

INTERFACING ANTHROPOLOGY AND EPIDEMIOLOGY: THE BEDOUIN ARAB INFANT FEEDING STUDY

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Abstract—This paper encapsulates a 10 year effort of multi-disciplinary research on the relationship between infant feeding, growth, and morbidity among the Negev Bedouin Arabs of Israel as they underwent a transition from semi-nomadism to urban settlement. The research team was multi-disciplinary including a nutritional epidemiologist and an anthropologist who both came to the study with previous experience in interdisciplinary work. The specific study objectives were (1) a description of infant feeding practices among Negev Bedouin Arab women at various stages of settlement, (2) an examination of the trend in these infant feeding practices, (3) a comparison of the extent to which different infant feeding practices are related to infant morbidity and growth after adjustment for exposure to social change and other covariates. The data collection took place in 1981-83 and the analysis from 1984-88. In this paper, two areas of the study are discussed in depth: the duration of exclusive breast feeding during the practice of the traditional postpartum 40 day rest period, and the development of a culture-specific scale of socioeconomic status. Through these examples, we highlight the use of ethnographic data and the merging of epidemiology and anthropology from hypothesis generation through data collection, data analysis and interpretation.

Key words—interdisciplinary, triangulation of data, growth, breastfeeding

The Bedouin Arab Infant Feeding Study was a prospective cohort study of Bedouin Arab women and their newborns residing in the north eastern Negev, near Beersheba Israel. It was designed as a longitudinal observational study of subcohorts of selected normal healthy newborns in 1981, with follow-up from the 6th through the 18th month of the infant's life. Another sub-cohort born in 1982 was followed from birth through the first nine months of life.

The overall study objective was to examine the association between infant feeding patterns, growth, and morbidity during the period of planned social change from a semi-nomadic lifestyle to urban settlement. Specific study objectives included: (1) a description of infant feeding practices among Bedouin Arab women with varying exposure to social change, (2) an examination of the trend in infant feeding practices among Bedouin Arab women who delivered the years before and during the planned social change, and (3) a comparison of the extent to which different infant feeding practices are related to infant morbidity and growth after adjustment for exposure to social change and other covariates. The data collection took place in 1981-83 and the analysis from 1984-88.

Based on examination of aspects of the research process during the Bedouin Arab Infant Feeding Study, this article describes the way in which the biomedical paradigm of epidemiology can be shifted and enriched by interfacing with medical anthropology. Sporadically over the last 25 years, various

epidemiologist and social scientists have written about the way in which the intermeshing of these two disciplines is potentially illuminating [1-5]. The perspective common to these articles is on the complementarity between epidemiology and social science.

Some have focused on the different methodological approaches of the two disciplines. Dunn and Janes write in their introduction to a collection of articles on anthropology and epidemiology:

Although one kind of measurement is very difficult to combine with the other in a single step, qualitative and quantitative measurement may inform the other at different stages of the research process [4, p. 20].

Others perceive that methodological collaboration has theoretical implications. For example, Nations writes that "using material on people's beliefs and practices will force us to wrestle conceptually . . . In short, it represents as a significant paradigm shift" [5, pp. 118-119].

The authors of this article share the view propounded by Janes, Stall and Gifford that:

it is not simply a matter of applying anthropological technique or theories to understanding disease and disorders; a wide range of possible research alternatives exists from enlivening epidemiological data with ethnographic detail to direct involvement by anthropologists in epidemiological research [6, p. viii].

The object of this article is to illustrate stages in the research where interfacing the two disciplines influenced the theoretical and methodological process and

altered the study design, data and findings. Among the team members of the infant feeding study of Negev Bedouin Arabs in Israel were the authors of this paper, a nutritional epidemiologist (MF) with research experience in infant nutrition and morbidity, and a medical anthropologist with a decade of work among the Negev Bedouin Arabs (GLH).

