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Breastfeeding and Milk Insufficiency  
in Esmeraldas City, Ecuador:

A Biocultural Perspective

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# Breastfeeding and Milk Insufficiency in Esmeraldas City, Ecuador: A Biocultural Perspective<sup>1</sup>

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## ABSTRACT

While it is widely recognized that breastfeeding is best for babies, many women stop breastfeeding earlier than recommended because they believe they are producing insufficient milk. There is a debate about whether women who report insufficient milk actually produce less breastmilk, or whether the perception of milk insufficiency results from factors such as cultural beliefs, misconstrual of the breastfeeding process, or inadequate social support. The present project is an ongoing longitudinal study from September 1998 through October 1999 following  $n = 72$  women and their babies over at least an eight month period in the city of Esmeraldas, Ecuador. Thus far 44% of participating women have complained of milk insufficiency at some point. Preliminary analysis suggests that age, multiparity and nutrition are factors influencing very early reports of milk insufficiency, while reports of milk insufficiency between two and four months are sensitive to economic conditions and to the age of introduction of supplements. In line with recent calls for biocultural approaches in public health and human biology research, the project aims to understand breastfeeding milk insufficiency by

- 1) a thorough investigation of women's cultural understanding of breastfeeding practices;
- 2) a longitudinal investigation of biological factors such as maternal and infant nutritional status, fat concentration of breast milk, and volume of milk intake by infants; and
- 3) a careful weighing of both cultural and biological variables in relation to milk insufficiency.

This is the first study combining test-weighing, creatinocrit analysis, and structured observations to be carried out in a developing country.

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## INTRODUCTION

This research is an ongoing longitudinal study to assess the interaction of factors associated with reports of milk insufficiency among  $n = 72$  breastfeeding women in Esmeraldas city, Ecuador. The study will provide data to answer unresolved questions in the literature on milk insufficiency. Among others, what is the relationship of reported milk insufficiency to the nutritional status of mothers and their babies? What is the relationship, if any, between real and perceived variation in milk production? One component is following 47 women, combining interviews, nutritional and observational data with test-weighings of milk consumption of infants and measurement of fat content of breastmilk. Another component is following 25 more women collecting mainly interview and nutritional information. The study combines measures of infant milk intake (by test-weighing using high precision scales), milk fat content (by the creamatocrit method), and maternal and infant nutritional status (through anthropometry) with a cultural and behavioral investigation of breastfeeding (through interviews and structured observations). This is the first study combining all of these methods to be carried out in a developing country. This is important because the effects of breastfeeding problems on child health and survival are far greater in poor countries than in rich countries. The results thus far are showing a high degree of the problem of perceived milk insufficiency, it appears due in part to cultural elaboration of the phenomenon and in part due to the socioeconomic crisis that is affecting Ecuador; but there are some indicators that biological factors, such as multiparity, nutrition as well as age of the mother are contributors to the problem as well.

## Literature Review

Gussler & Breisemeister's seminal (1980) article on what they termed "insufficient milk syndrome" was the first to offer a biocultural explanation of the phenomenon. They argued that rather than being only a culturally appropriate excuse to stop breastfeeding, milk insufficiency is "real" and associated with extended periods of separation between mothers and infants and scheduled rather than "on demand" patterns of breastfeeding in urban settings. Greiner et al. (1981) refuted Gussler & Breisemeister's assertion that urban patterns of breastfeeding necessarily result in milk insufficiency, citing instances where mothers and infants with less contact are able to breastfeed successfully. They like most other critics of Gussler & Breisemeister suggest that the real problem is the widespread use of infant formula. Van Esterick (1988) goes further, arguing that calling milk insufficiency a biomedical problem legitimizes the marketing of infant formula.

More recent studies of milk insufficiency have concluded that cultural practices, psychosocial factors, and breastfeeding behavior are directly linked to what is perceived as milk insufficiency. Hill & Aldag (1991) and Hill (1991) report a survey of 384 U.S. mothers that found the best predictors of milk insufficiency during the first 8 weeks postpartum were fussy infant behavior, low maternal confidence, poor maternal health, mother-in-law disapproval, and early introduction of solid foods and formula. Forman et al. (1992) in a study of a large sample of 1005 urban Bedouin Arabs of Negev, Israel, interviewing mothers and measuring weight and length of their infants, found that reported milk insufficiency was the reason 72% of women

gave for introducing bottles before two months. Interestingly, milk insufficiency was associated with multiparity.

