

# Lactation and Menstruation in Cultural Perspective

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*The anthropological study of women should rest upon a sound understanding of women's reproductive heritage. Current research in reproductive physiology can contribute to this understanding, particularly with reference to the lactation period. In preindustrial societies as a rule, lactation is prolonged and intensive, while menstruation is correspondingly uncommon. This is related primarily to cultural factors that interact with the suckling frequency, but other factors may be involved. Industrialization and the propagation of western attitudes have been associated with a worldwide decline in lactation; an example from Taiwan is presented. The concept of the menstrual cycle as a liminal state is introduced, and anthropologists are urged to rethink their understanding of physiologic and symbolic womanhood. [reproductive physiology, lactation, menstruation, conception, Taiwan]*

## INTRODUCTION

WITHIN THE PAST DECADE, anthropologists and other social scholars have developed an admirable literature on women. Much of this interest has sprung from issues raised by feminist writers, and serious efforts have been made to clarify the nature and extent of feminine participation in various cultures. An approach has been developed which attempts to view women as they view themselves, rather than with the distant perspective of a male-oriented elite. While this effort is rigorous and laudable in most respects, a certain bias undermines discussion of traditional women's roles, particularly when biological processes are considered as contributors to women's social status.

A few years ago, two cases in point appeared side by side in *Women in Chinese Society* (Wolf and Witke 1975). In "The Power and Pollution of Chinese Women," Emily Ahern refers to "the menstrual blood that flows when a woman is not pregnant" (Ahern 1975:198). She identifies "bodily effluvia associated exclusively with women" as menstrual blood and postpartum discharge (Ahern 1975:194). Her neglect of milk production and of its effects on a woman's ability to pollute leads her to an analysis which

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fails to satisfy because it cannot extract an explanation of traditional beliefs from a modern reproductive cycle. A second example is the next article, "Women and Childbearing in Kwan Mun Hau Village: A Study of Social Change," by Elizabeth Johnson (Johnson 1975). The author manages to treat the subjects of fertility, fecundity, contraception, infant mortality, women's roles, and attitudes toward family size without once mentioning lactation as a possible factor.

*Woman, Culture, and Society* (Rosaldo and Lamphere 1974) is permeated with a similar bias, although Chodorow does include milk in her list of "me/not-me" challenges (Chodorow 1974:59), and Ortner considers the nursing bond as a factor in circumscription of women's activities (Ortner 1974:77). Recent contributions to the anthropological literature on women offer little further insight regarding the interplay among menstruation, lactation, and women's social, symbolic, or ritual roles. In *Sexual Stratification: A Cross-Cultural View*, one will find only the briefest passing mention of lactation, and no consideration of any potential interaction between sexual standing and various sociocultural parameters of breastfeeding (Schlegel 1977).

American society is a particularly poor one in which to observe the relationship between breastfeeding and the absence of menstruation. Even with renewed interest in this ancient female function, breastfeeding in America is minimal by world standards; not so long ago it was characterized as the most restrictive in the world (Mead and Newton 1967).<sup>1</sup> Considering also that family size is now limited by reliable contraceptives, it is easy to demonstrate in the U.S. that the monthly discharge of menstrual debris is a fact of life for the vast majority of healthy premenopausal women. Such an inarguable observation becomes merely an assumption, however, when applied to other societies.

Since most people of the world anchor their beliefs in a recent or current preindustrial environment, an awareness of the preindustrial reproductive cycle is basic to an understanding of development and change in women's roles. With such a background, social and medical scientists can bring an interest in topics such as menstrual taboos, female symbolism, sexual dynamics, population control, and gynecologic cancers into focus upon women in societies less pervaded by technology than our own.

#### THE PHYSIOLOGY OF LACTATION

The modern reproductive cycle differs from the preindustrial primarily in its abandonment of intensive lactation, and modern physiologists have largely neglected lactation in favor of interests more germane to their own culture. However, the development of radioimmunoassay and the resurgence of interest in breastfeeding have stimulated fresh inquiry into the phenomenon of human lactation, and several old concepts have been cast aside. Current refinements continue to challenge the findings of previous studies; while the core physiology is generally agreed upon, the precise mechanisms are not. The essentials will be presented below; for discussion of specific neurohormonal mechanisms, see Delvoye, Badawi, Demaegd, and Robyn 1978a, Enjalbert, Ruberg, and Kordon 1978, Findlay 1974, L'Hermite 1979, Tyson 1977, and Yen 1978.

The pituitary hormone prolactin, long studied in other species including birds, has now been isolated in humans and is in fact routinely assayed under certain clinical conditions. In human females, prolactin induces and maintains milk secretion and promotes amenorrhea and infertility. This occurs physiologically during lactation and pathologically with certain pituitary tumors. Prolactin is unique among human pituitary hormones in that its secretion is tonically inhibited by the hypothalamus.

Psychiatric drugs that act therapeutically by reducing the activity of dopamine in the central nervous system also commonly cause amenorrhea with or without milk production. In this situation the secretion of prolactin is increased because its major inhibitor,

dopamine, is reduced. The dopamine agonist bromocriptine can abolish the amenorrhea and milk production of both normal and abnormal lactation.

During the latter half of pregnancy, the serum prolactin level elevates to roughly ten times its prepregnant value, in association with markedly elevated estrogen and progesterone levels (Yen 1978). These latter two hormones are thought to block the effect of prolactin on the secretory cells of the breast. Estrogen and progesterone levels fall rapidly after delivery, thus permitting prolactin to stimulate milk production.

The prolactin level remains constantly elevated for a few weeks after delivery in women who breastfeed, but the basal serum prolactin level returns to the prepregnant value within less than three months. However, whenever the infant sucks at the breast there is a pronounced surge of prolactin into the maternal system, the magnitude of which appears to vary with the intensity of the stimulus (Aono, Shioji, Shoda, and Kurachi 1977). This is a neuroendocrine reflex: the stimulus of suckling is transmitted by sensory nerves from the mother's nipple to her hypothalamus, where a more complex blockade of inhibitory pathways permits the pituitary to secrete prolactin into the bloodstream. The prolactin thus released acts directly at the mammary alveolar-cell membrane to promote continued milk secretion (Tulchinsky and Ryan 1980:152-155). It also inhibits estrogen production by the ovaries (Bonnar, Franklin, Nott, and McNeilly 1975; Faglia, Beck-Peccoz, Travaglini, Ambrosi, Rondenba, Paracchi, Spada, Weber, Bara, and Bouzin 1977; McNatty, Sawers, and McNeilly 1974; Thorner and Besser 1977) and the estrogen-induced preovulatory surge of pituitary luteinizing hormone (Aono, Miyake, Shioji, Kinugasa, Onishi, and Kurachi 1976; Glass, Shaw, Butt, Edwards, and London 1975), thereby preventing menstruation and ovulation.

During lactation, the amount of prolactin secreted is strongly correlated with the duration of amenorrhea (Delvoye et al. 1978: 223), while its relationship to the amount of milk produced is less clear. It appears that the individual mammary gland increases milk secretion in response to increased prolactin levels if the nutritional environment is held constant (Aono et al. 1977); as the nutritional status declines, more prolactin is required to evoke equivalent milk synthesis (Lunn, Prentice, Austin, and Whitehead 1980). This may partially explain the reported correlation between nutritional deprivation and prolonged lactational amenorrhea (see below).

The total amount of prolactin secreted daily is directly and causally related to the suckling frequency (Delvoye, Demaegd, Desnoeck-Delogne, and Robyn 1977). In lactating humans, milk synthesis is demonstrably decreased when 12 hours elapse without suckling (Grosvenor and Mena 1974:227). Factors local to the breast may contribute to this effect. Interestingly, species with very rich milk, such as rabbits and whales, suckle infrequently, while species with dilute milk, such as humans, nurse much more often (Findlay 1974:462); in societies with prolonged lactation, the human suckling frequency ranges from 12 to 16 or more per day.

It can thus be deduced that any practice that reduces the suckling frequency will reduce the amount of prolactin secreted. This in turn will decrease the inhibition of ovarian estrogen production, permitting earlier return of ovulatory function (Delvoye, Demaegd, Nyampeta, and Robyn 1978b). Critical frequency and hormone levels doubtless vary from woman to woman, perhaps depending on nutritional status, but it seems clear that women in general are more likely to menstruate the less often they nurse.

In the normal course of lactation, suckling frequency and intensity gradually decline as the infant matures, resulting in decreasing maternal exposure to prolactin and eventual resumption of menses. It appears that the first few lactational menstrual cycles may be anovulatory (Berman, Hanson, and Hellman 1972); this is consistent with gradual recovery of estrogen production. However, individual variation is notorious in this regard, and as many as three-fourths of lactating women ovulate prior to their first lacta-

tional menstrual period (Hefnawi and Badraoui 1977; Perez, Vela, Potter, and Masnick 1971).

A second neuroendocrine reflex involved in the act of suckling is the so-called let-down or milk-ejection reflex. Again, the stimulus of suckling is carried from the mother's nipple to her hypothalamus, but in this case the impulses arrive at the posterior, neural portion of the pituitary, which responds by releasing oxytocin. Upon arrival at its target organs, the hormone oxytocin causes contraction of the musclelike cells in the vicinity of the milk-producing cells of the breast, resulting in milk being squeezed out into the mammary ducts and sinuses; the breasts become warm and full, and milk spurts from the nipples. Oxytocin released by suckling has no direct influence on prolactin physiology. It does cause uterine contractions which can be felt by the mother, particularly during the puerperium (Meites and Kragt 1973:197-199).

Milk ejection is an easily conditioned reflex which may be coupled with a variety of visual, auditory, olfactory, and tactile stimuli such as the nipple-seeking behavior of a particular infant. To a similar degree it may be inhibited by maternal discomfort, anxiety, or embarrassment, all of which may act via epinephrine, a potent inhibitor of oxytocin release under experimental conditions (Meites and Kragt 1973:199). Impaired milk ejection can disrupt lactation despite the presence of a vigorous, hungry baby (Newton and Newton 1950), although breastfeeding is technically possible without this ancillary reflex (Sende, Pantelakis, Suzuki, and Bashore 1975).

An intriguing feature of the milk-ejection reflex is its apparent overlap with the pathways of sexual arousal and orgasm. Unlike the prolactin response, both milk ejection and orgasm are highly conditioned reflexes with a great deal of input from cortical centers (Cowie and Tindal 1971; Newton and Newton 1967). Milk ejection occurs with the uterine contractions caused by clitorally induced orgasm in lactating women (Campbell and Petersen 1953). Oxytocin may be involved in male sexual arousal and ejaculation (Meites and Kragt 1973:198). A few women can reach orgasm by nipple stimulation alone, and many report significant pleasurable genital sensation in association with suckling. Guilt and fear regarding the implications of erotic stimulation by a babe in arms have led some American women to abandon breastfeeding (Masters and Johnson 1966:161-162). In their small study of postpartum sexuality, Masters and Johnson observed the highest levels of sexual tension in lactating women, and it is tempting to speculate that a "pleasure bond" exists between mother and infant during the lactation period.