STUDY DESIGN AND METHOD

The study was conducted in collaboration with the National Institute of Child Health and Human Development, Bethesda, Maryland and the Ben Gurion University of the Negev, Beersheba, Israel. The study population comprised all the Bedouin Arab newborns in the Negev during 1981 and 1982 who were delivered at the hospital or a home ($N = 4580$). Except for hospitalization and birth interviews, mothers of multiple births, babies who were premature, had birthweights of less than 2200 g, had congenital anomalies or were hospitalized at birth for more than 10 days, were excluded from the sample. The mothers of the newborns were interviewed 2-3 days after giving birth in the hospital and subsequently at home at various intervals during the first 18 months of their infant's lives.

There were two cohort of mothers and infants who were divided into sub-samples and interviewed at the following stages:

1. The 1981 cohort had two sub-samples of mothers and their healthy newborns who were interviewed at home when the infants were 6 months old ($N = 539$ and 406 , out of 2253 newborns). One of these sub-samples was re-interviewed when the infants were 12 and 18 months old ($N = 385$ at 12 months and 352 at 18 months).
2. The 1982 cohort consisted of 2426 infants. The mothers were interviewed shortly after giving birth and then one sub-sample of 412 was re-interviewed at home 2 months after birth, and again when the infants were 9 months old ($N = 376/412$). Another sub-sample was re-interviewed at 6 months ($N = 243$).

At these interviews, data on infant feeding patterns, the social and physical environment, health service utilization, anthropometrics and illness cared for at home were collected. In addition, data were abstracted from hospital records and mothers were interviewed when their children were hospitalized.

The authors do not intend to review every phase or aspect of the development and completion of the study. Rather this paper spells out the methodological process which led to the interpretation of the findings [7, 8]. Specifically we illustrate the methodological interchange which occurred during the data collection, analysis and interpretation by describing two representative samples. The first is the development of a culture-specific scale of socioeconomic

status and the second is the association between the forty day post partum rest period and the duration of exclusive breastfeeding among Negev Bedouin Arab women. Although the examples are specific to the study, the strategies and process can be generalized.

THE DEVELOPMENT OF A SCALE OF SOCIO-ECONOMIC STATUS

One area of the study where there was an interface of anthropology and epidemiology was the development of a scale of socio-economic status. One of the study objectives was to review how changes in infant feeding patterns were linked to social change. Some studies use a technique of "rapid ethnographic assessment" [9]. This is of course a possible strategy when there is no literature or expertise available concerning the socio-cultural context of a study. In this case the expertise was derived from the anthropologist's previous work amongst Bedouin Arab women [10].

Background

The Negev Bedouin Arabs are a population of about 70,000. They live in the north eastern Negev and are undergoing a process of transition from semi-nomadism to urban settlement. Few families live entirely from their flocks of sheep and goats and their crops of wheat and barley, since there is little land available for pasture or cultivation. Land has been used for intensive agriculture by Jewish cooperative settlements, for industry by chemical companies and for development towns, nature reserves, and army manoeuvres. Most families live from wage labour, with or without agriculture and herding.

The settlement process has resulted in a wide variety of living conditions, economic circumstances, and household structures. Some extended family households live in tents in small encampments. They herd their flocks and grow crops with perhaps one member of the household working in wage labour as a truck driver or a night watchman. Others live in huts in unplanned subtribal clusters which vary in size from 15 to 1500 households and are similar to shanty towns throughout the world. Tent and hut dwellers live without running water, central sewage, and rubbish disposal systems: yet some have electricity supplied by a generator. Others who live in houses or huts in one of the five planned towns have access to roads, drainage, running water, clinics, schools and public transport. About two-thirds of the families in the planned towns live in houses with running water and tiled floors, while the remainder, who are in the process of building a home, live alongside their unfinished homes in huts with earth floors and water from pipe outlets some distance away.

