international union
for the scientific study
of population

union internationale
pour l'étude scientifique
de la population

AUSTRALIAN DEVELOPMENT ASSISTANCE BUREAU RESEARCH FOR DEVELOPMENT SEMINAR
AUSTRALIAN NATIONAL UNIVERSITY

CEMUBAC (Centre Scientifique et Médical de l'Université Libre de Bruxelles dans ses Actions de Coopération).

Paper prepared for the IUSSP seminar on Micro-Approaches to Demographic Research. Australian National University. Canberra, 3-7 September 1984.

A MICRO-APPROACH IN BREASTFEEDING PATTERNS IN RURAL KIVU (ZAÏRE)

MICHEL CARAËL

CEMUBAC (Centre Scientifique et Médical de l'Université Libre de Bruxelles dans ses Actions de Coopération).

Paper prepared for the IUSSP seminar on Micro-Approaches to Demographic Research. Australian National University. Canberra, 3-7 September 1984.

INTRODUCTION

It is well established that breastfeeding is the main determinant of birth intervals due to its effect on the duration of postpartum amenorrhoea, especially in societies where fertility is natural and where strong traditions of postpartum abstinence do not exist (Bongaarts and Potter, 1983; Page and Lesthaeghe, 1981).

This is the existing situation in Central Africa - Kivu (Zaïre), Rwanda, Burundi, and part of Uganda - where sexual relations resuming one week after delivery, a breastfeeding of two years duration favors a birth spacing of 33-39 months by means of prolonged postpartum amenorrhoea (Vis et al., 1975).

The only norm evident concerning breastfeeding is that of nursing the last child until the next pregnancy. This implies that weaning is mainly determined by the return of menses. The strong relationship observed between the long durations of breastfeeding and amenorrhoea is probably due to the correlation between the intensity of breastfeeding and the resulting duration of amenorrhoea.

While the mechanisms by which lactation inhibits ovulation where until now poorly understood, frequent nipple stimulation, hyperprolactinemie and amenorrhoea appear to be strongly associated (Tyson and Perez, 1978; Howie and Mc Neilly, 1982). But many questions remain to be answered. How frequent and intense does sucking have to be to maintain anovulation, for how long ?

It has been suggested by McNeilly et al.(1983); and by Delvoye et al. (1977) for nursing mothers from the urban area(Bukavu)of Kivu that a treshold of 5-6 sucklings per day is enough to maintain high prolactin levels during the first postpartum year. As a previous study has shown (Caraël, 1981), important regional variations occur in Kivu with respect to breastfeeding and amenorrhoea durations and birth interval lengths. It is important to investigate whether these differences are related to differences in breastfeeding patterns and intensity.

Moreover, it is now evident that in some developping countries, a shortening of the length of birth intervals due, among other, to changes in breastfeeding patterns was a result of "modernization" and acculturation(Nag, 1979; Romaniuk, 1980).

Central Africa, with a population density of more than 100 persons/km^2 forms a densly populated area, rare in Africa. This high density combined with a gross birth rate of 50-53 °/$_{oo}$ and an annual growth rate of 2.5-3 °/$_{oo}$ accentuates a rapid deterioration of the environment and food supply (Wils et al., 1978).

The detection of changes in breastfeeding patterns in such a situation is therefore of considerable importance for the health of the mother and child. To compare patterns of breastfeeding and amenorrhoea durations in Kivu subpopulations, a micro-approach will be used; first to detect recent changes in birth intervals, then to explore how to collect suckling frequency data in order to compare it to probabilities of menstruation. The discussion of preliminary results will focus on the existence of particular breastfeeding patterns depending on environmental factors and social behaviour, and on the difficulties of adequately measuring the frequency of breastfeeding.

BACKGROUND OF THE STUDY

A previous study (Caraël, 1981) has shown important regional differences between birth intervals in Kivu (Table 1). Three regions have been described. The rural area of the Havu ethnic group, highly traditional and isolated; the rural Shi area more oriented towards a marked economy - 50 % are hired farm laborers - , higher population density - 200-300 people/km² -;protein-calorie malnutrition and infant mortality are the highest in Kivu (Vis et al., 1975). The third zone is the urban area of Bukavu, the regional capital with approximately 200.000 inhabitants.