The effect of lactation on estrogen target organs such as the uterus and vagina has not been extensively investigated; nevertheless, the existing literature permits some generalizations. Tissues dependent on estrogen support undergo involution during the postpartum period, even in women who do not breastfeed. Lactation with its prolactin-associated hypogonadism appears to prolong and intensify this relatively dormant state (Keettel and Bradbury 1961; McLennan and McLennan 1975). The uterine lining does not proliferate in preparation for conception, and the cervical mucus remains impermeable to sperm. The vagina becomes relatively thin and atrophic, its mucosa less lush and moist; this is associated with increased vaginal pH and resultant decreased resistance to common vaginal infections (Kistner 1979:77-78). Cytologic examination of vaginal smears confirms the frequent presence of vaginal atrophy in hyperprolactinemic states, including lactational amenorrhea (Koss 1979: 197 and 216; McLennan and McLennan 1975; Peters, Israel, and Purshottam 1958).<sup>2</sup>

The atrophic postpartum vagina does not display the pronounced venous congestion and copious lubrication otherwise expected during sexual arousal, causing some women to experience painful intercourse. However, the lactating women studied by Masters and Johnson reported no subjective change in the intensity of orgasm despite objectively

decreased vulvovaginal response (Masters and Johnson 1966:150-151). So far as I am aware, sexual response has not been studied in prolonged lactational amenorrhea, nor have physiological parameters been correlated with the widely reported practice of postpartum sexual abstinence.

#### THE DURATION OF LACTATIONAL AMENORRHEA

Having reviewed the physiology of lactation, let us now examine a few of the better studies of lactational amenorrhea and infertility. The first is a literature survey by Christopher Tietze, in which he concludes that breastfeeding is a more reliable contraceptive for up to ten months than are any other methods in the hands of an inexperienced rural population (Tietze 1961). For this finding Tietze leans heavily on records from rural Crulai (Normandy) for 1674 to 1742. During that period, women whose babies survived to the age of one year gave birth to their next children ten months later, on the average, than women whose babies died in infancy. "In infancy" is not defined in this paper, but if we take as a minimum case a two-month interval of postpartum amenorrhea corresponding to infant death in the first week, we can deduce that lactational infertility lasted for an average of at least 12 months in Crulai if all other factors (e.g., coital frequency, contraception, fetal wastage) were equal. As Masnick has recently argued, other factors in infertility probably do not distribute equally with respect to birth outcome in preindustrial populations (Masnick 1979). These will be discussed under "The Preindustrial Reproductive Cycle."

One issue addressed in Tietze's paper is that of anovulatory menstrual cycles following postpartum amenorrhea. It would seem from the six endometrial biopsy studies cited that six to eight weeks of postpartum amenorrhea are followed by an average of two anovulatory cycles in nonlactating women, for a total of approximately four months' postpartum infertility (Tietze 1961:131). Unfortunately, all of the biopsy series in lactation were performed on minimal lactators—women in highly developed industrial societies who nursed for a few months at most. It would appear from these data that lactating women also experience an average of two anovulatory menstrual cycles before ovulation resumes, but this may be misleading.

In "Prolonged Lactation and Family Spacing in Rwanda," Bonte and van Balen present a table that summarizes some data relevant to the preceding topic. They call their population a naturalistic one; intercourse was traditionally resumed eight days after delivery (Bonte and van Balen 1969).

It can be inferred from these figures that menstruation generally returned before ovulation in the early months of lactation. However, by the time 75% of women had experienced reappearance of menses, a higher percentage had conceived. It would seem, then, that the longer lactation lasts, the more likely it becomes that ovulation will precede the first menstrual period. Other investigations using more direct methods also

TABLE 1. REAPPEARANCE OF MENSTRUATION IN RELATION TO CONCEPTION AFTER DELIVERY.

Time after delivery	Conception rate (%)	Reappearance of menstruation (%)
3 months	0.0	12.8
6 months	0.9	20.9
1 year	19.1	48.6
2 years	76.1	75.0
3 years	93.5	91.2
4 years and over	99.0	94.6

(Bonte and van Balen 1969: 100).

suggest a higher percentage of ovulatory first cycles in longer lactation intervals (Hefnawi and Badraoui 1977; Perez et al. 1971).

Among the rural Rwanda, 5.4% of lactating women became pregnant without menstruating. Comparing this with the monthly conception rate of 15% for the fertile nonlactating Rwanda women (N = 50 nonlactators, 318 lactators), we may calculate that at least one-third of the Rwanda lactators ovulated before they menstruated.<sup>3</sup> The Rwanda lactators conceived an average of nearly 15 months later than the nonlactators. The median duration of lactational amenorrhea was 15 months; the mean was on the order of 19 months.

A more recent study by Bonte and associates contrasts rural and urban Rwanda women with respect to conception rate during lactation (Bonte, Akingeneye, Gashakamba, Mbarutso, and Nolens 1974). The rural group was composed of 655 undernourished women with traditional practices; they carried their babies on their backs and offered the breast "at any time, on any occasion," particularly to stop crying (Bonte et al. 1974:98). The 253 urban women were well nourished and occidentalized; they offered the breast on a schedule and carried their infants on their backs only infrequently. Significant findings were as follows:

1. Mean duration of lactational amenorrhea for urban women who nursed until they became pregnant was 6.9 months; for the corresponding rural population, the mean was 18.6 months.

2. Among lactating women who conceived without menstruating, half of the urban group were pregnant within 4.5 months after delivery; the median was not reached in the rural group until 21 months postpartum.

3. Among lactators whose menses returned before they conceived, half of the urban group were pregnant within 9 months, compared with 22 months for the rural group.

4. Among nonlactators there was no statistically significant urban-rural difference in duration of postpartum amenorrhea or in conception rate, although the nonsignificant trend was consistently toward lower fertility in the rural group. The authors interpret this last finding as evidence that malnutrition was not a factor in the observed differences between the urban and rural groups. Although it does indeed appear that behavioral factors are paramount here, one cannot rule out an increasing role for suboptimal nutrition as lactation becomes increasingly prolonged.

"The Duration of Postpartum Amenorrhea" presents a survey of a metropolitan Boston population, only 22% of whom lactated at all (Salber, Feinleib, and MacMahon 1965). The authors report a mean duration of postpartum amenorrhea of 68 days in lactating women—only ten days longer than that of nonlactators in their population. This is contrasted with Potter's data from Punjab (Potter, New, Wyon, and Gordon 1965), which yield an overall median duration of postpartum amenorrhea of 11 months. By merely multiplying the mean lifetime number of live births (7.5) by 21 months (9 months pregnancy plus 12 months postpartum amenorrhea), and dividing that figure by the reproductive span of 33 years, they estimate that Punjabi women spend 40% of their reproductive lives in amenorrheic statuses. The corresponding value for Boston women is 7%.

As Salber and her coworkers point out, 40% is a conservative estimate for the Punjabi population because intrauterine death has not been taken into account. There are two ways in which fetal and embryonic deaths will increase the total amenorrheic span of Punjabi women relative to Boston women. First, the probability that any single conception will result in spontaneous abortion or stillbirth is higher in low-socioeconomic-status populations such as the Punjabi villagers. Second, in populations practicing little or no effective contraception, the lifetime number of conceptions will significantly exceed that in protected populations such as that of modern Boston. This is of course reflected in the

average lifetime number of live births (7.5 versus 2.5); average lifetime number of fetal losses should differ by an even larger factor. There is also the probability that very early neonatal deaths may go unreported when births take place at home with a local midwife in attendance, as they do in the Punjabi population.

A prospective study of Alaskan Eskimos by Berman and associates refers to Potter's data from India to confirm the impression that duration of lactational amenorrhea is independent of climate (Berman et al. 1972). The Alaskan study population (N = 299) was drawn from two United States Public Health Service regional centers (Large villages with hospitals) and nine surrounding villages, and thus exhibits the usual clinical selection bias in favor of women exposed to modern technology. Significantly, 19% of the postpartum women did not nurse their infants; breastfed infants were supplemented from the age of six months. The median duration of postpartum amenorrhea was ten months in lactating women versus 52 days in nonlactators.

Numerous studies have attempted to examine the role of nutritional factors in lactational infertility, but these have generally failed to distinguish among maternal nutrition, infant supplemental feedings, and sociocultural factors affecting the suckling frequency. An exception is the work of Delgado et al. in Guatemala (Delgado, Brineman, Lechtig, Bongaarts, Martorell, and Klein 1979), in which a mass of nonrandomized prospective data is processed through a series of multiple regression analyses to yield a slight but statistically significant negative correlation ( $r = -0.219$ ,  $p$  less than 0.01) between maternal caloric intake in the third trimester of pregnancy and the duration of lactational amenorrhea (mean duration = 14 months). Caloric intakes during the first six months of pregnancy and during lactation were not independently related to the duration of amenorrhea. Infant supplementation, however, was significantly negatively correlated, but the  $r$  value is not reported.

Finally, there is an admittedly biased, retrospective questionnaire study of western breastfeeders, in which 72 women supplied information regarding specific infant-care practices and duration of lactational amenorrhea (Kippley and Kippley 1974). All of these women had purchased *Breast Feeding and Natural Child Spacing* (Kippley 1969) and are thus not a representative North American sample. A total of 112 nursing experiences were judged to provide sufficient information for inclusion in the study, and the following findings are worth consideration:

1. The mean duration of lactation for the entire collection of experiences was 16.3 months; the mean duration of lactational amenorrhea was 10.2 months, ranging from 1 to 30 months.
2. Among those whose lactation experiences had included no supplemental solids or liquids *at all* until the infant was five months old, the mean duration of lactational amenorrhea was 11.6 months.
3. For 29 of the 112 nursing experiences, these criteria were met: no pacifiers used; no bottles used; no solids or liquids for five months; no feeding schedules other than baby's; presence of night feedings; and presence of lying-down nursings (naps, night feedings) (Kippley and Kippley 1974:168). For these experiences the mean duration of lactation was 22.8 months; the mean duration of lactational amenorrhea was 14.6 months. There were 22 women reporting the 29 experiences.

This study, while saying nothing about the population at large, does demonstrate that presumably well-nourished Canadian and American women are capable of prolonged lactational amenorrhea, at least under certain circumstances. As a footnote to Bonte's work with the Rwanda, it highlights the probability of a behavioral influence on the duration of lactational amenorrhea. Thus the elucidation of amenorrheic patterns may lie within the province of anthropology.