Ethnography: the sub-tribe as the unit of social change

Whole sub-tribes move into the towns together, but the pace at which each family builds a home varies

association between the period and the duration of living. Negev Bedouin Arab households are specific to the area and cannot be generalized.

DEVELOPMENT OF A SCALE OF SOCIO-ECONOMIC STATUS

There was an interface between ethnography and sociology. The development of a scale of socio-economic status. One of the challenges was how changes in infant mortality related to social change. Some possible ethnographic assessment strategies were available when conducting a study. In this case the anthropologist's work with Negev Bedouin Arab women [10].

There are a population of about 1 million in the north eastern Negev. The process of transition from nomadism to settlement. Few families live in tents, keep sheep and goats and their livelihood since there is little land available for cultivation. Land has been acquired by Jewish cooperative agricultural companies and military reserves, and army personnel derive income from wage labour, and herding.

This has resulted in a wide range of socio-economic circumstances. Some extended family live in tents and small encampments. They work with perhaps one or two men in wage labour as day labourers. Others live in small clusters which vary in size and are similar to those in the world. Tent and hut dwellers have water, central sewage, and electricity, yet some have electricity. Others who live in houses in planned towns have access to water, clinics, schools and shops. About two-thirds of the population live in houses with electricity, while the remainder, who are building a home, live in tents or huts with earth floors and outlets some distance

THE UNIT OF SOCIAL CHANGE

In the towns together, but in the villages builds a home varies

enormously depending on its resources. Households consist of either extended family members or members of a nuclear family. The variation depends on the family developmental cycle and personal preference. Although many nuclear families make up individual households, it is the extended family which combines resources to initiate home construction. Thus, the decision to live in encampments, unplanned clusters, or planned towns, is a sub-tribal one and not that of an individual household [11]. This ethnographic observation led to a key indicator for determining socio-economic groups, notably place of residence by sub-tribe, which was demarcated on a map of the Negev Bedouin Arabs.

The ethnography also provided information regarding the potential use of 'conventional' indicators of socio-economic status such as paternal occupation. It was unclear how the occupation of Bedouin Arab men could be used to measure socio-economic status in this population. Although Bedouin Arab men worked in a wide variety of skilled and unskilled manual labour—lorry drivers, watchmen, construction workers of all types, assembly line workers—there was little variation in the level of their individual wage levels. Few girls and women worked, although their number was growing as were the numbers of Bedouin Arab teachers, lawyers, and doctors. Secondly, since residence was patrilocal and sub-tribal, there was often a wide variation in education and living conditions by sub-tribe. In addition there was often a sharing of economic resources amongst the extended family. Therefore, information on the father's occupation alone was an inadequate indicator of the economic resources of the household and would not illuminate different levels of socio-economic status within Negev Bedouin Arab society.

Debate about the limitations of occupation as a measure of socio-economic status [12–14] has led to the development of 'indices of social disadvantage' which use several aspects of living conditions rather than occupation as the sole indicator. The questionnaires were therefore designed in line with this approach and a breadth of information was collected at the initial interview with each mother. The specific areas addressed included: living conditions (type of floor, electricity, water source), family structure, maternal and paternal occupation and education, household objects (furniture and appliances), shopping patterns, apparel, and transport.

The recognition of this socio-economic patterning arose from the previous experience and work of GLH. MF had also used a spatial approach of mapping residential clusters for the examination of socio-economic parameters in her work with the Pima Indians [15]. Her observations about SES patterns based on residential/census areas on an Indian reservation were highly correlated with the presence or absence of specific material goods e.g. refrigerators. Similarly the Bedouin Arab infant feeding study, we found that specific aspects of living con-

ditions such as electricity, flooring and type of water supply were associated with the place of residence. Thus, ethnographic observations and notes about the place of residence of each sub-tribe as the unit of social change resulted in the creation of a residential map of the Negev Bedouin Arabs which was of critical importance in the development of the scale of socio-economic status.