Studies in public hospitals in Hermosillo, Mexico interviewed in a first study 73 mothers (Perez-Escamilla et al. 1992a, 1992b), finding that adverse hospital environment was associated with high rates of formula use and reports of milk insufficiency at sixteen days postpartum (46%). In a second study (Perez-Escamilla et al. 1993, Segura-Milan et al. 1994), 165 mothers were interviewed, 107 from a hospital with an innovative rooming-in and education program promoting breastfeeding. While 80% of mothers reported milk insufficiency at some point during the study, reports within eight days ( $n=75$ ) were most related to maternal confidence, maternal education, and whether the hospital allowed rooming-in and provided breastfeeding information. Determinants of lactation success changed as the infant grew older, but sociocultural and biocultural determinants were always more important than biological factors like birth weight, infant sex, parity, maternal weight, height and triceps skinfold.

Hillervik-Lindquist et al.'s (1991) study of 51 well educated Swedish mothers was the only longitudinal study to use test-weighing as a method. Mothers were given scales and asked to measure their infants' weight and 24-h milk intake at age 1 week, 1,2,3,4,5, and 6 months ( $\pm 1$  week), and during and one week after perceiving milk insufficiency. Over half the mothers experienced milk insufficiency at some point ( $n=28$ ), and were categorized as the "crisis" group. The authors conclude that while there was no significant difference in measured milk intake during and one week after the "crises", infants' weight-for-age and intake were significantly lower in the crisis group at several points during the study.

Although cultural factors have been identified as the major cause of milk insufficiency, the question of whether milk insufficiency is "real" or only perceived is still an important question. Tully & Dewey (1985) interviewed a total of 217 mothers from four ethnic groups, finding that while 35% to 40% of all mothers reported milk insufficiency within the first 6 weeks, these reports were first associated with psychosocial factors rather than with biological inability. But cultural responses could lead to actual reduction in milk supply; for example, use of pacifiers, introducing bottles, or decreasing nursing frequency so the breasts feel more "full" before feeding.

While studies of milk insufficiency have shown that behavioral factors can be important in early lactational problems, other research suggests that behavioral influences may become even more important later in lactation. Theories support a shift from endocrine to "autocrine" control of milk production as lactation progresses (De Coopman 1993, Daly & Hartman 1995a, 1995b). Endocrine control is a hormonal control, which acts on both breasts, and seems to be more important at the beginning of lactation. On the other hand, "autocrine" control is a local control operating separately within each breast in relationship with milk removal, and regulated, according to De Coopman (1993), to match the "demand-appetite" of the infant and to prevent over production of milk, since milk production is costly to the mother. This "autocrine" control appears to become more important from the third to fourth month on. This may then be a crucial time for the development of milk insufficiency, but this question needs more research because most studies of milk insufficiency have concentrated on early lactation.

Although there is evidence that maternal nutritional status may have little to do with production of breast milk, still there is inconclusive data on this matter. The Institute of Medicine (1991) in an extensive review of the literature on breastfeeding and nutrition concluded that data from different populations are mixed in terms of how maternal nutritional status affects lactation. While maternal nutritional status is not related to milk production among healthy women in industrialized countries, data are not conclusive from non-industrialized countries. There is established data showing that the composition of human milk, especially the lipid composition, changes from mother to mother, day to day, and with the mother's diet (Haug & Harzer 1987, Harzer & Bindels 1987, Woolridge 1995).