The results showed (Table 1) a mean birth interval about 10 months shorter in the urban center than in the most traditional area of the Havu. The Shi interval length occupied an intermediate position. The short mean waiting time to conception in all three areas pointed to a similarity in terms of fecundability and an almost total absence of some form of contraception as a method of child spacing. The differences in birth interval lengths stem almost entirely from a difference in postpartum amenorrhoea. The correlation between the durations of breastfeeding and of amenorrhoea is relatively striking.

Changes in breastfeeding patterns and shortening of the postpartum non-susceptible period are known to be associated with several factors - education, occupation, income -. The Shi area, more than the Havu appears to be moving towards a market economy. Do these factors contribute to the degradation of traditional breastfeeding patterns ?

BIRTH INTERVALS IN THE PAST : RURAL SHI

A retrospective evaluation of the evolution of birth intervals in the Shi region is possible due to the Catholic parish registers of Walungu, a church which was started in the 1920's. The data are based on all marriages with completed fertility : families having 6 or more children in which the wife is at least 35 years old without marital disruption. The means of successive birth intervals are computed for each completed family size, according to the period of marriage (Leridon, 1973).

Table 2 presents some of the findings. Marriages formed during years 1935-1939 present a shortening of the means of birth intervals, birth rank by birth rank, as of the rank 6, instead of the characteristic increase expected in a non-malthusian population at the end of the reproductive period. This birth interval lengthening reappears progressively for families after 1945 where a stabilizing of the mean birth intervals is observed around 31 to 32 months. A comparison of the interval between the second and third births, and third and fourth, according to the year of marriage clearly indicates a decrease of mean birth interval between 1935-1939 and 1945-1949 on the order of 2.8 to 3.7 months and a stability in the decades that follow.

The average age at first marriage is relatively stable. The decrease in the "marriage-first birth" interval suggests that the previous difference may be due to a shortening of the waiting time to conception. This may be explained by the increased time that men spend in home following the gradual disappearance of their traditional activities (tending cattle, service to local traditional authorities, clearing new land, ...).

After 1945, birth intervals show no evidence of a progressive decrease due to changes in breastfeeding patterns associated with "modernization" even though this was a period of extreme socio-cultural changes in the region (mass education, health services, salaried employment). If this assumption is true, are the differences in length of postpartum amenorrhoea between Shi and Havu women due to differences in breastfeeding patterns ?

BREASTFEEDING PATTERNS OF SHI AND HAVU WOMEN

DATA

Of a medical survey of 562 women in a Shi hill (community) and of an household survey of 240 families in a Havu hill, 342 and 166, respectively breastfeeding mothers who had had at least one live birth were asked to provide information on menstrual status, frequency of feedings, supplementation and general breastfeeding behaviour. The two surveys were not conducted under the same conditions; however, comparisons with previous surveys allow us to assume that the two samples are representative of the populations being studied. From the Havu sample, a sub-sample of 42 breastfeeding women chosen according to the age of the nursing child evenly distributed them between 1 and 30 months, was observed during 12 hrs, from dawn to dusk. The recorded observations included duration of feeding, the factor which provoke it, the duration and number of supplementary feedings and the length of physical relations between mother, child and family. Each mother-child dyad was observed only once and that during the dry season (May-June 1984). A similar study is presently taking place with the Shi women.

RESULTS

Amenorrhoea Duration.

The life-table method permits us to compare proportions of women still amenorrheic, according to the months elapsed since the birth for Shi and Havu women (Fig. 1). The median durations of postpartum amenorrhoea for Shi and Havu women are 13-14 months and 18-19 months respectively. These values are basically in accordance with the average values observed in Table 1. The first and third quartiles are 7-8 and 24-25 months for Shi women and 12-13 and 26-27 months for Havu women. According to the shapes of their distributions, the conditional probabilities of resuming menstruation are much higher for Havu women after 15 months.

Breastfeeding Practies.

For the question "How many times has your child suckled during the preceeding day and night ? " the averages were respectively 4.1 $\pm$ 1.7 times in the day and 3.3 $\pm$ 1.3 times in the night for the Shi; 7.2 $\pm$ 1.8 times in the day and 4.1 $\pm$ 1.5 times in the night for the Havu. Thus a frequency difference of $\pm$ 4 times in 24 hours between the two groups. (7.4 $\pm$ 2.3 versus 11.3 $\pm$ 3.1) largely due to the the daytime frequency of nursing. These two frequencies gradually decline after 12 months.