Data analysis: house type as the unit of analysis

Now the challenge was to move the ethnographic/residential clusters off the map and into the quantitative analysis, the data for which were collected at the individual household level, in order to create a scale of socio-economic status. The quantitative analysis involved a selection of 'culture specific' variables to form a 'meaningful' socio-economic scale. Preliminary analysis involved examination of the frequency distribution of all variables potentially indicative of socio-economic status; therefore, all items ranging from living conditions to apparel were reviewed. Only those items with sufficient variation were placed on the list of potential indicators of socio-economic status. These included: father's education, whether the father worked for wages, his occupational status, floor type, water source, and cooking appliance. We were surprised at the limited number of items with sufficient variation, but recognized that certain questions and their responses were of limited validity. For example a question on the size of the family flock had only 5% of the respondents reporting a flock size of 50 or more. A shortage of grazing had resulted in smaller flocks but in addition at that time the Ministry of Agriculture were actively discouraging large flocks so that there was a tendency to underestimate flock size when questioned. Some items applied to too few families; for example, few mothers used diapers for infants and toddlers at the time of the study. Other items were too generalized to be meaningful; for example, maternal dress was a mix of traditional and western amongst most women. Thus, recognition of the distribution of each item was a function of both ethnographic observation and questionnaire responses.

Preliminary analysis also revealed an association between house type and place of residence (Table 1). Among the families of infants born in 1981, 42% residing in traditional areas lived in tents and 48% lived in huts; 66% residing in transitional areas lived in huts; and 52% who were classified in an established planned town lived in houses. This table was the initial mirror reflection of the ethnographic mapping.

A set of cross-tabulations of the potential indicators of socioeconomic status by house type, in contrast with place of residence, demonstrated statistically significant associations with house type but not with place of residence. In a review of the map with these results, we recognized that characteristics indicating similar socio-economic status tended to cluster together geographically by house type. The

Table 1. The percentage (and number) of each housing type by place of residence and follow-up cohort

Place of residence	Housing type		
	House % (n)	Hut % (n)	Tent % (n)
Traditional (n = 530)			
Cohort 1981	10 (36)	48 (165)	42 (145)
Cohort 1982	14 (26)	59 (108)	27 (50)
Transitional (n = 443)			
Cohort 1981	13 (32)	66 (161)	21 (50)
Cohort 1982	11 (21)	74 (149)	15 (30)
Established (n = 579)			
Cohort 1981	52 (162)	37 (114)	12 (36)
Cohort 1982	64 (171)	27 (71)	9 (2)

concordance of the quantitative analysis with the ethnographic mapping led to house type being used as a reflection of our visual discrimination of socio-economic status.

In the next step of the data analysis, the variables significantly associated with house type on a univariate basis were subjected to discriminant function analysis with the dependent variable defined as tent (including tent and tent-hut dwellers), hut, and house (including house dwellers alone or in combination with any of the above type dwellings). Four variables, notably paternal education (0-16 years), floor type (tile, cement, or earth), cooking apparatus (electric or gas oven, primus stove, open fire), and water source (tap, outside water pipe, cistern, well) significantly distinguished the three housing types [8]. The discriminant function analysis, permitted us to determine the extent to which certain variables were related to house type and in turn to socio-economic status. Therefore the analysis was a validation exercise of our visual discrimination of socio-economic status. We found that the four variables, described in the text, discriminated the three house types. If we had not had good discrimination with these variables, we might have considered entering house type by itself into the discriminant function analysis, but we would not have used house type alone as an indicator of socio-economic status (Table 2).

These variables formed a socio-economic scale with the distribution of scores trichotomized into equal units of high, medium, and low SES groups. (The other variables which had been entered in the discriminant function analysis—job status and whether the father worked for wages—covaried with

Table 2. Percentages (number) correctly classified by housing type and by the classification summary of variables in the scale of socioeconomic status based on the discriminant function analysis, by cohort

Housing type	Variables in the SES scale		
	House	Hut	Tent
Cohort 1981			
House	66 (130)	30 (59)	4 (7)
Hut	15 (58)	72 (277)	15 (58)
Tent	(3)	10 (18)	88 (154)
Cohort 1982			
House	71 (129)	27 (50)	(4)
Hut	11 (31)	77 (219)	12 (33)
Tent	1 (1)	30 (28)	69 (65)

paternal education and were dropped from the analysis [8].)