## THE PREINDUSTRIAL REPRODUCTIVE CYCLE

While preindustrial societies have varied in their emphasis on reproduction, rarely have they abandoned lactation as the principal means of sustaining dependent infants. We have seen that lactation can be associated with a duration of amenorrhea significantly greater than that of pregnancy, and that lactational amenorrhea may be influenced by behavioral factors. A social model of the preindustrial reproductive cycle will now be described; this is not to be confused with a biologic model, which would emphasize parameters (e.g., ovulation, prolactin level) not directly perceived by preindustrial people.

An idealized picture of the feminine reproductive cycle in preindustrial societies is simply drawn. A young woman is married within a year or two of puberty and becomes pregnant within a year of marriage.<sup>4</sup> After ten lunar months (40 weeks)<sup>5</sup> of gestational amenorrhea, she gives birth to her first child, who shares her bed until he or she is weaned. Weaning is not completed until the child has sufficient teeth for chewing solid food, and it is probably postponed until a second pregnancy becomes obvious. The average interval from delivery to return of menses in preindustrial societies is roughly 13 lunar months, approaching 16 months in many societies (Tietze 1961). Once ovulation and menstruation resume, the reproductive cycle repeats itself, generating a physiologic birth interval of two to two-and-one-half years.

According to this model, comparison of average time spent in each of preindustrial women's three socially significant reproductive statuses—pregnancy, lactational amenorrhea, and menstruation—would yield results quite foreign to our modern experience. In the first place, menstrual months would comprise the smallest segment of the cycle, with an average of approximately four months' exposure per conception (Kistner 1979:470). Pregnancy, which varies little in duration unless the entire cycle is aborted, would occupy the second niche. A woman's most probable reproductive status, therefore, would be lactational amenorrhea, with an average duration of one year per cycle. It would be easy to conclude that menstrual months occupy less than one-fourth of a preindustrial woman's reproductive span.

We will turn now to a discussion of factors that modify the validity of this preindustrial reproductive paradigm. The model as depicted above must be limited, first of all, to women socially at risk of pregnancy; voluntary and involuntary celibates (nuns, widows, etc.) and lesbians must be excluded. Assuming for now that our population consists only of coitally accessible reproductive-aged women, a number of other restrictions must be considered. One is the fact that a significant percentage of conceptions, about 50%, do not result in live-born infants. Most of these losses represent early spontaneous abortion perceived only as a delayed menstrual period. When an abortion occurs early in pregnancy, the woman's body returns rapidly to its prepregnant state; when labor later in pregnancy results in the birth of a nonviable or dead fetus, more time will elapse between successive menstrual statuses. Taken together, such unproductive pregnancies account for a small but not negligible increment in reported live-birth intervals for all societies. They also diminish the contribution of lactational amenorrhea to a woman's reproductive history, while increasing her familiarity with menstrual months.

Infant mortality is another important consideration in preindustrial societies. Reliable figures are rarely available, and significant variation among populations is to be expected; the exact statistics are not necessary for this discussion. Infant death before the age of one year tends to reduce the duration of lactational amenorrhea without directly affecting duration of pregnant or menstruating statuses. This means that lifetime exposure to menstruation increases as the infant mortality rate increases; the lower the infant's age at death, the more pronounced this effect on the female reproductive cycle. In prein-

dustrial societies, as in our own, most infant deaths occur within the first few weeks after birth. Some women may be able to obtain infants to replace those which have been lost, thus guarding lactational amenorrhea from untimely interruption. Unless such infants are borrowed or adopted either from families which have lost a lactating woman or from women with failing lactation, they represent an abrupt termination of the lactation period for the original mother. It is presently impossible to estimate how much of this erosion of lactation by infant mortality is buffered by infants in need of a breast.

A third factor influencing the preindustrial reproductive cycle is contraception. Strictly observed coital abstinence is of course the most effective method of temporary contraception. This is not an uncommon practice among preindustrial peoples, among whom it tends to correlate with the relatively infertile lactation period. However, other birth-control methods are employed in preindustrial societies. Most methods known to be somewhat effective are capable of prolonging the interval of repetitive menstrual cycling and thus reducing the probability of amenorrheic statuses. Coitus interruptus, acidic douches, vaginal pessaries, and plugs of various types — all of these can deflect or destroy sperm before conception can occur. Ingested medicinal preparations are reported to have temporary or permanent sterilizing effects, with or without abolition of the menstrual cycle, and some societies are said to have knowledge of effective abortifacients (Newton 1968).

Infertility related to anovulation or postovulatory sex-hormone deficiency ("luteal phase defects") will prolong repetitive menstrual cycling, although anovulatory cycles tend to be irregularly spaced. Infertility associated with endocrine disorders causing amenorrhea (e.g., hyper- or hypothyroidism) will have the opposite effect. Infertility due to structural abnormalities caused by endometriosis, gonorrhoea, pelvic tuberculosis, or schistosomiasis will prolong the menstrual segment indefinitely despite normal endocrine function; such diseases are presumably more prevalent in preindustrial societies.

Male infertility is the limiting factor in 40% of American couples evaluated for failure to conceive, and this must also be a factor in preindustrial infertility. Since male fertility waxes and wanes in response to a host of ill-defined psychic and physical stimuli (Hafez and Evans 1973:648-660), it is likely that temporary male infertility causes a significant percentage of delayed conceptions in preindustrial societies.

Separation of sexual partners by hunt, harvest, war, etc., will increase exposure to menses if it occurs during the menstrual segment of the reproductive cycle. It seems probable that different societies would exhibit different biases in their selection of males to be temporarily separated from females. Perhaps husbands of pregnant or lactating women may be treated differently from those of more obviously fecundable women, depending upon the need to increase or curb the population.

Suckling frequency is a major variable in duration of lactational amenorrhea; correlates of suckling frequency will be discussed below under "The Transition Period."

Other factors interact with the reproductive cycle in vague and variable ways. There is evidence that humans react to stress with reduced fertility, via anovulation, amenorrhea (Yen 1978:349-352), spontaneous abortion and stillbirth, oligospermia and impaired sperm function.<sup>6</sup> Modern writers tend to assume that nonspecific stress is more prevalent in modern society, with its frantic pace and numerous distractions; we forget, however, that failing crops, empty fishnets, dying children, extremes of heat or cold, parasite infestations, lurking wolves or snakes or tigers, self-imposed religious practices, and even boredom may contribute significantly to the background stress level of preindustrial societies.

Malnutrition with depletion of fat stores appears to cause amenorrhea; there may be a critical fat/lean-body-mass ratio permissive for human female reproduction (Frisch and

McArthur 1974; Frisch 1978; Lev-Ran 1974; Vigersky, Andersen, Thompson and Loriaux 1977; Wilmsen 1978).

Sustained vigorous exercise may promote amenorrhea, either via altered fat/lean-body-mass ratio or via other mechanisms (Dale, Gerlach, and Wilhite 1979; Feicht, Johnson, Martin, Sparkes, and Wagner 1978; Frisch, Wyshak, and Vincent 1980b); it is of interest that both stress and exercise cause increased prolactin secretion in humans of both sexes (Yen 1978:160). Labor-saving devices, including the automobile, can markedly reduce the exercise level of a population. The degree of physical strength and stamina required to carry out women's subsistence activities in most preindustrial societies would astonish the average modern westerner. Inactivity may be a factor in the decline of lactational amenorrhea observed in modern societies.

The photoperiod, which may be altered by artificial light, interacts with reproductive function in unnumerable terrestrial organisms, including mammals (Follett 1977). Elucidation of specific mechanisms is within reach of current investigations, but the role of these in humans remains to be defined (Borbely 1978).

Finally, intermenstrual or early gestational vaginal bleeding is often misinterpreted as menstrual flow by modern women, and presumably also by preindustrial women, who may also be subject to a variety of taboos regardless of the etiology of the bleeding.

The schematic illustration, Figure 1, concludes this section of the paper (page 806).

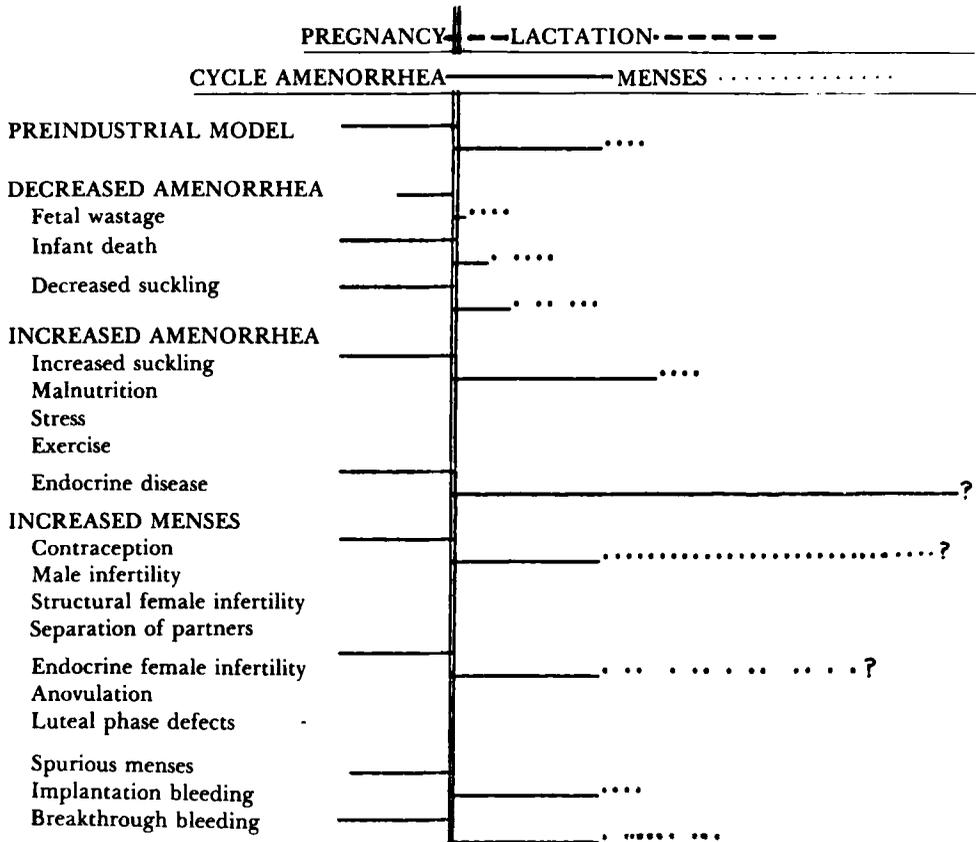
#### THE TRANSITION PERIOD

Margaret Mead and Niles Newton have advanced the term "transition" to describe the period after birth when the infant is still completely dependent on its mother for sustenance (Mead and Newton 1967). Birth represents the severing of the umbilical lifeline, but not the termination of all ties to the maternal body. A newborn takes in its own oxygen and excretes its own waste products, but it remains bound to its mother via the mammary lifeline. In modern societies this transition period is muted and can be abolished entirely; in preindustrial societies this cannot be allowed to happen. The female's ability to nurse her offspring is a crucial aspect of mammalian reproduction; in all but recent times, with rare exceptions, it has been crucial for the perpetuation of human societies.

