota Press, Minneapolis 1950. E. Zubiran et al., "Endocrine disturbances in chronic human malnutrition", *Vitamins and Hormones*, Vol.4, 1953, p. 97.

poor, leading to a high prevalence of infectious diseases, especially those of a diarrheal nature. Moderate malnutrition is endemic. With the initiation of the INCAP study in the late 1960s, clinics were established in each village. Free basic medical care is provided and pregnant or lactating women and their infants can obtain free nutrient-rich beverages prepared at the clinic.

The population of the four villages increased at an average annual rate of 2.7 % (from 2,914 to 3,358) between the November 1969 census and the February 1975 census. In the period 1970-74, the crude birth and death rates were 42.5 and 6.9 per 1,000, respectively. Largely as a result of the provision of free basic medical care, the infant mortality rate dropped from between 150 and 200 per 1,000 in the 1960s to 50 per 1,000 in the early 1970s. The percentage of females aged 15-45 living in consensual or formal marriage unions was 68 % (an average of the 1969 and 1975 censuses), and the mean age at first union was 18.5 years. Contraceptive practice was not measured in the prospective study, but medical personnel believe it to be virtually absent.

TABLE 1

AGE-SPECIFIC FERTILITY RATES AND AGE-SPECIFIC MARITAL FERTILITY RATES FOR THE PERIOD 1970-1974

Age	Average number of women [a]	Live births	Age-specific fertility rate	Average number of married women [b]	Legitimate live births	Age-specific marital fertility rate
15-19	133.5	105 [b]	157	32	104	650
20-24	115.5	190	329	78	189	485
25-29	102.5	135	263	78	132	338
30-34	78.0	127	326	68.5	125	365
35-39	84.5	84	199	73	83	227
40-45	64.5	42	130	55.5	41	148
45-49	54.5	5	18	45	5	22
			TFR = 7.1			TMFR = 11.2

[a] Average of 1969 and 1975 census counts.

[b] Includes 3 births to women aged 10-14.

REPRODUCTIVE CHARACTERISTICS OF THE STUDY POPULATION

1) Fertility rates

The calculations of the age-specific fertility rates and age-specific marital fertility rates for the period 1970-74 are presented in Table 1. (For convenience, the terms "marriage" and "marital" are used here to refer to women living in consensual union as well as to women who are formally married.) The total fertility rate and the total marital fertility rate equal 7.1 and 11.2, respectively. The age-specific fertility rates contain substantial sampling errors due to the relatively small number of women in each five-year age group. To minimize this error, subsequent analyses will focus on ten-year age groups.

2) Birth intervals and their components

The interval between live births is divided into three parts : (1) the postpartum amenorrhea interval, from birth to the first postpartum menstruation; (2) the l(live)-conception wait interval, defined as the interval from the first postpartum menses to the conception that ends in a live birth (this interval may contain one or more aborted pregnancies); and (3) the full-term pregnancy interval of approximately 9 months' duration. This segmentation of the birth interval can be done reliably because it requires measuring the timing of only two types of well-defined events - the live birth and the return of the menses. It is possible to further subdivide the l-conception wait interval into menstruating and aborted pregnancy intervals. This is not done here because women in the four study villages occasionally did not report missed menses, perhaps to avoid the battery of medical tests that were applied to women suspected to be pregnant.

The unbiased measurement of the means of birth intervals and their components requires the use of life table techniques.[6] Table 2 shows the life table analyses of the births, postpartum, and l-conception wait intervals for different age groups. The average duration of each of the three types of intervals increases with age. Compared with other natural fertility populations, the means of the l-conception wait intervals are typical or perhaps slightly below average, while the means of the postpartum amenorrhea

[6] L. Chen et al., "A prospective study of birth interval dynamics in rural Bangladesh", *Population Studies*, Vol. 28 , No.2, 1974, pp. 227-297. R. Potter et al., "Application of field studies to research on the physiology of human reproduction", *Journal of Chronic Diseases*, Vol. 18 , 1965, pp. 1125-1140.

intervals are relatively long.[7]