During the questioning it became apparent, in both areas, that the mothers underestimated the frequency of suckling in a proportion difficult to establish. The majority counted only the "large" suckles; those times that corresponded to when they intended to feed the child. These "nutritive" sucklings often took place at precise times of the day and where remembered, such as when the child awoke or when the mothers returned from the field. This was not the case for the "little" suckles, those given "on demand" and whose frequence day and night were not counted or remembered.

Supplementary food is begun at a median child age of 1-2 months in Shi area, with third quartile around 4-5 months; at 2-3 months in rural Havu with third quartile at 5-6 months. These early supplementation usually consisted of sorghum porridge or mashed bananas, of poor nutritional quality. Hot supplementary foods are initiated around 6-7 months.

According to the mothers, the major factor influencing the number and length of sucklings is the age of the child. The second factor is the mothers died and activity in the fields. The beginning of the rainy season (Oktober-December) is, at once, a period of reduced protein intake and intense sowing activities. The feedings are more numerous because the child is hungry and cold but shorter as the mother has little breastmilk or time. Among the factors that reduce sharply the number of feedings, the most often mentioned is illness of mother and child including malaria, measle,bronchitus and tonsillitus.

The survey of the Shi mothers brought to light the custom of the "busire", the enclosure of the newborn, which effects the frequency of suckling. At one week of age the child is put in an enclosure which he does not leave till an average age of 5.5 months. The mother works in the fields several hours per day or more depending on the season, leaving him under the care of a paternal family member or a guardian. The length of reclusion is fixed by the diviner "mulaguzi" according to several criteria, one of which being the survival of previous children. The higher the incidence of infant mortality in the family, the longer the period of reclusion as it is believed to protect the child from hostile environment. Historically, the competition to acquire land and livestock, the sources of riches and power, has been stronger in Bushi than elsewhere in Kivu (Colle, 1937). Cattle were numerous and rules of neighbourhood guaranteed all nursing women "entonda y omwana", milk for the child; the Shi woman on whom as for Havu woman lies most of the work in the fields, may partially liberate herself from maternal duties without endangering the child. He can be left with a guardian who has at his/her disposal cows milk and sorghum porridge. By encouraging early weaning, the "busire" also permited her to attain the ideal of high fertility to which the women of Kivu aspire.

With population growth and higher densities, with the disappearance of pasture and cattle, cow milk has became rare, being replaced by water, but the "busire" remains and is in fact reinforced by the increasing infant mortality rate.

In the rural Havu area, this custom is unknown, mother and child do not separate. The child is taken to the field until an average age of 18-20 months. The practice of breastfeeding on demand is not altered as confirmed by the micro-observation.

To complement the survey which result in an underestimation of the number of feedings per day, 12 hours continuous daytime observations were conducted with 42 breastfeeding Havu women. Due to the small sample size it is not our intention to quantify the observed variables but to schematize their relationships (Fig. 2).

a. Nursing frequency. Sucklings increase from 6-7 during the first postpartum months to a maximum of 14-15 between 9-14 months. They then decrease irregularly till 24 months when their number stabilizes at around 7.

b. Total feeding time. Relatively stable during the first six months, the feeding time increases to a maximum of about 110 min between 10 and 14 months. The time then decreases rapidly due to the combined effect of decreased frequency and duration of suckling. Sucklings lasting longer than 10 min represent 32 % of all sucklings. Frequent during the first 6 months, these long sucklings become rare after 12 months. Sucklings of 5-9 min are more frequent (39 %). They are distributed regularly according to the postpartum months. Sucklings of 1-4 min form 29 % of the total but occur principally - 23 % - from 7 to 17 postpartum months.

c. Interval between nursing bouts. The interval is high during the first weeks following birth, the minimum of 40-45 min is observed between 12-14 months. The interval lengthens at the same time the average nursing frequency decrease to stabilize around 90-100 min between 24-26 months.

d. Supplementary foods. Of 3 to 4 times during the first 6 months, supplementation increases in the following months. The daytime becomes for the child one long series of "nibbles", tasting a variety of foods, and short sucklings between 9 and 16 months. The suckling is most given on demand during this period : "emotional" sucklings are in the majority. Around 18 months, the nibbling becomes spaced and the child begins to be integrated into the adult eating habits.