The amenorrhea of lactation appears to be closely associated with the transition period. Tietze mentions two undocumented "old wives' tales" which are not borne out by scientific scrutiny. One is that menstruation never occurs while the mother is breastfeeding, and other is that lactation stops when menstruation reappears (Tietze 1961). These appear to be examples of carrying to a logical extreme the observation that menstruation usually returns when the child is turning to other foodstuffs. In other words, a woman who is menstruating is not "with child"—she is neither pregnant nor intensively lactating.

Muting of the transition period is probably one of the most sensitive indices of the social change which accompanies industrialization. Westernization without industrialization also reduces the transition state (Jelliffe 1962; Jelliffe and Jelliffe 1972, 1978; Raphael 1979), and since westernization and the blandishments of western advertising have been tied so closely to industrialization, it is time to consider whether the transition state can or should be maintained in the face of industrial development. There is an abundance of pressing economic and social grounds for investigating the nature of lactation failure in developing societies, but in addition the cultural features of lactation decline should not be overlooked (Latham 1977; Raphael 1979). In fact, the socioeconomic impact of modernization cannot be understood outside its cultural context.

Fig. 1. Some Factors Affecting the Preindustrial Reproductive Cycle.



Cultural correlates of a muted transition period can be gleaned from various ethnographic works. Niles Newton and Margaret Mead have identified many of these (Mead and Newton 1967). Dana Raphael has stressed the importance of a supportive social environment in initiating successful lactation (Raphael 1975, 1976). The Whiting Six Cultures series provides a clear glimpse of the degree to which modern western society has forsaken support of breastfeeding (Whiting 1963). (It is important to recognize that a western investigator may describe a community as practicing indulgent, frequent breastfeeding, when in fact the suckling frequency in that same community may have decreased 50% over the preceding ten years.) A set of attitudes originating in the developed West will be advanced for consideration. The reader will note that some of these are undergoing revision at the germinal center of modern American culture. All of these attitudes correlate inversely with suckling frequency, and therefore with duration of lactational amenorrhea.

1. The female breast is conceptualized as primarily an erotic appendage for males to ogle, fondle, etc. This leads to concern with the shape and size of the breasts in regard to sexual attractiveness, and to proliferation of garments designed to support, mold, and/or disguise the true contour of the breasts. Although modesty need not prevent women from appearing at the beach, it is generally held that women should not expose their nipples in

public, particularly when men are present. This stricture obtains despite the fact that segregation of sexes is limited to toilets and locker rooms. In the United States, certain locales have statutes forbidding public exposure of the female breast, even for the purpose of nursing a baby.

2. The female breast is viewed secondarily as an organ that can produce milk. Breast milk tends to be equated nutritionally with cow's, and the idea abounds that infants need additional nourishment in the early months. Solid foods are believed to be desirable well before the baby has teeth, and therefore foods are offered in premasticated form. In addition, the concept that the breast often fails to produce enough milk goes hand in hand with anxious monitoring of the infant for signs of inadequate milk intake, such as "excessively frequent" attempts to suckle.

3. Infant feedings are conceptualized as duties that should be spaced several hours apart, and eliminated at night as soon as possible. More frequent demand is thought to indicate inadequate milk supply. Sigmund Freud notwithstanding, there is a pervasive skepticism regarding any physical, emotional, or sexual infant need for sucking a nipple, apart from the need for nutrition. Thumb sucking is regarded as a common and relatively harmless habit of infancy which may be prevented by providing objects designed for oral autostimulation.

4. Crying is thought to be healthy infant behavior, within certain limits. There is an associated belief that infants need to cry to exercise their lungs, which is regarded as desirable. Additionally, there is general agreement that infants may cry themselves to sleep without any harm.

5. Adults are believed to require time away from children. The culture emphasizes the importance and fragility of the marital bond, which is thought to benefit from time spent together as a couple. Adults are encouraged to mingle with other adults in settings where children are not welcome. Within the home, parental privacy is held in high esteem. Infants do not sleep in their parents' bed and generally do not share their parents' bedroom after the first few weeks. They are thought to need sleeping platforms with cushions surrounded by vertical bars to prevent escape or fall. Night feedings thus obligate both infant and parent to leave their beds.

6. It is considered necessary and desirable to organize one's activities on the basis of an external stimulus such as a clock or calendar. For example, people commonly eat because it is mealtime, not because they are hungry. The culture recognizes the concepts of "bath time" and "nap time" as distinct from dirtiness and sleepiness. Similarly, people inspect their watches to decide whether a baby who is crying and chewing his fists is ready for a feeding.

Besides these attitudinal factors, certain access factors appear to be associated with a muted transition period. Access factors tend to increase with modernization and with improved socioeconomic status.

1. Toys and infant gear such as mobiles, cuddly bears, strollers, and walkers are all capable of distracting or separating an infant from the breast. Lipsitt has presented evidence that extraneous stimuli can suppress suckling in human infants (Lipsitt 1969). Even a six-week-old infant modifies its suckling behavior in response to interesting stimuli (Bruner 1969).

2. Proliferation of adult entertainments such as films, concerts, discos, taverns, and certain sports events encourages separation of mother and infant, which may be mismanaged from the standpoint of maternal prolactin secretion.

3. Increased living space allows for separate sleeping quarters and tends to permit some accumulation of infant playthings.

4. Increased access to food, and in particular to cow's-milk preparations, can reduce the transition period by several mechanisms. Maternal nutrition could conceivably in-

teract with the suckling frequency, if better nourishment of the mother were to result in higher-quality milk and a more easily satisfied infant. Supplementation of the infant may improve maternal nutrition indirectly by minimizing the caloric drain of lactation, although this may then be replaced by the nutritive demands of pregnancy. Supplementation of the infant can be expected to reduce the suckling frequency: although young infants clearly display a nonnutritive suckling drive (Findlay 1974:458) which may not be satisfied by the supplemental feeding method, it is obvious that time spent preparing and administering the supplemental feedings is time not available for breastfeeding. Additionally, it has been suggested that bottle-feeding encourages "laziness" when the infant is reconfronted with a breast, because the bottle is easier to drain and, unlike the breast, can be emptied without efficient use of jaw muscles (Davis, Sears, Miller, and Brodbéck 1948; Graber 1963; Newton and Newton 1962). Recall that the amount of prolactin released with suckling may be related to the intensity of the stimulus.

5. Clothing which encases the breasts behind complex or awkward fastenings will impede frequent suckling. Fashionable western-style dresses often fasten in back and are thus incompatible with breastfeeding; western undergarments also tend to fall into this category. Nursing bras, promoted to prevent sagging breasts, require the mother actively to initiate a feeding. With less complicated garments, the experienced older infant can find the mother's nipple without interrupting her handwork.

6. Clocks, television, and artificial lighting encourage disregard for circadian rhythms and intrinsic stimuli such as hunger, satiety, fatigue, and comfort. They may permit the substitution of feeding schedules for infant-initiated feeding patterns.

7. Outmoded but nonetheless "modern" medical practices such as the isolation of newborn infants and the use or abuse of obstetric anesthesia/analgesia can have persistent negative effects on mother-infant interaction (Adamsons and Joelsson 1966; Barnett, Liederman, Grobstein, and Klaus 1970; Bowes, Brackbill, Conway and Steinschneider 1970; Brazelton 1970; Klaus, Kennell, Plumb, and Zuehlke 1970; Klaus and Kennell 1976; Kron, Stein, and Goddard 1966). Sophisticated obstetric management which avoids such complications, including education of the mother in techniques of psychogenic analgesia (psychoprophylaxis), is available to relatively few of the increasing numbers of women occupying the world's hospital obstetric beds.

8. An economic system that favors or requires the participation of mothers of young children in the nondomestic labor force will encourage separation of mother and infant at an early age. Even when mothers are not separated from their infants, the transition period may be difficult to maintain (see below).

I have emphasized correlates of a muted transition period in order to present western biases to the western reader, but it should be recognized that the converse of any factor described above will support the transition period and promote lactational amenorrhea via increased suckling frequency. For example, when mother and infant share a bed in close physical contact, night feedings are even simpler than daytime feedings and need not rouse the mother from her sleep, particularly with an experienced infant. There is no reason to ply the infant with cereals and strained fruits at the evening meal, in the hope of glutting him sufficiently to eliminate "the 2 A.M. feeding." The transition period is therefore maintained, and the maternal system is exposed to a steadier rate of prolactin surges.

Inarguably, some correlates of a muted transition period have considerable social value and should not be discouraged simply because they decrease the suckling frequency. The twin issues of nutrition and fertility in the Third World have received widespread attention. Another important issue in developing regions is that of infant cognitive stimulation. Long-range social goals do not necessarily suggest that the breast should be offered in preference to enriching or instructional infant playthings. It is to be hoped,

however, that an understanding of the role of these factors in lactation decline will foster their sensitive and judicious dissemination.

#### SOCIOECONOMIC CHANGE AND THE TRANSITION PERIOD: A TAIWANESE CASE

One issue of particular importance with reference to the transition period in modern society is that of infant care in the workplace. Jiminez and Newton recently surveyed 195 societies regarding postpartum resumption of work; they observed that most traditional societies with prolonged breastfeeding permit mothers to remain physically close to their infants while carrying a full work load (Jiminez and Newton 1979). This topic will be addressed in this section, which will examine the influence of paid labor performed at home on the duration of the transition period.

In 1972 I had the opportunity to reside in a rural Taiwanese coal-mining village as the mother of a fat, breast-fed baby. An effort was made to examine certain parameters of lactation in this Chinese community (population 730-plus), which was caught early in the escalating phase of industrial and technological development. In conjunction with massive pressure to modernize, some constant themes and some changing ones could be discerned. (For an overview see Harrell 1981a, b). Their description, which follows, will parallel the attitude and access factors put forth in "The Transition Period."