TABLE 2

PROPORTION OF BIRTH, POSTPARTUM AMENORRHEA, AND L-CONCEPTION WAIT INTERVALS NOT YET COMPLETED BY MONTHS SINCE BEGINNING OF THE INTERVAL AND BY AGE OF THE MOTHER

Months since beginning of interval	Birth interval			Postpartum amenorrhea interval			L-conception wait interval		
	All ages	Age 20-29	Age 30-39	All ages	Age 20-29	Age 30-39	All ages	Age 20-29	Age 30-39
0	1.00	1.00	1.00	1.00	1.00	1.00	.98	.99	.98
3	1.00	1.00	1.00	.96	.96	.97	.53	.48	.49
6	1.00	1.00	1.00	.89	.90	.91	.40	.34	.38
12	1.00	.99	1.00	.69	.67	.77	.26	.19	.30
24	0.73	.67	.80	.08	(.06)	(.08)	.19	(.12)	(.24)
36	0.38	.35	.43	(.01)	(.00)	(.01)	(.15)	(.11)	(.17)
Median duration (months)	28.6	26.3	30.6	13.8	13.2	15.1	3.7	2.8	2.9
Mean duration (months)[a]	-	-	-	14.2	13.4	15.4	10.3	6.1	11.0

Notes : Ages shown represent age at end of the birth interval, as estimated by adding the mean birth interval duration to the age at the beginning of the birth interval. Only age at the beginning of the birth interval was coded.
Values in parentheses are based on fewer than 25 cases.

- = Not calculated because a substantial proportion of birth intervals exceed the five-year duration of the observation period.

[a] Means are calculated from life tables truncated at the end of the month in which the longest closed interval occurs.

NUTRITIONAL STATUS OF MOTHERS

To evaluate the nutritional conditions in a population, nutritionists and public health officials have available an array of methods. Nutritional status is assessed through

[7] H. Leridon, *Aspects Biométriques de la Fécondité Humaine*, Presses Universitaires de France, Travaux et Documents de l'INED, Cahier No. 65 , 1973.

anthropometry, clinical examination, and biochemical or biophysical tests, while nutritional intake can be estimated with dietary surveys.[8] In the four study villages, anthropometric measures and dietary information were routinely collected from pregnant and lactating women, but the data on individual diets were considered unreliable and will not be used here.

Anthropometric measures such as weight, height, arm circumference, and skinfold thickness provide perhaps the simplest and most direct means for assessing an individual's caloric nutritional status.[9] (Other aspects of nutritional status, such as protein, vitamin, or mineral deficiencies, will not be considered due to a lack of information on their prevalence.) Nutrition is one of the primary determinants of the physical dimensions of the body, although genetic and other biological factors are also important.[10] Surpluses and deficits in recent caloric intake affect the fat and, to some extent, the muscle mass of the body, thus changing its dimensions. Skinfold thickness directly measures the amount of fat under the skin, which is the principal storage place for the body's caloric reserves. Weight, arm circumference, and skinfold thickness are primarily indices of the adequateness of intake in recent weeks or months. Height, on the other hand, is a measure of skeletal size and is largely determined by nutritional levels during the early years of life, up to puberty; it is therefore an indicator of a person's nutritional history. The averages of the anthropometric measures obtained from women in the study area three months after birth of a child are :

Height : 1.49 m

Weight : 48.9 kg

Arm circumference : 22.6 cm

Triceps skinfold : 0.93 cm

By comparison, the standard weight for U.S. women of the same height is 53.2 kg at age 30.[11]

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[8] D. Jelliffe et al., *The Assessment of the Nutritional Status of the Community*, W.H.O., Geneva 1966. W.H.O., *Expert Committee on Medical Assessment of Nutritional Status*, W.H.O. Technical Report Series, No. 258, 1963.

[9] D. Jelliffe et al., *The Assessment of the Nutritional Status of the Community*, and W.H.O., *Expert Committee...*, op.cit. in [8].

[10] D. Jelliffe et al., *op.cit.*

[11] A. Keys et al., "Body weight, body composition, and calorie status", in M. Wohl et al., eds., *Modern Nutrition in Health and Disease*, Lea and Febiger, Philadelphia 1968.