e. Physical relations mother, child and family. There are an average of 229 $\pm$ 86 min of physical contact per 12 h between mother and child, not counting the contact during breastfeeding. Thus a Havu child spends an average of 40-45 % of the day in direct contact with her mother. This contact is longest at the age of 2-4 months : the child spends almost 60 % of his day in bodily contact with his mother at this time, which is the period when breastmilk is supplemented with other food.
Physical contacts with family members average 153 $\pm$ 98 min. In all, bodily contact represents half of a nursing child day untill the age of 13-15 months. The Havu child seems to be voluntary cut off from exploring his physical environment. When he is not nursing, he is carried on his mothers back where his movements are restricted, or held on someone lap. This relationship of strict physical dependance may be one of the factors explaining the observed increase of "emotional" sucklings between 9 and 14 months.

DISCUSSION

A specific pattern of breastfeeding amongst rural Shi that does not occur among Havu women, appears, to someextent, to explain, at the population level, the shorter length of birth interval and of the postpartum non-susceptible period. The median duration of postpartum amenorrhoea of 13-14 months for Shi women versus 18-19 months for Havu women corresponds to a decreased suckling frequency of $\pm$ 4 feedings per 24 hrs and to longer intervals between nursing bouts. This difference is confirmed by the Shi custom of "busire" which creates a daily separation of mother and child and hinders demand feeding.

In the rural Shi area where social stratification and acculturation are more regionally sensitive, a retrospective analysis showed a greater stability in the mean length of birth interval since 1945-1950. The associated variables of "modernization" - education, employment, income - do not seem to alter traditional breastfeeding patterns in rural areas. Further studies are nonetheless necessary to confirm the results but before embarking on an investigation between the women background characteristics and breastfeeding practices, we have to consider the adequacy of the method. It is necessary to know the pattern of suckling by month of breastfeeding in order to compare it to probabilities of resuming menstruation.

In this regard, when comparing the two methods used, the micro-observation of 12 hours suggests an important underestimation of the number of feedings resulting in a straightening of the curve of the evolution of the nursing frequency according to child age. This curve agrees well, as a working hypothesis, with the increasing rate of resuming menstruation after 15 months for Havu women. Studies in Kivu have shown that prolactin levels are highly correlated with the frequency of suckling and not with the duration, nor with total suckling time (Delvoye et al., 1977; Hennart, 1983). Thus all sucklings are important even those of short duration. The "emotional" sucklings are not necessary shorter or less intense than "nutritive" sucklings. Even a short suckling can be nutritive because 80 % of the milk yield is taken by the child in the first 2 min of a suckling (Lucas et al., 1979).

It is interesting to compare our observations with the results of a serum prolactin study of 160 Havu breastfeeding women (Hennart et al., 1981). The average rate of serum prolactin stayed at more than 1000 mu/l untill 12-15 months and then declined rapidly to a treshold of 500 mu/l between 15-18 months. This treshold is considered normal for unpregnant and non breastfeeding women. This drop occurs at the time in which the nursing frequency decreases in Fig 2. In addition to serum prolactin level measures, the previous authors recorded the number of feeding episodes during a 24 hours period in a health center where mothers and children were under observation to collect information on mother's milk volume by infant test-weighing. By this "laboratory" method of observation, the frequency was 8-10 feedings during the first 20 postpartum months which did not decrease till later. The authors logically concluded that the drop in prolactine level "was not associated with a significant decline in the frequency of sucklings".

The survey method used to establish the nursing frequency appears to be decisive in the interpretation of results and perhaps for a better understanding of the relationship between breastfeeding patterns and the length of postpartum amenorrhoea. The 12 hours continuous observation of nursing mothers could be one of the best method to clarify the different variables associated with breastfeeding patterns.

To confirm this assumption it is our intention to make further surveys with the same method and larger samples in order to establish a median curve with percentiles of the evolution of the number of feedings according to child age. These data in parallel with that of the median postpartum amenorrhoea duration would permit some valuable comparisons. It would be useful to make surveys, during the dry and the rainy seasons for taking into account seasonal variations in breastfeeding practices and in the onset of postpartum menses (Chen et al. 1974; Whitehead et al., 1978; Huffman et al., 1980).
These observations suggest the existence of only one breastfeeding pattern amongst the population investigated. It is not sure that others patterns do not coexist within subpopulations.