1. Although the breasts of young nulliparous women were never exposed in public and were frequently hidden behind falsies, lactating women were permitted to nurse their babies publicly on many occasion. On summer evenings women could often be found squatting in small groups, gossiping, with one or two babies at their mothers' breasts. Men paid them no particular attention but would engage nursing women in conversation if the need arose. If a woman began to breastfeed in mixed company, a man might comment, "Oh, the baby's eating milk." but he would not alter his tone or body language, in marked contrast to American males. Local grandmothers would tease a suckling toddler by withdrawing the mother's nipple from his mouth (foreigners were not exempt from this treatment). Elderly women enjoyed the luxury of going topless in the summer's heat; on the hottest days they could be observed fanning themselves outdoors in the shade, nude except for black cotton pants.

2. Foremost among my impressions of attitudes affecting the transition period in Taiwan was the constantly offered statement that breast milk is superior to cow's. Throughout the Taipei Basin, people showed intense interest in the American baby's diet. After learning her age and sex, they rarely failed to inquire whether she received mother's milk or cow's milk: the distinction was obviously important to them. In the capital city of Taipei, where billboards advertising powdered cow's milk (*mu-nai-fen*, "mother's milk powder") were difficult to miss, the expectation was that Americans would bottle-feed. Bottle-feeding was associated with money (powdered milk was beyond the budget of some families) and progress, although students were taught in high school that breast milk is the best nutrition for infants. In the countryside, breast milk was generally associated with healthy infants and "good" mothers. This was the message overheard in bus stations and on crowded streets, and once proclaimed by a grandmotherly neighbor who had squeezed my breast to prove for herself that Americans do have milk.

The Taiwanese belief in the superiority of human milk seemed borne out by a casual inspection of the village. Those infants which were exclusively breastfed tended to be larger, stronger, and healthier than those receiving bottles. Milk powder was diluted to half the recommended concentration by less prosperous households; bottles were not sterilized and were allowed to lie about in the sun, being attacked by flies and shared by older children.

Attitudes varied regarding the supplemental feeding of solid foods. Most villagers felt that this was not necessary before the age of 9 to 12 months, while some had heard in school that it was desirable. Rice gruel was the food most likely to be offered. Egg was occasionally given, but dominant grandmothers tended to oppose this practice on the ground that it gives babies bad breath.

With respect to supplemental milk for babies who seem hungry after a breast meal, the general feeling was supportive. Grandmothers in particular seemed eager to bottle-feed an unsatisfied infant, although they might resist supplementation with solid food. This unfortunately worked against induction of increased maternal milk supply, but nobody ever suggested that more frequent suckling might solve the problem. One young woman who was determined to breastfeed her first baby tried several different dietary measures believed to increase milk production, all the while offering a bottle after each breast meal. By the time the baby was three months old, it was being completely bottle-fed.

3. There was no concept in the village of feeding schedules; infants were nursed or bottle-fed on demand if the mother was available. Bottle-fed older babies and toddlers often slept with their bottles and kept them at hand during the daytime. One four-year old was observed to carry a bottle about with her as she played. Pacifiers of various types were employed by some households. All children were eventually weaned onto a virtually continuous supply of starchy snacks; many lost their baby teeth to decay a year or two before permanent teeth would appear.

4. People varied in their tolerance of infant crying. None seemed to believe that crying was good for babies, but some babies had earned the label of "cryer" through their implacable fussing. Such babies were apt to be ignored for longer periods of squalling than their more "cooperative" little cousins. In general, the crying of very young infants was met with an immediate offer of food, usually the mother's breast. The older a child became, however, and the more complex its needs, the deafer grew the ears of its caretakers. The howling of toddlers was so common in the village that one learned to tune them out as background noise, in a class with buzzing motorbikes and agitated ducks.

5. All babies shared their parents' bed at night; rural people had difficulty conceiving of another arrangement. (In fact, even disregarding ease of night feedings, it would seem ruthless to isolate a helpless infant in an environment where rats, spiders, and cockroaches hold sway). Recreational activities, which were few, always included children; an exception must be made for village males who visited Taipei brothels with some regularity (prostitution is legal in Taiwan). People could not imagine excluding children from functions such as weddings and funerals. Indeed, children were unobtrusive at such affairs, which were not conducted in solemn and silent fashion.

6. Except for televised Little League baseball and Taiwanese opera, which would command the rapt attention of all but the eldest in the village, few adult activities were guided by the precise time of day. Coal miners reported for work at a certain time if they chose to work that day, but their schedules were flexible; young factory workers departed and returned by the clock, as did schoolchildren when school was in session. Most people rose at dawn to begin working, and continued working until dusk, with time out in the afternoon for television. Local shops opened when their owners had eaten breakfast and remained open the rest of the day, seven days a week. When a family's meal had been prepared, it would be set out on the table for family members to consume when they pleased; people wandered indoors and out with rice bowl and chopsticks as weather permitted. Traditional feasts comparable in magnitude to our Thanksgiving were an exception; for these, families would dine together beside the household altar.

1. Commercial toys and infant gear were still scarce, although the impact of strollers and carts was beginning to be felt in the countryside, now that a pavement of sorts had

been applied to many rural thoroughfares. Several infants in the community were confined to carts most of the day. I rarely saw them offered any stimulation as a substitute for the wealth of stimuli reaching an infant who rides on its caretaker's back. Even toddlers, who are carried most of the time in traditional households, could be observed sitting blandly in stationary bamboo carts hardly large enough to contain them, with perhaps a discarded medicine bottle for the afternoon's entertainment.

2. There was not a single adult pastime for women to engage in while leaving the children at home.

3. Living space was cramped by American standards: in many households parents and children all shared one bed. An extended family consisting of an old woman, her two sons and their wives and children would typically share a common parlor with its ancestral altar, a common kitchen which was also the bathing area, and a common courtyard for livestock, laundry, and assorted paraphernalia. The grandmother would have her own bed, curtained off from the kitchen or parlor and often shared with weanling toddlers or older children. Each of the sons would have a separate bedroom for himself, his family, and their personal belongings. A prosperous household would also provide separate sleeping arrangements for adolescents. The television was in the parlor or in one of the bedrooms; if the family had a refrigerator, it was usually displayed in the parlor. Floors were of packed earth or, more commonly, cement—too dirty to allow infants to roam; one well-to-do family had installed vinyl flooring in their parlor but regarded its need for occasional mopping as an egregious nuisance.

4. Nutrition in Taiwan has long been considered adequate by world standards. The staple food is polished white rice; the poorest families may serve partially polished rice. Roughly 75% of the village diet consisted of rice, with the remainder selected from an abundant variety of fresh produce, fish, and meat. The village supported two butchers and two grocers; most people kept a few chickens and/or ducks, and many households cultivated a vegetable patch. The cabbage and onion families were particularly well represented in village fare. The quantity of meat consumed varied with the occasion and the family purse, feast days being opportunities for gorging on meat without the usual rice (elderly people complained that they could not "eat full," however, without the accustomed rice). Slabs of pork fat were consumed by those who could afford little meat. Beef was not eaten, and milk products were avoided, except ice cream and "mother's milk powder." Soybean products were numerous, particularly as snacks. Fruits were available all year; that summer, a favorite new homemade treat was guava-juice pop-sicles.

Villagers still adhered to the traditional custom of feeding women nothing but chicken, sesame oil, wine, and rice for a month after childbirth. This "hot" combination was thought to replace the energy lost with the mother's blood at delivery; an associated belief held that the baby would fail to thrive if its mother was not provided with sufficient quantities of these foods.

5. Clothing had changed from grandmother's day. All but the most indigent women were wearing bras, and western dresses or sweater tops with pants were favored over the traditional front-closing shirt or jacket. Despite the ubiquitous presence of mini-skirts that season, young women still preferred the squatting position for most of their activities.

6. Clocks and electric lights were present but not prominent; television, however, provided major diversion from the grind of daily living. Approximately two-thirds of families owned their own TVs and two households had color TVs.<sup>7</sup> Every villager had access to a television set during the usual viewing times.

7. Childbirth was moving out of the village and into midwives' clinics, although some young women still preferred to deliver at home with their mother-in-law in attendance. It

was unusual for a woman to obtain prenatal care. Labor and delivery were accomplished without the use of analgesics. Regardless of where the birth occurred, mother and infant were confined at home for a month after delivery; the mother and all those who had contact with her were considered ritually polluted at this time. Some younger women regarded this obligatory confinement as a stifling practice.

8. Cottage industry had entered the community, primarily as the production of knit sweaters for export. The income this work could bring to the family encouraged many strong young mothers to spend 12 hours a day at the village knitting mills, leaving their children in the care of the paternal grandmother. Quite often, the nearest knitting machine was in the family's own parlor. Other young mothers engaged in the less taxing occupations of reeling or piecing; these daughters-in-law were expected to share more of the domestic chores than those who worked full-time at the noisy and tedious machines.

Idleness was a privilege of old age. Young women who did not work for a cash income tended to have major responsibility for a household. All laundry was washed by hand, scrubbing clothes on rocks while squatting at the river's edge or at the village spring, often with a baby on one's back. Wet clothes had to be hung out on bamboo poles before the day's marketing could be done. After marketing, it was time to prepare the "dishes" of the day, which were served fresh at midday and then allowed to stand, covered, to be re-served in the evening and again the next morning; rice was cooked fresh for each meal. Afternoons brought a lull in women's domestic activities unless there were sick children, special errands, or religious feasts. Children, of course, demanded their share of attention. Before evening, the wash had to be brought in, domestic animals tended, and the family bathed. A few women were forced to carry water for bathing from the village wells, but most households pumped water into the kitchen.

Having observed this much of village culture, I wished to test the hypothesis that the presence of a mother-in-law was related to a decline in the duration of the transition period. Clearly, these Taiwanese villagers were much more supportive of lactation than most modern Americans. It appeared, however, that women who lived with their mother-in-law were more likely to offer bottles and to wean at an early age than were women who managed a household on their own. This did not fit my preconception of a mother-in-law as an experienced older woman who would communicate her superior female wisdom and skills to her son's young wife. It was obvious that young mothers employed in the knitting industry had mothers-in-law to tend their children, but since most of them worked at home, near their infants, it seemed unlikely that work itself would interfere with suckling to that degree. Perhaps the mother-in-law, herself eager for interaction with the grandchild, was encouraging bottles so that she could feed the baby.

Out of a total of 40 women in the community with children younger than 26 months, the cutoff for the 3-*sui* cohort<sup>8</sup> at the time of the study, 25 were interviewed specifically about their employment in extradomestic pursuits, the residence of their mother-in-law, and the infant-feeding practices with regard to each child. The group interviewed did not differ significantly from the remainder of new mothers in age, parity, percent working, or percent living with their mother-in-law; it was selected primarily for interviewer convenience. From the 25 women interviewed, 3 were subsequently excluded—two because of insufficient information and one because she proved to be the only woman in the sample who had worked away from home.