Before anthropometric measures can usefully be applied for comparisons of the nutritional status of individuals, it is important to standardize for skeletal size. This is necessary because the correlation between skeletal size and all anthropometric measures confounds the measurement of current nutritional status. (For example, a tall under-nourished woman could weigh more than a short, well-nourished woman.) To avoid this problem, an individual's weight, arm circumference, and skinfold are standardized by multiplying each measure by hp/h , where hp is the average height in the population and h the height of the person.

The standardized measures of weight, arm circumference, and triceps skinfold are the three nutritional status indices used in the present study. To simplify analyses, these variables have been combined into one overall index of a woman's nutritional status. Each of the measures was first transformed to zero mean (by subtracting the population average) and unit variance (by dividing by the standard deviation). The average of the three transformed variables was then taken and that average was considered a woman's overall nutritional status index (NSI). Based on this index, mothers were divided into three nutritional status groups of approximately equal size :

	Relative nutritional status
NSI < - 0.4	: low
- 0.4 < NSI < 0.4	: medium
NSI > 0.4	: high

TABLE 3

AVERAGE STANDARDIZED ANTHROPOMETRIC MEASUREMENTS OF MOTHERS IN THREE NUTRITIONAL STATUS GROUPS , THREE MONTHS AFTER BIRTH

Relative nutritional status	Nutritional status index range	Average nutritional status index	Average weight (kg)	Average arm circumference (cm)	Average skinfold (cm)
Low	< - 0.4	- 0.82	43.7	20.7	0.70
Medium	- 0.4 << 0.4	- 0.06	48.7	22.7	0.90
High	> 0.4	1.14	55.6	25.1	1.29

The average weight, arm circumference, and skinfold found in each of the three categories are summarized in Table 3, showing the substantial variation in nutritional status that exists within the study population.

THE EFFECTS OF NUTRITIONAL STATUS ON REPRODUCTION

Once measures of reproductive performance and of nutritional status are available, it is a relatively simple matter to relate the two. The technique chosen was multiple linear regression with reproductive parameters as dependent variables and nutrition indices as independent variables. Because age and socioeconomic status are significantly correlated with nutritional status, these two additional independent variables were introduced into each regression. But because socioeconomic status did not make significant contributions in the regressions, it is not included here.

The first dependent variable used in the regressions is a measure of individual fertility equal to the average annual number of live births per woman in the period 1970-74. Averaged over all women, this variable gives a rough approximation of the marital fecund fertility rate ($\times$ 1,000), because the large majority of women in the study were nonsterile and married for the entire five-year period. Table 4 shows the results of the regressions. There is a consistent positive relation between anthropometric measures and the nutritional status index on the one hand, and fertility on the other. The effects of the nutritional status index and the standardized skinfold are significant at the 0.05 level. An attempt to identify the important intervening variables in the nutrition-fertility link is made in Tables 5 and 6 where the relationships between nutritional status and the birth interval components are analyzed. The results are clearcut : a decrease in nutritional status has a consistent, positive, and generally significant influence on the postpartum amenorrhea interval, but the effect on the 1-conception wait interval is not significant. The latter finding implies that nutritional status does not affect fecundability (and its determinants, ovulation, sperm production, and frequency of intercourse) or the probability of a spontaneous abortion, because either factor may be expected to operate in the same direction to lengthen or shorten the 1-conception wait interval in response to nutritional status variations.

TABLE 4

RESULTS OF MULTIPLE REGRESSIONS WITH THE AVERAGE ANNUAL NUMBER OF LIVE BIRTHS PER WOMAN (x 1000) AS THE DEPENDENT VARIABLE

Independent variables	Regression coefficients		Partial correlation coefficients	R^2
1) Constant	462			
Age	- 3.70	(1.12)	- 0.188	0.0453
Nutritional status index	21.8	(9.68)	0.132	
2) Constant	348			
Age	- 3.48	(1.12)	- 0.180	0.0376
Standardized weight (kg)	2.25 [a]	(1.36)	0.097	
3) Constant	319			
Age	- 3.62	(1.14)	- 0.184	0.0365
Standardized arm circumference (cm)	6.29 [a]	(4.04)	0.092	
4) Constant	390			
Age	- 3.50	(1.12)	- 0.183	0.0530
Standardized skinfold (cm)	71.3	(26.2)	0.159	

[a] Not significant at 0.05 level.