## METHODOLOGY

### Research Design

This is a longitudinal study from September 1998 to October 1999. The units of analysis are  $N = 72$  breastfeeding women 20 to 40 years old. The dependent variable is whether women complain, perceive, or have problems with the "normal" production in quality or quantity of their milk. Independent variables are the nutritional, socioeconomic and ethnographic data that this research is gathering. The first group of  $n = 25$  women are participating in a component of the research in which anthropometric and interview data are being collected over 10 months. Structured prospective observations of breastfeeding within a 12-hour frame were collected for two months. Structured retrospective recalls of breastfeeding within a 24-hour period (following the methods of Gray 1995) were collected just for one month. This first component of the research was designed to become familiar with the structure of breastfeeding in Esmeraldas before the more intensive test-weighing began with the second group, as well as for the refinement of methods and for the comparison of prospective data on breastfeeding behavior from direct observations with retrospective recall of breastfeeding behavior to determine how reliable the retrospective data are. The main focus of the study is the second group of  $n = 47$  women from whom data is being collected over 8 months on anthropometry, lipid content of milk samples, test-weighings, structured prospective observations within a 12-hour frame, and ethnographic information about breastfeeding views and practices. This total of  $N = 72$  women and their babies have been followed with monthly visits.

### Research Site

Ecuador's northernmost coastal province of Esmeraldas is located between the equator and 1°0 north latitude in a tropical rain forest riverain basin, biogeographically distinctive because of the effect of the *El Niño* current and being limited by the high Andes cordillera to the east (Estupiñan 1984). The province borders on Colombia to the north from where an ongoing migration is occurring. Esmeraldas is the poorest province of Ecuador, peripheral to polarization of successive governments at Quito and Guayaquil, the major cities of Ecuador (Cueva 1982). Esmeraldas city is the capital of the province, an intermediate size city (134,960 according to the 1990 census) that is a center for migration from smaller towns and villages (Middleton 1981). The majority of residents are Afro-Ecuadorian, as opposed to only 5% in

Ecuador as a whole (Corkill & Cubitt 1988). Following a racial and ethnic hierarchy typical of Latin America, élites are usually *mestizo* or white, and in Esmeraldas furthermore mainly Quitenians and Guayaquilenians. Whitten (1974) suggests this hierarchy is a rather recent introduction of national patterns of stratification and describes a process of “ruralization” of Afro-Ecuadorian neighborhoods where people are blocked from participating fully in urban life. The majority of poor neighborhoods are either very low on the flood plains of the river or very high on the unstable sandy clay ridges above the city. The municipal and provincial government fails to provide basic services to the population like ditches to collect water runoff, garbage collection, and potable water delivery. All of these factors combined with flooding and mudslides due to the *El Niño* phenomenon in the winter of 1998 and the economic crisis that Ecuador is currently experiencing means that throughout much of this research period the city has literally been on the constant verge of collapse.

### Sampling Procedure

The sampling procedure had to be redesigned to include the entire city rather than only Esmeraldas parish as was originally proposed, for the following reasons. First, the devastating effects of the *El Niño* phenomenon in 1998 caused many people to be relocated. Second, recruiting of women for this study has been complicated, in part due to them having to fit the parameters of this research (see below), and in part due to the difficulty of finding pregnant women when all contacts are informal and there is little functioning health infrastructure for identifying them. Third, the assistants for this research reside throughout the city and helped to recruit women in their respective neighborhoods. Informed consent was obtained from all women recruited for this study.

The number of women selected was greater than the target sample size ( $N = 72$ ) as it was expected that after giving birth, some of the initial sample would not fulfill the following criteria. Only women who had a vaginal delivery, without complications, of a full term infant (birth  $> 2500\text{g}$ , gestational age  $> 37$  weeks, and an Apgar of  $> 7$ ) were included. This information from home births was assessed as closely as possible from maternal recall or midwives who attended the birth, asking about appearance, movement and response of the baby in the first minutes after birth. Only women who had previously had a child were selected since, as mentioned above, multiparity is a possible factor associated with milk insufficiency. For the first component of the research, 36 women due to give birth in November–December 1998 were recruited in an initial sample. We continued with 32 who fulfilled the criteria mentioned above, but ended with 25 due to further selection. For the second component, 78 women due to give birth in February–March were recruited in an initial sample; we continued with 61 who fulfilled the criteria mentioned above, and ended with 47 due to further selection. For the first group the total of 11 dropouts were for the following reasons: 4 caesareans, 3 lost due to changes of address, 2 decided not to collaborate, 1 husband disapproved, and 1 had to go to the hospital for surgery. For the second group, the reasons for a total of 31 dropouts were as follows: 11 caesareans, 3 mothers did not give birth during the expected period, 1 did not fit the age and parity criteria, 1 baby was stillborn, 7 were lost due to changes of address, 4 decided not to continue with the research, 2 had such crowded living conditions that it was impossible to fit an assistant and scale there, 1 husband disapproved, and 1 moved out of the city. Further, the second group includes one

primiparous woman and one 18-year-old woman, both of whom while not fitting one of our criteria we retained because they were so enthusiastic to participate.