The interview population thus consists of 22 women with a total of 67 live births; mean age of the mothers was approximately 28; mean parity was 3.045. Ten of the 22 mothers worked in their homes for a cash income; they had given birth to 23 children, for a mean parity of 2.30 (range 1-6). The remaining 12 mothers did unpaid domestic labor only; they had a total of 44 children for a mean parity of 3.67 (range 1-7). Difference in age

TABLE II.

	Mother working				Not working				Total				$\chi^2$	$p <$
	Yes	No	%	N	Yes	No	%	N	Yes	No	%	N		
Breastfed $\geq$ Year														
Reverse birth order (Youngest) Y														
Y + 1	*2	*4	33	6	7	2	78	9	9	6	60	15		
Y + 2	3	2	60	5	9	1	90	10	12	3	80	15		
Total	2	1	67	3	*7	*0	100	7	9	1	90	10	3.90	0.05*
Parity/birth order	7	7	50	14	23	3	88	26	30	10	75	40	5.27	0.05
1-2	6	4	60	10	8	2	80	10	14	6	70	20		
3-4	1	1	50	2	9	0	100	10	10	1	84	11		
$\geq 5$	0	2	—	2	6	1	83	6	6	3	67	9		
Total	7	7	50	14	23	3	88	26	30	10	75	40	5.27	0.05
(Sut) Age														
1-2	*2	*3	40	5	4	1	80	5	6	4	60	10		
3-4	1	2	33	3	10	2	83	12	11	4	73	15	6.56	0.02
$\geq 5$	4	2	67	6	*9	*0	100	9	13	2	87	15	3.78	0.10*
Total	7	7	50	14	23	3	88	26	30	10	75	40	5.27	0.05

paralleled the difference in parity; neither was statistically significant. None of the 22 mothers had worked while nursing some children but had not worked with others.

It was elected to limit the data analysis to the three youngest children of each mother, thus reducing problems of maternal recall and overrepresentation of nonworking women. Considering only the three youngest, working women averaged 2.00 children per woman while nonworking averaged 2.50, for a total of 50 children in the study.

For already weaned children included in this study, the mean duration of breastfeeding was between 12 and 13 months. This is decreased from Gallin's estimate of two years for a late-1950s Taiwanese village (Gallin 1966:193), and it is decreased from the mid-1960s national survey reported by Jain and associates (Jain et al. 1970, Jain and Sun 1972) which yielded a mean duration of lactation of 16 months in urban Taiwan and 17.7 months in rural areas. No mother interviewed had nursed any of her children for two years; the longest lactation period was 22 months, which included the subsequent pregnancy and a short interval of nursing the fourth and fifth children simultaneously.

Considering all children in the sample who had either nursed to the age of one year or been weaned at a younger age, 50% of the babies of working mothers and 88% of the babies of nonworking mothers nursed as long as one year ( $p$  less than 0.05). Parity was unrelated to the duration of lactation. There does appear to have been an age trend, with the youngest children of working mothers differing significantly from the third-youngest children of nonworking mothers, despite the small numbers involved. For all but one of the age categories compared, there is a higher percentage of children nursed a year or longer among the older children; this is true regardless of maternal occupation, and it suggests a social trend independent of the involvement of young mothers in home-based paid employment. The age trend appears to magnify (\*) but cannot explain the observed working/nonworking differences.

The use of supplemental feedings was examined as a measure of the weakness of the transition period in this population. There were 45 infants who had either breastfed exclusively to the age of five months or received supplemental feedings before five months (the remaining infants were newborns still being exclusively breastfed). Among the babies of working mothers, 56% had been supplemented before the age of five months, compared with 24% of the babies of nonworking mothers ( $p$  less than 0.10). An age trend was also evident with supplementation.

With regard to the mother-in-law hypothesis, the presence of a mother-in-law was not associated with either the duration of breastfeeding or the practice of supplementing young infants, except via the mother-in-law's clear correlation with mothers who worked for cash income. No mothers were working unless the mother-in-law was present; two-thirds with a mother-in-law worked (one nonworking mother lived with her mother-in-law half the time in question).

TABLE III.

Daughter-in-law	Working				Not working				$\chi^2$	$p$
	Yes	No	%	N	Yes	No	%	N		
Mother-in-law present	10	0	100	10	5.5	6.5	46	12	5.31	0.05

There were three reasons given by women in the study for termination of breastfeeding: (1) not enough mother's milk, (2) baby learned to walk, which is the right time to wean, and (3) pregnancy. Eight out of the ten infants weaned from the breast before the age of one year were weaned because of insufficient maternal milk production; bottles were introduced prior to weaning. Milk production appears to have been declining in the village. This is suggested both by decreased duration of lactation compared

TABLE IV.

	Mother working				Not working				Total				$\chi^2$	$p <$
	Yes	No	%	N	Yes	No	%	N	Yes	No	%	N		
Supplements < 5 Mos.														
Reverse birth order														
(Youngest) Y	*6	*1	86	7	3	8	27	11	9	9	50	18	3.74	0.10
Y + 1	2	4	33	6	3	8	27	5	12	29	17	10	4.57	0.05*
Y + 2	1	2	33	3	*1	*6	14	7	2	8	20	45	3.35	0.10
Total	9	7	56	16	7	22	24	29	16	29	35	45		
(Sut) Age														
1-2	*5	*1	83	6	3	4	43	7	8	5	62	13		
3-5	2	2	50	4	3	9	25	12	5	11	31	16		
$\geq 5$	2	4	33	6	*1	*9	10	10	3	13	19	16	5.07	0.05*
Total	9	7	56	16	7	22	24	29	16	29	35	45	3.35	0.10

with previous studies, and by the increased supplementation of village infants over the preceding three years.

While nutrition in the community may have been improving (or at least becoming richer in animal fat and protein), and while better nutrition may interact unfavorably with the duration of lactational amenorrhea, there is no evidence that good nutrition interferes with milk synthesis. Since milk production depends on prolactin secretion, and this in turn depends on suckling frequency, it appears highly probable that the suckling frequency had declined from previous levels. In addition, we are forced to conclude that industrial employment in the home, close to the infant, may be associated with a reduced transition period; the most likely explanation is reduced accessibility for suckling.

All of the women interviewed for this study had wanted to breastfeed their babies. By modern American standards, these rural Taiwanese women are successful breastfeeders; by preindustrial Taiwanese standards, not so. This decline has begun to occur in an attitudinal setting still very supportive of breastfeeding, but it can be predicted that attitudes will change to match the community's increasing access to a modern life-style. Swept along by the rush of technological development, women in present-day Taiwan cannot easily distance themselves from the demands of progress in order to evaluate its effects upon their lives. As in the United States, an understanding of "what has been visited upon us" may have to await a generation or two of technological experience. It may be up to the anthropologists to provide the world with a cognitive framework supporting lactation against the thrust of modernization, thus permitting women to choose or reject breastfeeding on some basis other than its failure rate.

#### CONCLUSION

The participation of women in the symbolic systems of various cultures parallels the global tendency to endow liminal states with particular symbolic importance (Turner 1967). In this regard, it is interesting that so much has been written to describe or explain menstrual symbols, rites, and customs, while so little effort has been expended on lactation. Perhaps this discrepancy does not arise from bias on the part of the anthropologist, but rather from a universal human perception of lactation as a *nonliminal* state, in contrast to menstruation. This would be a misperception for modern western societies, where menstrual cycles repeat themselves ad infinitum and lactation is an unusual occurrence. It would seem to clash with Mead and Newton's concept of lactation as a transition period; however, the transition period focuses upon the birthed but still parasitic infant, while our symbolic interest is the woman herself.

We have seen that prolonged lactation is associated with prolonged absence of menses, and that this is influenced by numerous cultural factors that interact with the suckling frequency. The concept that amenorrhea represents a "with child" state has been introduced, and it has been suggested that such states are the rule, rather than the exception, for preindustrial women. Not only is menstruation relatively uncommon, but it represents a liminal state. A menstruating woman is between children, for she has let go of one but has not yet conceived the next. If she is not between children, she is at either extreme of reproductive life, for menses are more common near puberty and menopause, when cycles tend to be anovulatory. A menstruating woman is like a Chinese bride who has left her natal home but has not yet crossed the threshold of her husband's home. Hence the magic, the suspicion, the pollution, the isolation which have been so well described.

For women in preindustrial ages and societies, the less common menstrual cycle may signal a "coming into heat," an emotional and genital ripeness for copulation, interjected between the stable, pallid, parasitized state of lactational amenorrhea and the transform-

ing, tumescent, parasitized state of pregnancy. Menstrual flow would thus symbolize the height of female sexual capacity vis-à-vis the male, as well as the female's liminal freedom from biologically or culturally mandated intensive infant parasitism.

And what of the ever recurrent menstrual cycle?

In modern western society, we function continually in this heightened sexual state, this cyclic surging of powerful female hormones. We think of this as our natural birthright, and we as women become defensive at the suggestion that "nature" may affect our temperament or judgment. We tend to favor public acceptance of menstruation as a normal and natural function, yet we do this with a certain degree of ambivalence. For example, *The Curse*, an exhaustive effort to demystify menstruation, ultimately recommends bequeathing "the most elementary and obvious aspect of womanhood" (p. 2) to our daughters as "Eve's blessing," (p. 242) while simultaneously and enthusiastically promoting menstrual extraction, the "sixty-second period" (Delaney, Lupton, and Toth 1976:216).

The preindustrial reproductive cycle with its intensive transition period suggests another view, that continuous menstrual cycling is not a natural attribute of human females. Perhaps "the curse" can be explained as an artifact of the Age of Technology, something imposed upon women by a society of plenty which needs no more children.<sup>9</sup>

From the preindustrial reproductive cycle, we can learn that menstruation need not be regarded as the hallmark of healthy womanhood. Our femaleness need not be inextricably bound up with recurrent menstrual flow. We need not rationalize our distaste for this monthly nuisance, and we can reject menstruation if we wish, without rejecting our sexuality. Perhaps this understanding can help western scholars move away from the concept of the "normal monthly period," and closer to the origins of physiologic and symbolic womanhood.

#### NOTES

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<sup>1</sup> There may have been one exception to U.S. supremacy in this regard: the Marquesans of Polynesia are said to have had an extremely negative attitude toward breastfeeding, with the lowest average age at weaning for any society studied by Whiting and Child (Whiting and Child 1953).

<sup>2</sup> It should be noted that signs of estrogen deficiency do not always persist even in surgically castrated women (Koss 1979:212); this appears to be due to increased peripheral (primarily adipose) estrogen production (Grodin, Siiteri, and MacDonald 1973; Perel and Killinger 1979; Frisch 1978; Frisch, Canick, and Tulchinsky 1980). Extragonadal sources of estrogen may be available to lactating women, particularly those with substantial fat deposits.