Note : Figures in parentheses are standard errors.

TABLE 5

RESULTS OF MULTIPLE REGRESSIONS WITH THE COMPLETED POSTPARTUM AMENORRHEA INTERVAL (IN MONTHS) AS THE DEPENDENT VARIABLE

Independent variables	Regression coefficients	Partial correlation coefficients	R^2
1) Constant	9.91		
Age	0.124 (0.052)	0.123	0.0244
Nutritional status index	- 0.908 (0.414)	- 0.114	
2) Constant	15.8		
Age	0.121 (0.052)	0.121	0.0246
Standardized weight (kg)	- 0.129 (0.058)	- 0.115	
3) Constant	18.1		
Age	0.132 (0.053)	0.130	0.0257
Standardized arm circumference (cm)	- 0.391 (0.169)	- 0.120	
4) Constant	11.3		
Age	0.112 (0.052)	0.112	0.0165
Standardized skinfold (cm)	- 1.60[a] (1.17)	- 0.071	

Note : Figures in parentheses are standard errors.

[a] Not significant at 0.05 level.

TABLE 6

RESULTS OF MULTIPLE REGRESSIONS WITH THE COMPLETED L-CONCEPTION WAIT INTERVAL (IN MONTHS) AS THE DEPENDENT VARIABLE

Independent variables	Regression coefficients	Partial correlation coefficients	R^2
1) Constant	1.3		
Age	0.081 [a] (0.047)	0.098	0.0097
Nutritional status index	-		
2) Constant	1.3		
Age	0.081 [a] (0.047)	0.098	0.0097
Standardized weight (kg)	-		
3) Constant	1.3		
Age	0.081 [a] (0.047)	0.098	0.0097
Standardized arm circumference (cm)	-		
4) Constant	0.13		
Age	0.075 [a] (0.048)	0.091	0.0164
Standardized skinfold (cm)	1.41 [a] (0.990)	0.083	

Note : Figures in parentheses are standard errors.

- = Variables that were not significant at the 0.2 level were entirely deleted from the regression by the computer program.

[a] Not significant at the 0.05 level.

Fertility levels associated with different values of the nutritional status index can be determined from the regression equations, but it is also possible to estimate this relationship by calculating the total marital fecund fertility rate (TMFFR) observed in each of the three nutritional status groups defined in Table 3 :

Relative nutritional status	*TMFFR*
Low	15.1
Medium	16.0
High	16.8

POSSIBLE EXPLANATORY MECHANISMS

In the previous section it was established that the nutritional status of women affects their fertility and that this relationship operates through variations in postpartum amenorrhea intervals. The question to be addressed next is how nutrition can influence postpartum amenorrhea. Unfortunately, the detailed measurements necessary to resolve this issue were not available for the four study villages (two determinants of postpartum amenorrhea, total duration of lactation and infant mortality, were measured, but neither variable was significantly related to nutritional status of the mother). Several mechanisms linking nutrition to postpartum amenorrhea can be proposed :

1) If under-nutrition reduces the volume of breast milk produced by lactating mothers, then infants who are dependent on mother's milk for nourishment may attempt to compensate for the decrease in milk flow by increasing the intensity and duration of suckling. This, in turn, tends to prolong the period of amenorrhea, because the antiovulatory effect of lactation is apparently the consequence of nipple stimulation.[12]

2) Poor nutrition of the mother may be an indication of a general low availability of food for her family, including the infant. Lack of food to supplement the infant's diet could lead to a greater dependence on breast feeding, thus reducing the probability of return of menses.

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[12] J. Tyson et al., "Human lactational and ovarian response to endogenous prolaction release", *Science*, Vol. 177 , 1972, p. 897.

3) Regardless on the intensity or pattern of lactation, there may be an unspecified physiological mechanism operating to strengthen the antiovulatory effect of suckling among under-nourished mothers.

4) Frisch concludes from her studies that a minimum weight for height (that is, a minimum standardized weight) is required to maintain regular ovulation and menstruation.[13] The assumption is that, during the postpartum amenorrhea interval, the high caloric demands of lactation prevent the mother from attaining this required minimum weight.