Validity of the SES scale

The scale reflected the socio-economic variation within Bedouin Arab society in a way that both encompassed family living conditions and the process of sedentarization. It was used throughout the data analysis in relation to growth, morbidity and health services. For example, the family's socio-economic status was inversely associated with the rate of stunting as defined by height for age of two standard deviations or more below the WHO/NCHS standard.

Table 3 shows that the pattern appeared consistently over the first 18 months of life [8]. (During the 18 months, the whole distribution of height for age shifted to the left, so that there is an apparent increase in the rate of stunting across all SES, including the high SES group (Fig. 1) [8]). Thus this scale had predictive validity by being highly correlated with the rates of stunting and of hospitalized morbidity, which were two health outcomes consistently associated with malnutrition and disease.

In summary, the scale of socio-economic status was the direct result of ethnographic observation, quantitative data collection, statistical analysis and validation through health parameters. It would have been impossible to develop this socioeconomic scale without the interface of anthropology and epidemiology from the stage of hypothesis generation through questionnaire design, analysis, and interpretation.

THE FORTY DAY POST-PARTUM REST PERIOD

Hypothesis generation and questionnaire design

The seclusion of mothers and their newborns for 40 days postpartum is a practice observed in many societies [16, 17]. In Negev Bedouin Arab society, new mothers traditionally remain at home for forty days, receive help with their work, and congratulatory visits from their kin. As suggested by Raphael's work on breastfeeding [18], we thought that the persons providing the social support and help with the household chores during the 40 days might influence the establishment and maintenance of breast feeding or the use of supplementary feeding. Moreover, they might serve as role models and potential nutritional advisors for infant feeding practices. In a culture undergoing social change, the meaning and practice of the traditional 40 day post-

Table 3. Percentage stunted, (number in each stratum), and relative risk (RR) of stunting among a cohort of Bedouin Arab infants followed at 6, 12 and 18 months by socioeconomic status (SES)

Variable	6 months (n = 274)			12 months (n = 264)			18 months (n = 228)		
	% stunted	RR		% stunted	RR		% stunted	RR	
SES									
Low	19 (91)	1.00		27 (85)	1.00		40 (67)	1.00	
Middle	12 (105)	0.63		19 (103)	0.71		27 (89)	0.68	
High	5 (78)	0.26		11 (76)	0.41		31 (72)	0.78	

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each stratum), and relative of Bedouin Arab infants socioeconomic status (SES)

	18 months
	(n = 228)
ed RR	% stunted RR
1.00	40 (67) 1.00
0.71	27 (89) 0.68
0.41	31 (72) 0.78

partum period might be an arena in which changes in infant feeding practices would appear.

During the pilot and the first year of the study, one of the authors had observed changes in both infant feeding practices during the first 40 days postpartum and in the extent, type, and duration of social support occurring during the 40 day period. Therefore the authors hypothesized that women who had a shorter period of support during the 40 days might start using a breastmilk supplement earlier than those who had support during the full 40 days.

The original study design required an initial hospital birth interview of all Bedouin Arab women delivering newborns in 1982, with a home follow up of a select subcohort of mother/infant pairs when the infants were 6 months old. To capture the effects of social change on the 40 day postpartum period, the authors decided to select another sub-sample of the cohort (born from March to June 1982) for re-interview at 2 and again at 9 months. A questionnaire specific to the 40 day period was designed for administration at 2 months with items about the length and type of seclusion, the duration and type of help with work, the extent of visiting as well as the infant feeding practices of sisters and sister-in-law and mothers and mothers-in-law. This questionnaire also contained the core sections on infant feeding, morbidity, and growth of the index infant and on the socio-economic environment of all home interviews. Therefore the ethnographic observation and anthropological knowledge, concerning the importance of the 40 day post-partum period, resulted in a modification of the study design for the second birth cohort in the study.