REFERENCES

Bongaarts, J. and Potter, R.G. (1983). Fertility, Biology, and Behaviour, London : Academic Press.

Caraël, M. (1978). Relations between Birth Intervals and Nutrition in three Central African Populations (Zaïre) in W.H. Mosley ed Nutrition and Human Reproduction, New York : Plenum Press.

Caraël, M. (1981). Childspacing, Ecology and Nutrition in the Kivu Province of Zaïre, in H.J. Page and R. Lesthaeghe eds Child-Spacing in Tropical Africa : Traditions and Change, London : Academic Press.

Caraël, M. and Stanbury, J.B. (1983). Promotion of Birth Spacing on Idjwi Island (Zaïre). Studies in Family Planning 14 (5) : 134-142.

Chen, L.C., Ahmed, S., Gesche, M. and Mosley, W.H. (1974). A Prospective Study of Birth Interval Dynamics in Rural Bangladesh. Population Studies 28 (2) : 277-296.

Colle, P. (1937). Essai de Monographie des Bashi. (Polycopié), Bukavu.

Delvoye, P., Delogne-Desnoeck, J. and Robyn, C. (1976). Serum Prolactin in Long-lasting Lactational Amenorrhoea. Lancet ii : 288.

Delvoye, P., Demaegd, M., Delogne-Desnoeck, J. and Robyn, C. (1977). The influence of the Frequency of Nursing and of Previous Lactation Experience on Serum Prolactin in Lactating Mothers. Journal of Biosocial Science 9 : 447-452.

Hennart, P., Delogne-Desnoeck, J., Vis, H. and Robyn, C. (1981). Serum levels of Prolactin and Milk Production in Women during a Lactation Period of Thirthy Months. Clinical Endrocrinology 14 : 349-353.

Hennart, P. (1983). Allaitement maternel en situation nutritionnelle critique. Thèse d'agrégation, Bruxelles : Université Libre de Bruxelles.

Howie, P.W. and McNeilly, A.S. (1982). Effect of Breastfeeding on Human Birth Intervals. Journal of Reproduction and Fertility 65 : 545-557.

Huffman, S.L., Chowdhury, A.K.M.A., Chakraborty, J. and Simpson, N. (1980). Breast-Feeding patterns in Rural Bangladesh. American Journal of Clinical Nutrition 33 : 144-154.

Leridon, H. (1977). Human Fertility : the Basic Components. Chicago University Press.

Lucas, A., Lucas, P.J., Baum, J.D. (1979). Pattern of milk flow in breastfeed infants. Lancet ii : 57.

McNeilly, A.S., Glasier, A.F., Howie, P.W., Houston, M.J., Cook, A.and Boyle, H. (1983). Fertility after Childbirth : pregnancy associated with breastfeeding. Clinical Endocrinology, 18 : 167-173.

Nag, M. (1979). How Modernization can also increase Fertility. Working Paper n° 49. Center for Policy Studies. The Population Council.

Page, H.J. and Lesthaeghe, R. (eds) (1981). Child-spacing in Tropical Africa : Traditions and Change, London : Academic Press.

Potter, R.G. (1963). Births Intervals : Structure and Change. Population Studies 17 : 155-166.

Romaniuk, A. (1980). Increase in natural Fertility during the early Stages of Modernization : evidence from an African Case Study, Zaïre. Population Studies 34 (2) : 293-310.

Tyson, J.E. and Perez, A. (1978). The Maintenance of Infecundity in postpartum Women. In Nutrition and Human Reproduction, New York : Plenum Press.

Vis, H.L., Bossuyt, M., Hennart, P. and Caraël, M. (1975). The Health of Mother and Child in Rural Central Africa. Studies in Family Planning, 6 (12) : 437-441.

Whitehead, R.G., Rowland, M.G.M., Hutton, M., Prentice, A.M., Muller, E. and Paul, A.A. (1978). Factors influencing lactation performance in rural Gambian mothers. Lancet ii : 178.

Wils, W., Caraël, M., Tondeur, G. (1976). Le Kivu montagneux. Surpopulation, sous-nutrition et érosion du sol, Bruxelles, Cemubac.