As already mentioned, a lack of detailed data precludes a determination of which of the above factors is most important. However, the Frisch hypothesis seems less plausible in view of the finding that women in the study population tended to lose weight throughout their lactation periods. Three months after birth, the mothers' average weight was 48.9 kg, while at the time of conception it was 46.5 kg (weaning occurs in the large majority of cases at or near the beginning of the next pregnancy). When their menses returned, the women were typically still losing weight rather than reaching a critical minimum level.

DISCUSSION

The findings presented here and the results of previous investigations discussed in the introduction are in general agreement concerning a positive relation between nutritional status and fertility. A nutritional effect on postpartum amenorrhea was also expected, but the absence of any significant correlation between nutritional status and the probability of conception is somewhat of a surprise.
An explanation for this unexpected outcome is probably to be found in the differences between the types of under-nutrition studied by various investigators. More specifically, a distinction should be made between chronic and acute under-nutrition. Chronic under-nutrition prevails in a population that lives for long periods at low levels of caloric intake. In order to stay alive, energy output is reduced to match intake and fat reserves are minimal, resulting in a generally precarious but not life-threatening condition. In the case of acute malnutrition, a person's caloric output substantially exceeds intake; the difference is made up by metabolizing stored fat and, in starvation, muscle mass. This state of disequilibrium is compatible with

[13] R. Frisch, "Demographic implications of the biological determinants of female fecundity", *Social Biology*, Vol. 22, No.1, 1975, pp. 17-22.

life for only a short time - that is, only so long as there are reserves left to be used. It is interesting to note that existing reports of the detrimental effects of under-nutrition on the production of ova and spermatozoa all involve *acute* malnutrition, such as results from famine or anorexia nervosa. Aside from the possibility that under such conditions the function of the reproductive organs is impaired by the accompanying psychological stress,[14] it seems plausible to assume that the body will respond to the emergency situation with appropriate action involving the endocrine system. Since the gonads are part of the endocrine system, their function may also be affected. Presumably no such action occurs in the case of chronic malnutrition, because there is no emergency and metabolism follows normal channels.

Another reason for not expecting a large influence of nutrition on reproductive function under conditions of chronic malnutrition can be found in genetics. If one assumes that there is a genetically determined variation among women in the susceptibility to nutritionally induced impairment of fecundity, then, over many generations of breeding, the population will come to consist predominantly of women whose fecundity is highly resistant to variations in nutritional status. The rural Guatamalan population is perhaps an example.

SUMMARY

Using detailed reproductive and nutritional status data from 400 rural Guatamalan women, an analysis is made of the effect of nutritional status on fertility. Anthropometric measurement - weight, height, arm circumference, and skinfold - are used to determine a woman's nutritional status. Reproductive performance is measured by the marital fecund fertility rate and its determinants, the birth interval components. The analysis shows nutritional status to be positively related to fertility. A negative relationship with the duration of postpartum amenorrhea is also demonstrated, but no significant effect of nutritional status on the probability of conceiving or on the risk of spontaneous abortion is found.

[14] S.L. Israel, *Diagnosis and Treatment of Menstrual Disorders and Sterility*, Paul B. Hoeber Inc., Medical Book Department of Harper & Brothers, New York, 1959.

RÉSUMÉ

Les effets de la nutrition sur la fécondité

Utilisant un état détaillé d'informations sur la fécondité et la nutrition obtenu sur un échantillon de 400 femmes vivant dans les régions rurales du Guatémala, on procède à une étude des effets de la nutrition sur la fécondité. On fait appel à des mensurations anthropométriques - poids, taille, circonférence du bras, état de la peau - afin de déterminer l'état nutritionnel de la femme. La capacité de procréation se mesure par le taux de productivité des mariages et ses déterminants, les composantes de l'échelonnement des naissances. L'analyse indique qu'il existe une relation positive entre l'état nutritionnel et la fécondité. Une relation négative concernant la durée de l'aménorrhée post-partum est également démontrée, mais aucun effet de l'état nutritionnel sur la probabilité de conception ou sur le risque d'avortement spontané n'est constaté.