## Data Collection

### Materials and Methods

In September 1998, I settled in Esmeraldas city and hired and trained six assistants. Five of the assistants are senior students from the School of Nursing at the Catholic University of Esmeraldas, and one is a recent graduate of the program. In October we conducted interviews using an initial questionnaire with 36 women for the first component of the study. Information gathered included: views and practices associated with breastfeeding, including circumstances in which it is inappropriate to feed or that influence milk production, ideas about colostrum, whether sorcery or envy or "evil eye" could influence milk production, and whether milk insufficiency is a culturally accepted reason for weaning; demographic data including maternal age, parity, household members and residence history; data about future plans, including intended plans for delivery and infant feeding, previous breastfeeding experience, maternal confidence, and advice from family members, household members, neighbors or health workers. The women were revisited 8–15 days postpartum, at which time we used a second questionnaire for postpartum data like place and characteristics of the delivery, Apgar estimate, early contact and feeding of the infant, infant feeding policies in the hospital or feeding practices at home births, the early experience of milk production, reported frequency and duration of feeds, infant feeding behavior and perceived thriving. Reported frequency of nursing may not accurately reflect actual feeding frequency (Vitzthum 1994b), but it is being collected as an indicator of women's perceptions of feeding frequency.

At that time and then again a month later, a 12-hour schedule of structured breastfeeding observations were carried out. Assistants in training kept activity diaries to record observations within a 12-hour frame, following the procedures of Vitzthum (1988, 1994a). Structured observations include suckling magnitude and frequency to the nearest minute, who initiates and terminates nursing sessions, and other activities engaged in while feeding. Supplementary food intake is also recorded, including measurement of the volume of any breast milk substitute (formula, cow's milk, coladas) consumed and notation of the type and approximate amount of other supplements. Assistants also make informal observations of breastfeeding and utilize the LATCH score technique developed by Jensen et al. (1993) to make systematic visual assessments of key functional components like infant's ability to latch, audible swallowing, and mother's comfort and position. On the day of the 12-hour observation I visit each woman to conduct the monthly interview and assess nutritional variables through anthropometry. The anthropometric measurements taken are length, weight, arm and head circumference of the babies, and height, weight, and arm circumference, and triceps and subscapular skinfolds of the mothers. The materials used for anthropometry are an infant measuring board (Seca), a portable anthropometer (GPM), a Lange Skinfold Caliper, an adult spring scale (Seca), and pediatric metric tapes.

We inquire as well about the states of health of mothers and infants, and their states of health for the preceding month. After the first postpartum interview, subsequent monthly

interviews have utilized a third questionnaire to assess longitudinal changes in household composition, cultural views and practices, and socioeconomic information. Socioeconomic information collected includes noting observed indicators such as the possessions of the household, method of cooking, and type of residence. Whether the residence is rented or owned, type of income of the household, and changes in income of the household have been requested only with the third and later interviews when rapport was well established. For the first month we revisited each woman the day following the 12-hour observation and elicited a maternal recall of breastfeeding activities of the previous day by narrative reconstruction of their activity schedules for the entire 24-hour period. This initial study showed that the recall data was quite unreliable, and so the 24-hour recalls were not continued.

The initial sample of 78 women for the second component of the research were interviewed in December and January using the initial questionnaire; the second questionnaire was administered to these women eight to fifteen days postpartum. At that time and monthly thereafter a 12-hour schedule of test-weighing and structured breastfeeding observations have been carried out by the assistants. Anthropometry, interviews, and collection of a small milk sample is also conducted on this day. For assessing milk intake volume we are using the 12-hour test-weighing technique (Brown 1986, Garza et al. 1986). Test-weighing involves weighing the baby before and after each nursing session using a portable integrating electronic balance. This research uses three of these balances, two Dina baby balances with printer, accurate to 5 g, and one lightweight Ohaus accurate to 2g. All the balances function with either electricity or battery.