<sup>3</sup> In Hefnawi and Badraoui's study of Egyptian women (1977), one-fourth of lactators conceived without menstruating; in Chile, Perez et al. (1971) found that 78% of lactating women ovulated prior to their first menses.

<sup>4</sup> Without contraception, 25% of couples will conceive in one month, 60% in six months, and 80% within a year, assuming cohabitation with fairly regular intercourse; these are average figures (Kistner 1979:470).

<sup>5</sup> The lunar month is used here because of its correlation with the average frequency of menses in ovulating women; thus number of months of amenorrhoea equals number of missed menstrual periods.

<sup>6</sup> The laboratory performing sperm penetration assays at the University of Washington does not use medical students as controls during exam time because their semen becomes unreliable, presumably due to anxiety (Dr. Donald Moore, personal communication).

<sup>7</sup> In 1978, six years later, approximately 75 color television sets were present in the community; this increase paralleled that in other aspects of material economic development, such as refrigeration, plumbing, and automobiles.

<sup>8</sup> *Sui*, the traditional Chinese concept of age, places each individual within a cohort who have been alive during the same number of Chinese calendar years. A child is granted one *sui* at birth; thereafter, everybody adds a *sui* at the New Year. Thus a child born the day before New Year's will be two *sui* on New Year's, while a child born on New Year's Day will not be two *sui* until the next New Year arrives. Two months after New Year's, the maximum chronological age for a child of two *sui* is fourteen months; the minimum is two months plus one day.

<sup>9</sup> It appears that the excessive modern rates of breast cancer and endometrial (uterine) cancer may be related to excessive menstrual cycling, either directly or through the factors responsible for our increased exposure to menses; this is a complex, unresolved issue.

#### REFERENCES CITED

- Adamsons, Karlis, Jr., and Ingemar Joelsson  
1966 The Effects of Pharmacologic Agents upon the Fetus and Newborn. *American Journal of Obstetrics and Gynecology* 96:437-460.
- Ahern, Emily M.  
1975 The Power and Pollution of Chinese Women. *In Women in Chinese Society*. Margery Wolf and Roxane Witke, eds. pp. 193-214. Stanford: Stanford University Press.
- Aono, Toshihiro, Akira Miyake, Takenori Shioji, Takayuki Kinugasa, Toshio Onishi, and Keiichi Kurachi  
1976 Impaired LH Release Following Exogenous Estrogen Administration in Patients with the Amenorrhea-galactorrhea Syndrome. *Journal of Clinical Endocrinology and Metabolism* 42:696-702.
- Aono, Toshihiro, Takenori Shioji, Tsuneo Shoda, and Keiichi Kurachi  
1977 The Initiation of Human Lactation and Prolactin Response to Suckling. *Journal of Clinical Endocrinology and Metabolism* 44:1101-1106.
- Barnett, Clifford R., P. Herbert Leiderman, Rose Grobstein, and Marshall Klaus  
1970 Neonatal Separation: The Maternal Side of Interactional Deprivation. *Pediatrics* 45: 197-205.
- Berman, Michael L., Kenneth Hanson, and Ida Hellman  
1972 Effects of Breast-feeding on Postpartum Menstruation, Ovulation, and Pregnancy in Alaskan Eskimos. *American Journal of Obstetrics and Gynecology* 114:524-534.
- Bonnar, J., M. Franklin, P. N. Nott, and A. S. McNeilly  
1975 Effect of Breast-feeding on Pituitary-ovarian Function after Childbirth. *British Medical Journal* 4:82-84.
- Bonte, M., and H. van Balen  
1969 Prolonged Lactation and Family Spacing in Rwanda. *Journal of Biosocial Science* 1: 97-100.
- Bonte, Monique, Emmanuel Akingeneye Mathias Gashakamba, Etienne Mbarutso, and Marc Nolens  
1974 Influence of the Socio-economic Level on the Conception Rate During Lactation. *International Journal of Fertility* 19:97-102.
- Borbély, Alexander A.  
1978 Effects of Light on Sleep and Activity Rhythms. *Progress in Neurobiology* 10:1-31.
- Bowes, Watson A., Jr., Yvonne Brackbill, Ester Conway, and Alfred Steinschneider  
1970 The Effects of Obstetrical Medication on Fetus and Infant. *Monographs of the Society for Research in Child Development*, Volume 35, Number 4, Chicago University Press.
- Brazelton, T. Berry  
1970 Effect of Prenatal Drugs on the Behavior of the Neonate. *American Journal of Psychiatry* 126:1261-1266.

- Bruner, Jerome S.  
1969 Processes of Growth in Infancy. *In* Stimulation in Early Infancy. Anthony Ambrose, ed. pp. 205-228. New York: Academic Press.
- Campbell, Berry, and W. E. Petersen  
1953 Milk "Let-down" and the Orgasm in the Human Female. *Human Biology* 25:165-168.
- Chodorow, Nancy  
1974 Family Structure and Feminine Personality. *In* Woman, Culture, and Society. Michelle Zimbalist Rosaldo and Louise Lamphere, eds. pp. 43-66. Stanford: Stanford University Press.
- Cowie, A. T., and J. S. Tindal  
1971 The Physiology of Lactation. London: Edward Arnold.
- Dale, Edwin, Detlef H. Gerlach, and Ava L. Wilhite  
1979 Menstrual Dysfunction in Distance Runners. *Obstetrics and Gynecology* 54:47-53.
- Davis, Herbert, Robert R. Sears, Herbert C. Miller, and Arthur J. Brodbeck  
1948 Effects of Cup, Bottle, and Breast-feeding on Oral Activities of Newborn Infants. *Pediatrics* 2:549-558.
- Delaney, Janice, Mary Jane Lupton, and Emily Toth  
1976 The Curse: a Cultural History of Menstruation. New York: E. P. Dutton and Co., Inc.
- Delgado, Hernán, Elena Brineman, Aaron Lechtig, John Bongaarts, Reynaldo Martorell, and Robert E. Klein  
1979 Effect of Maternal Nutritional Status and Infant Supplementation during Lactation on Postpartum Amenorrhea. *American Journal of Obstetrics and Gynecology* 135:303-307.
- Delvoe, P., M. Demaegd, J. Desnoeck-Delogne, and C. Robyn  
1977 The Influence of the Frequency of Nursing and of Previous Lactation Experience on Serum Prolactin in Lactating Mothers. *Journal of Biosocial Science* 9:447-451.
- Delvoe, Pierre, Mohamed Badawi, Marc Demaegd, and Claude Robyn  
1978a Long Lasting Lactation is Associated with Hyperprolactinemia and Amenorrhea. *In* Progress in Prolactin Physiology and Pathology, (Proceedings of the International Symposium on Prolactin, Nice, France, 1977.) C. Robyn and M. Harter, eds. pp. 213-232. Elsevier/North-Holland Biomedical Press.
- Delvoe, P., M. Demaegd, Uwayitu-Nyampeta, and C. Robyn  
1978b Serum Prolactin, Gonadotropins, and Estradiol in Menstruating and Amenorrheic Mothers during Two Years' Lactation. *American Journal of Obstetrics and Gynecology* 130:635-639.
- Enjalbert, Alain, Merle Ruberg, and Clause Kordon  
1978 Neuroendocrine Control of Prolactin Secretion. *In* Progress in Prolactin Physiology and Pathology, (Proceedings of the International Symposium on Prolactin, Nice, France, 1977) C. Robyn and M. Harter, eds. pp. 83-94. Elsevier/North-Holland Biomedical Press.
- Faglia, G., P. Back-Peccoz, P. Travaglini, B. Ambrosi, M. Rondena, A. Paracchi, A. Spada, G. Weber, R. Bara, and A. Bouzin  
1977 Functional Studies in Hyperprolactinemic States. *In* Prolactin and Human Reproduction: Proceedings of the Sero Symposia, Vol. 11. P. G. Crosignani and C. Robyn, eds. pp. 225-238. London: Academic Press.
- Feicht, C. B., T. S. Johnson, B. J. Martin, K. E. Sparkes, and W. W. Wagner, Jr.  
1978 Secondary Amenorrhea in Athletes. *Lancet* 2:1145-1146.
- Findlay, A. L. R.  
1974 The Role of Suckling in Lactation. *In* Lactogenic Hormones, Fetal Nutrition, and Lactation. John B. Josimovich, Monica Reynolds, and Edgard Cobo, eds. pp. 453-477. New York: John Wiley and Sons.
- Follett, B. K.  
1977 Photoperiodism and Seasonal Breeding in Birds and Mammals. *In* D. B. Crighton, G. R. Foxcroft, N. B. Haynes, and G. E. Lamming, eds. pp. 267-293. London: Butterworths.
- Frisch, Rose E.  
1978 Nutrition, Fatness, and Fertility. The Effect of Food Intake on Reproductive Ability. *In* Nutrition and Human Reproduction. W. Henry Mosely, ed. pp. 91-122. New York: Plenum Press.