I am grateful to R.Schoenmaeckers and E.Coussaert for their advice and comments.

TABLE 1. Birth Interval Components and Mean Birth Interval in Two Rural and One Urban Areas of Kivu (1975).

	RURAL HAVU	RURAL SHI	URBAN
Mean duration of breastfeeding, in months ° (i)	21.9	17.2	14.9
Mean duration of postpartum amenorrhoea, in months ° (ii)	18.7	14.4	9.6
Mean waiting time to conception, in months ° (iii)	7.7	7.3	6.6
Mean length of birth interval estimated from components (ii) and (iii), in months °°	36.8	31.7	26.1

° Birth interval components are derived from retrospective surveys of 300 women in each area.

°° For method of calculation see Potter (1963).

TABLE 2. Mean length of birth interval by interval order for non-contracepting families having 6 or more children (all final sizes), by date of marriage. Rural Shi.

Date of marriage	number of families	mean age at first marriage		interval order										mean length
		Man	Woman	-1°	-2	-3	-4	-5	-6	-7	-8	-9	-10	
(years)		(years)		(months)										(months)
1935-39	85	21.3	18.5	17.0	33.9	35.3	35.2	34.0	32.4	32.8	32.3	31.5	30.4	33.6
1945-49	160	20.6	19.3	18.7	31.1	31.6	32.0	31.8	32.8	31.6	32.3	33.7	33.3	31.9
1950-54	105	20.3	18.8	15.0	31.2	30.2	31.1	31.2	33.0	32.7	35.6	33.6	33.6	32.0
1955-59	110	20.3	19.3	14.5	29.9	31.6	31.7	32.8	33.2	34.3	32.1	37.4	32.7	31.7
1970-74 °°	77	20.9	19.5	12.9	29.9	31.6	31.5							

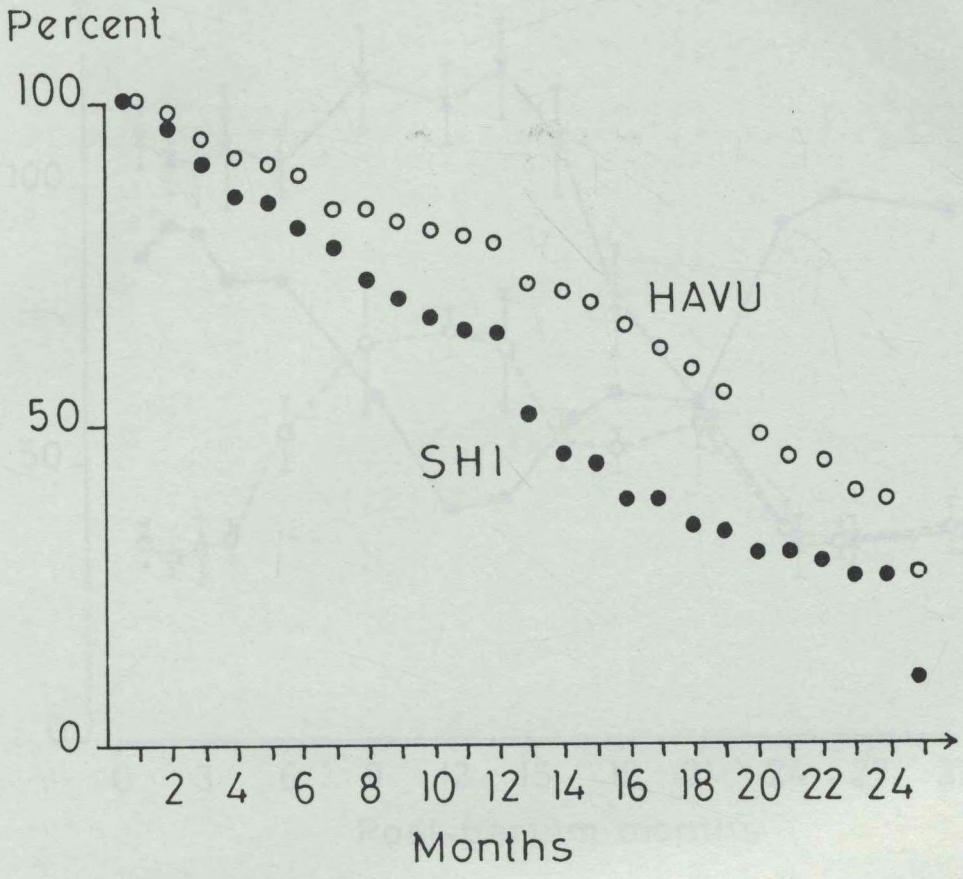
° Interval between marriage and first birth.