For the compositional analysis of milk fat, we utilize the creamatocrit method described by Lucas et al. (1978). Fat is the major determinant of the energy value of breast milk due to the relative constancy of the contribution of protein and lactose, thus most of the energy variation in milk is due to variation in fat. The creamatocrit materials are a hematocrit centrifuge (Clay Adams), standard glass capillary tubes (75 x 1.5 mm, without heparin), and a very small sample of milk (about 75 ul) drawn into a capillary tube sealed at one end with plasticine and centrifuged for 15 minutes. The length of the cream layer is then measured and calculated as a percentage of the total length of the milk column (Lucas et al. 1978, Jensen et al. 1985) using a standard hematocrit measuring ruler (MLW). The advantages of this method are that preparation of the sample is not required, and the low cost, making it suitable for fieldwork. Very small samples of breast milk are taken manually by the women on their 12-hour schedule day, during the first mid-morning feed, two minutes after let-down has occurred (Neville et al. 1984, cited in Jensen et al. 1985), then picked up by myself and centrifuged at my home within six hours of collection.

## Data Analysis

Some preliminary results will be stated below. The complete analysis of the data will be conducted at my home institution the City University of New York Graduate School over the next year upon returning from the field in October 1999. In initial analysis of the data, t-tests and chi-square tests will be used to compare such variables as breastfeeding structure, ideas and beliefs about and experiences of breastfeeding, test-weighing results, creamatocrit percentages, socioeconomic status, social support, hospital practices, and anthropometry between women who report milk insufficiency and those who do not. Since it is expected that the factors that

influence breastfeeding success will change over the course of lactation, these analyses will be conducted separately for different age groups of infants. Based on the initial analysis, multiple regression analysis will be used to determine what set of variables is the best predictor of milk insufficiency. This first analysis will provide the basis for comparison and analysis of cultural and biological factors.

## PRELIMINARY RESULTS

Of the seventy-two (72) women participating in the study, only two have fully weaned their babies at this time. The most common supplements offered to the babies are herbal teas, mashed banana, coladas and, less commonly, formula. Fifteen percent (15%) of all mothers, including the two women who have fully weaned at five months, were using all of these very early before one month. Thirty-one (31) mothers (43%) had introduced supplements by one month; 47 (65%) was the total offering supplements by two months; and by three months, 55 (76%) were offering supplements to their babies. Thirty-two women (32) so far at some point during the study have complained of milk insufficiency, representing 44% of the total of the sample. Of these, 53% introduced supplements by one month and 88% by three months, compared to only 35% and 68% respectively for the rest of the women. Of the 32 women who have complained of insufficient milk, 27 complained within the first four months. Of them, 20 women complained between the second and fourth month. Interestingly, half of all initial complaints occurred in the month of April, the second month of a severe economic crisis that is presently occurring in Ecuador. Seven (7) mothers (two from the first group and five from the second) mentioned very early to have some problems breastfeeding at the first visit post-partum. From these seven women, four mothers have high age and high multiparity: One mother of 38 years with 9 children, one mother of 38 years with 3 children, one mother of 40 years with 4 children and one mother of 40 years with 12 children. Then there are two mothers of chronically low weight, and one mother with a very low weight (37 kg x 150 cm).