- Frisch, Rose E. and Janet W. McArthur  
1974 Menstrual Cycles: Fatness as a Determinant of Minimum Weight for Height Necessary for Their Maintenance or Onset. *Science* 185:949-951.
- Frisch, Rose E., Jacob A. Canick, and Dan Tulchinsky  
1980 Human Fatty Marrow Aromatizes Androgen to Estrogen. *Journal of Clinical Endocrinology and Metabolism* 51:394-396.
- Frisch, Rose E., Grace Wyshack, and Larry Vincent  
1980 Delayed Menarche and Amenorrhea in Ballet Dancers. *New England Journal of Medicine* 303:17-19.
- Gallin, Bernard  
1966 Hsin Hsing, Taiwan: A Chinese Village in Change. Berkeley and Los Angeles: University of California Press.
- Glass, M. R., R. W. Shaw, W. R. Butt, R. Logan Edwards, and D. R. London  
1975 An Abnormality of Oestrogen Feedback in Amenorrhoea-galactorrhoea. *British Medical Journal* 3: 274-275.
- Graber, T.  
1963 The "Three M's": Muscles, Malformation, and Malocclusion. *American Journal of Orthodontics* 49:418-450.
- Grodin, J. M., P. K. Siiteri, and P. C. MacDonald  
1973 Source of Estrogen Production in Postmenopausal Women. *Journal of Clinical Endocrinology and Metabolism* 36:207-214.
- Grosvenor, C. E., and F. Mena  
1974 Neural and Hormonal Control of Milk Secretion and Milk Ejection. *In Lactation: A Comprehensive Treatise*. Vol. I. Bruce Larson and Vearl R. Smith, eds. pp. 227-276. New York: Academic Press.
- Hafez, E. S. E., and T. N. Evans, eds.  
1973 Human Reproduction: Conception and Contraception. Hagerstown, Md.: Harper and Row.
- Harrell, Stevan  
1981a The Effects of Economic Change on Two Taiwanese Villages. *Modern China* 7:31-54.  
1981b Social Organization in Hai-shan. *In The Anthropology of Taiwanese Society*. Emily Martin Ahern and Hill Gates, eds. pp. 125-147. Stanford: Stanford University Press.
- Hefnawi, F., and M. H. H. Badraoui  
1977 The Benefits of Lactation Amenorrhea as a Contraceptive. *Fertility and Sterility* 28:320.
- Jain, Andrudh K., and T. H. Sun  
1972 Inter-Relationships Between Socio-Demographic Factors, Lactation, and Postpartum Amenorrhea. *Demography India* 1:3-15.
- Jelliffe, Derrick B.  
1962 Culture, Social Change, and Infant Feeding: Current Trends in Tropical Regions. *American Journal of Clinical Nutrition* 10:19-45.
- Jelliffe, Derrick B., and E. F. Patrice Jelliffe  
1972 Lactation, Conception, and the Nutrition of the Nursing Mother and Child. *Journal of Pediatrics* 81: 829-833.  
1978 Human Milk in the Modern World: Psychological, Nutritional, and Economic Significance. Oxford: Oxford University Press.
- Jiminez, Marcia Houdek, and Niles Newton  
1979 Activity and Work during Pregnancy and the Postpartum Period: A Cross-cultural Study of 202 Societies. *American Journal of Obstetrics and Gynecology* 135:171-176.
- Johnson, Elizabeth  
1975 Women and Childbearing in Kwan Mun Hau Village: A Study of Social Change. *In Women in Chinese Society*. Margery Wolf and Roxane Witke, eds. pp. 215-241. Stanford: Stanford University Press.
- Keettel, W. C., and J. T. Bradbury  
1961 Endocrine and Studies of Lactation Amenorrhea. *American Journal of Obstetrics and Gynecology* 82:995-1002.

- Kippley, Sheila  
1969 *Breastfeeding and Natural Child Spacing*. Cincinnati: K Publishers.
- Kippley, Sheila, and John F. Kippley  
1974 *The Relation Between Breastfeeding and Amenorrhea: Report of a Survey*. In *Breastfeeding and Natural Child Spacing*. Sheila Kippley. pp. 163-168. New York: Harper and Row.
- Kistner, Robert W.  
1979 *Gynecology: Principles and Practice*. Chicago: Year Book Medical Publishers, Inc.
- Klaus, Marshall H., and John H. Kennell  
1976 *Maternal-Infant Bonding and the Impact of Early Separation or Loss on Family Development*. St. Louis: C. V. Mosby Co.
- Klaus, Marshall H., John H. Kennell, Nancy Plumb, and Steven Zuehlke  
1970 *Human Maternal Behavior at the First Contact with her Young*. *Pediatrics* 46:187-192.
- Koss, Leopold G.  
1979 *Diagnostic Cytology and its Histopathologic Bases*. Philadelphia: J. B. Lippincott Co.
- Kron, Reuben E., Marvin Stein, and Katharine E. Goddard  
1966 *Newborn Sucking Behavior Affected by Obstetric Sedation*. *Pediatrics* 37:1012-1016.
- Latham, Michael C.  
1977 *Infant Feeding in National and International Perspective: An Examination of the Decline in Human Lactation and the Modern Crisis in Infant and Young Child Feeding Practices*. *Annals of the New York Academy of Sciences* 300:197-209.
- Lev-Ran, Arie  
1974 *Secondary Amenorrhea Resulting from Uncontrolled Weight-reducing Diets*. *Fertility and Sterility* 25:459-462.
- L'Hermite, Marc  
1979 *Reproductive Processes in Hyperprolactinaemic Women*. In *Psychoneuroendocrinology in Reproduction: An Interdisciplinary Approach: Proceedings 2nd. International Symposium on Clinical Psychoneuroendocrinology in Reproduction*, Venice, Italy, 1979. L. Zichella and P. Pancheri, eds. pp. 339-348. Elsevier/North-Holland Biomedical Press.
- Lipsitt, Lewis P.  
1969 *Learning Capacities of the Human Infant*. In *Brain and Early Behavior: Development in the Fetus and Infant*. R. J. Robinson, ed. pp. 227-249. New York: Academic Press.
- Lunn, P. G., A. M. Prentice, S. Austin, and R. G. Whitehead  
1980 *Influence of Maternal Diet on Plasma-Prolactin Levels during Lactation*. *Lancet* 1980, 1:623-625.
- Masnick, George S.  
1979 *The Demographic Impact of Breastfeeding: A Critical Review*. *Human Biology* 51:109-125.
- Masters, William H., and Virginia Johnson  
1966 *Human Sexual Response*. Boston: Little, Brown.
- McLennan, Margaret T., and Charles E. McLennan  
1975 *Hormonal Patterns in Vaginal Smears from Puerperal Women*. *Acta Cytologica* 19:431-433.
- McNatty, K. P., R. S. Sawers, and A. S. McNeilly  
1974 *A Possible Role for Prolactin in Control of Steroid Secretion by the Human Graafian Follicle*. *Nature* 250:653-655.
- Mead, Margaret, and Niles Newton  
1967 *Cultural and Patterning of Perinatal Behavior*. In *Childbearing: Its Social and Psychological Aspects*. Stephen A. Richardson and Alan F. Guttmacher, eds. pp. 142-244. Baltimore: Williams and Wilkins.
- Meites, Joseph, and Clifford L. Kratt  
1973 *The Hypophysis*. In *Physiology and Biophysics III. Digestion, Metabolism, Endocrine Function, and Reproduction*. Theodore C. Ruch and Harry D. Patton, eds. pp. 169-202. Philadelphia: W. B. Saunders.

- Newton, Niles  
1968 Population Limitation in Crosscultural Perspective. I. Patterns of Contraception. *Journal of Reproductive Medicine* 1:343-354.
- Newton, Niles Rumely, and Michael Newton  
1950 Relation of the Let-down Reflex to the Ability to Breast Feed. *Pediatrics* 5:726-733.
- Newton, Michael, and Niles Newton  
1962 The Normal Course and Management of Lactation. *Clinical Obstetrics and Gynecology* 5:44-63.
- Newton, Niles, and Michael Newton  
1967 Psychological Aspects of Lactation. *New England Journal of Medicine* 277:1179-1188.
- Ortner, Sherry B.  
1974 Is Female to Male as Nature is to Culture? *In* *Woman, Culture, and Society*. Michelle Zimbalist Rosaldo and Louise Lamphere, eds. pp. 67-87. Stanford: Stanford University Press.
- Perel, E., and D. W. Killinger  
1979 The Interconversion and Aromatization of Androgens by Human Adipose Tissue. *Journal of Steroid Biochemistry* 10:623-627.
- Perez, A., P. Vela, R. Potter, and G. S. Masnick  
1971 Timing and Sequence of Resuming Ovulation and Menstruation after Childbirth. *Population Studies* 25:491-503.
- Peters, Hannah, Sarah Israel, and Savitri Purshottam  
1958 Lactation Period in Indian Women: Duration of Amenorrhea and Vaginal and Cervical Cytology. *Fertility and Sterility* 9:134-144.
- Potter, Robert G., Mary L. New, John B. Wyon, and John E. Gordon  
1965 Applications of Field Studies to Research on the Physiology of Human Reproduction: Lactation and its Effects upon Birth Intervals in Eleven Punjab Villages, India. *Journal of Chronic Diseases* 18:1125-1140.
- Raphael, Dana  
1975 Matrescence, Becoming a Mother, A "New/Old" *Rite de Passage*. *In* *Being Female: Reproduction, Power, and Change*. Dana Raphael, ed. pp. 65-71. The Hague: Mouton.  
1976 *The Tender Gift: Breastfeeding*. New York: Schocken Books.
- Raphael, Dana, ed.  
1979 *Breastfeeding and Food Policy in a Hungry World*. (International Conference on Human Lactation, New York, 1977). New York: Academic Press.
- Rosaldo, Michelle Zimbalist, and Louise Lamphere, eds.  
1974 *Woman, Culture, and Society*. Stanford: Stanford University Press.
- Salber, Eva J., Manning Feinleib, and Brian MacMahon  
1965 The Duration of Postpartum Amenorrhea. *American Journal of Epidemiology* 82:347-358.
- Schlegel, Alice, ed.  
1977 *Sexual Stratification: A Cross-cultural View*. New York: Columbia University Press.
- Sende, Pierre, Nicholas Pantelakis, Kotaro Suzuki, and Richard Bashore  
1975 Plasma Oxytocin Level in Pregnancy with Diabetes Insipidus. *Clinical Research* 23:242A.
- Thorner, M. O., and G. M. Besser  
1977 Hyperprolactinaemia and Gonadal Function: Results of Bromocriptine Treatment. *In* *Prolactin and Human Reproduction: Proceedings of the Sero Symposium*, vol. 11. P. G. Crosignani and C. Robyn, eds. pp. 285-301. London: Academic Press.
- Tietze, Christopher  
1961 The Effect of Breastfeeding on the Rate of Conception. *Proceedings of the International Population Conference*, New York 2:129-136.
- Tulchinsky, Dan, and Kenneth J. Ryan  
1980 *Maternal-fetal Endocrinology*. Philadelphia: W. B. Saunders Co.
- Turner, Victor  
1967 *The Forest of Symbols*. Ithaca: Cornell University Press.
- Tyson, J. E.  
1977 Neuroendocrine Control of Lactational Infertility. *Journal of Biosocial Science Supplement* 4:23-29.

- Vigersky, Robert A., Arnold E. Andersen, Ronald H. Thompson, and D. Lynn Loriaux  
1977 Hypothalamic Dysfunction in Secondary Amenorrhea Associated with Simple Weight Loss. *New England Journal of Medicine* 297:1141-1145.
- Whiting, Beatrice B., ed.  
1963 *Six Cultures: Studies of Child Rearing*. New York: John Wiley.
- Whiting, John W. M., and Irvin L. Child  
1953 *Child Training and Personality: A Cross-cultural Study*. New Haven: Yale University Press.
- Wilmsen, Edwin N.  
1978 Seasonal Effects of Dietary Intake on Kalahari San. *Federation of American Society for Experimental Biology Proceedings* 37:65-72.
- Wolf, Margery, and Roxane Witke, eds.  
1975 *Women in Chinese Society*. Stanford: Stanford University Press.
- Yen, Samuel S. C.  
1978 Physiology of Human Prolactin. *In Reproductive Endocrinology: Physiology, Pathophysiology and Clinical Management*. Samuel S. C. Yen and Robert B. Jaffe, eds. pp. 152-170. Philadelphia: W. B. Saunders Co.

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