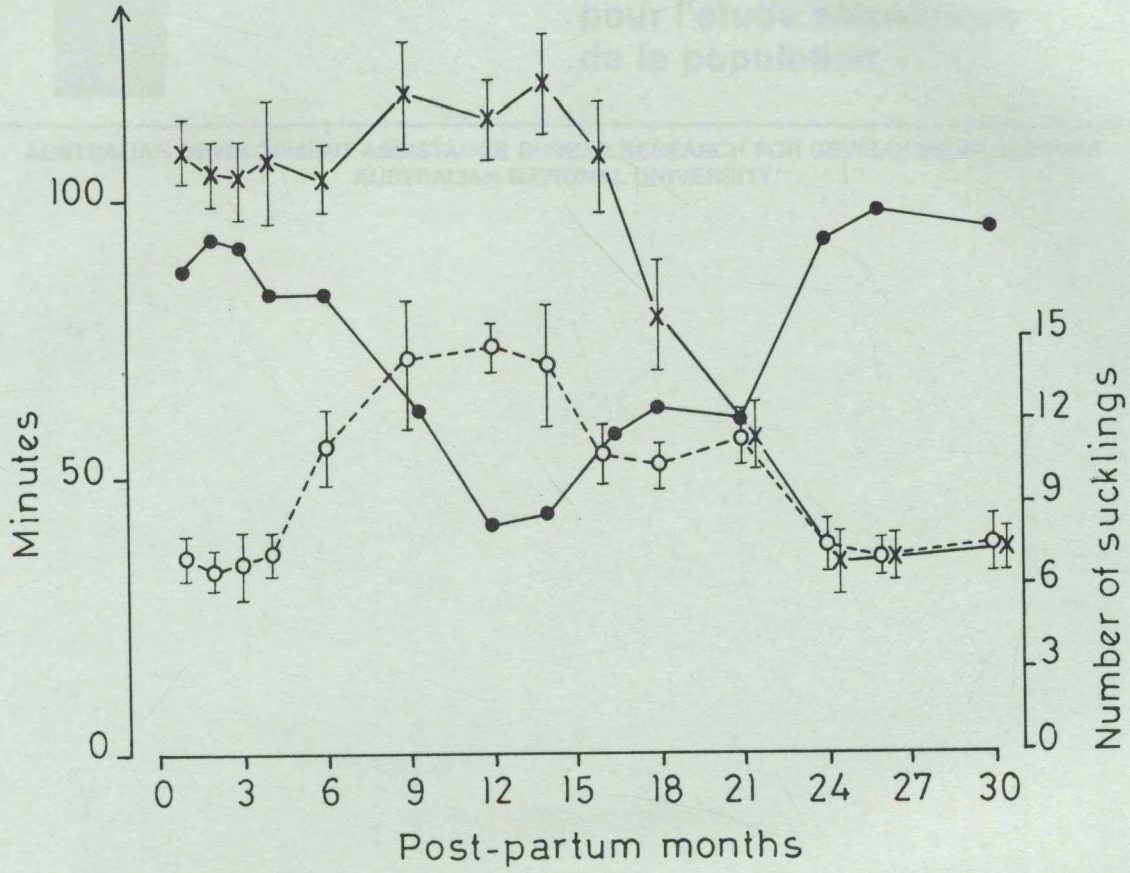
°° Families having 4 or more children.

LEGEND OF FIGURES

Fig 1. Proportions of Havu (o) and Shi (•) breastfeeding women still amenorrheic by months elapsed since the birth.

Fig 2. Average nursing frequency (o), average total sucking time (x) (min) and mean length of intervals between nursing bouts (•)(min) during 30 postpartum months. Rural Havu area.
Each point representing the mean ± SD of 3 observations.


Percent
100
50
0
HAVU
SHI
2 4 6 8 10 12 14 16 18 20 22 24
Months


Minutes
100
50
0
15
12
9
6
3
0
Number of sucklings
0 3 6 9 12 15 18 21 24 27 30
Post-partum months