Data being gathered through structured observations, test-weighing and creatinocrit is ongoing and will continue through October of 1999 in order to ensure that all mothers and their babies have been followed for at least eight months. We are in the process of converting the structured observation written narratives conducted thus far into graph form to have a visual representation of breastfeeding structure (as per Vitzhum 1994), including bar graphs to the nearest minute of time spent suckling, time spent sleeping and crying of the baby, and time offering of supplements. The breastfeeding structure before one month appears to be clearly delineated sessions of on average 7–8 minutes on alternating breasts every 1½ to 1¾ hours. Within these parameters there appears to be a very small difference in early breastfeeding magnitude and frequency between women who report milk insufficiency and those who do not, but by three months the difference in frequency is marked with those reporting insufficiency breastfeeding their babies on average 10.9 minutes every 3½ hours compared to 10.45 minutes every 1¾ hours for the rest of the women. It may be that very small differences in early breastfeeding magnitude and frequency influence reports of milk insufficiency. Those perceiving insufficiency then breastfeed less frequently by three months. The test-weighing results appear to confirm that the babies of women who report milk insufficiency are consuming less breastmilk than their peers. Creatinocrit analysis of milk samples from the mothers suggest a

consistently normal to high normal percentage of milk fat in this population. The only exceptions are two mothers 40 years old that complain of milk insufficiency and have consistently low normal creatocrit percentages.

As to health care delivery, I can say that prenatal care and practitioner attendance at delivery are very poor or nonexistent for many people (even at the public hospital one woman was not attended). The informal system of midwifery, popular and robust just a few years ago, is now declining with the aging of these women and concerted efforts by the public health authorities to control their activities. Of these mothers 74% gave birth at the hospital or clinic and 26% at home, whereas just fifteen years ago those percentages were reversed. Nevertheless, mothers still use many traditional activities related with childbirth and breastfeeding. Nearly all of the mothers used herbal remedies after delivery, especially teas made from one called the “birthing” (*nacedera*) plant, in part to increase early production of milk.

## DISCUSSION

It appears that in general breastfeeding problems in Esmeraldas including milk insufficiency are influenced by cultural views and practices, socioeconomic and nutritional factors. Although the stage of the analysis is not advanced enough to draw hard conclusions yet, the data thus far suggest that

- 1) reports of milk insufficiency between two and four months are most sensitive to economic conditions, breastfeeding frequency and the early introduction of supplements, and
- 2) age, multiparity and nutrition of the mother are factors influencing very early reports of milk insufficiency. The most interesting result thus far has been the dramatic effect of the economic crisis.

While inflation has been high and the country in recession for several years, recently the economy of Ecuador has gone into a deeper crisis. In March of this year (1999) the value of the Ecuadorian sucre dropped 100% against the dollar in just one day, and the government froze all dollar bank accounts and half of the sucre accounts. Prices of most basic goods and services immediately nearly doubled, and in some cases went even higher, as some merchants tried to take advantage as much as possible. Salaries have not risen correspondingly. On the contrary, many people lost their jobs or had their salaries deferred or reduced. In general here in Esmeraldas, in the city as well as the wider province, the crisis is the cause of many changes in the lifestyle of the people, along with an increase in despair, uncertainty, violence, crime, and migration to other countries. The rate of inflation here has been the highest in the country. General strikes accompanied by riots have closed down the city three times for a period of several days over the last four months. Changes with the crisis that have directly affected the lives of the mothers participating in this study we could summarize as follows:

1. There is a drastic increase of unemployment in the households. Many mothers are looking for work, or already working, leaving their baby home with others for much of the day.

2. Families eat less, both in frequency as well as in content. For instance, instead of the usual three or two meals a day, they now eat two or only one. Whereas in the past they used 2 lbs. of bones in a soup, now they use 1 lb for the same amount of soup. They consume more carbohydrates and less proteins.
3. There are other behavioral changes with the crisis. Sharing food, which is such a part of the Esmeraldas culture, now has become more difficult. People are reluctant to have guests now since they cannot offer as much as in the past. This made some mothers reluctant to continue in the project since they cannot offer as much food as before to the assistant conducting the 12-hour observations. We have attempted to reassure them and they are continuing with the project. Some mothers have stated that they now feel forced to breastfeed, because there is not money to buy formula.

In short, the crisis has had profound effects on nutrition. While the babies in this study are all within normal parameters and growing well, parameters to measure nutritional status are not only measurement of growth and calories consumed. I am also taking into account health and sense of well-being for a complete analysis. The mothers are under a great deal of stress and both mothers and babies are more often ill since the crisis. Although this research is on insufficient milk, I am concerned about these other issues as well, and not just as factors affecting the phenomenon of milk insufficiency.

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