Triangulation in data collection and integration of data analysis

Following the birth interview in 1982, the 40 day questionnaires were administered to 412 mothers at approximately 2 months post-partum. All quantitative data were collected retrospectively. Responses were limited to behaviours such as the presence or absence of someone to help with specific chores during the 40 days and the feeding practices, as well as the visiting patterns of female kin. There was a recognition, however, that qualitative information was necessary to understand the context and dynamics in which these behaviours and practices occurred. In 1984, one of the authors (GLH) undertook field-work in the hospital and home setting by visiting another group of women from delivery through the first 40 days post-partum. She also talked with other mothers and grandmothers concerning the myth, reality and meaning of their 40 day practices. Therefore, both quantitative and qualitative data were gathered on the forty day period and both types of data were available for analysis.

Eighty-six percent of the 2 month sub-sample were exclusively breastfeeding around 2-3 days following hospital delivery and only 24% of these women were

Table 4. Infant feeding practices at 2 months among mothers who had assistance during the '40 days' and those who did not. All mothers had breast fed at birth

Help during the 40 days	Feeding practices				Total N
	Breast only % N	Breast and bottle % N	Bottle only % N	Cereal, breast and bottle % N	
No help	27 (21)	51 (40)	4 (3)	18 (14)	78
Help	26 (63)	53 (126)	5 (12)	16 (38)	239
Total	27 (84)	53 (166)	5 (15)	16 (52)	317*

$\chi^2 = 1.268, P = 0.74.$

*Total of 7 who did not respond to the question.

doing so at 2 months (i.e. the end of the 40 days). Therefore, in the overall sample there is a substantial drop in the percentage of mothers who were totally breastfeeding their babies during the interval from birth to 2 months. We analyzed the data to determine which aspects of the 40 day period influenced the decline in total breastfeeding and concurrent increase in breast and bottle feeding with powdered milk and found some unexpected findings. Initially, it seemed that having help with household chores during the 40 day period did not influence the length of exclusive breastfeeding (Table 4).

Twenty-six percent of the mothers with help and 27% of the mothers without help were exclusively breastfeeding their babies at 2 months post-partum. Thus initially, it seemed that having help with household chores during the 40 day period was not associated with infant feeding practices.

However, it became apparent on further analysis, that the duration of help with household work during the 40 day period was associated with the length of time that mothers maintained exclusive breastfeeding (Table 5).

Thirty-one percent of mothers who had help with cooking throughout and sometimes beyond the 40 day period, maintained exclusive breastfeeding. In contrast, only 24% of mothers who had help with cooking for only 2-3 weeks of the 40 day period, maintained exclusive breastfeeding.

Infant feeding practices of the respondent's sisters and sisters-in-law influenced their own pattern of infant feeding. Of women who had sisters-in-law who breast fed their babies during their first year of life, 34% were breastfeeding and 45% were breast and

Table 5. Infant feeding practices at 2 months by duration of help with cooking

Duration of help	Feeding practices				Total N
	Breast only % N	Breast and bottle % N	Bottle only % N	Cereal, breast and bottle % N	
<40 days	24 (33)	50 (68)	5 (7)	21 (29)	137
>40 days	24 (33)	56 (52)	3 (3)	10 (9)	93
Total	27 (62)	52 (102)	4 (10)	16 (38)	230*

$\chi^2 = 6.332, P = 0.09.$

*Total of exclusive breast feeders excludes 6 who always got help with cooking, 1 who did not remember how many days she received help, 83 who did not receive any help during the 40 days and 3 without infant feeding data.

bottle feeding. Among sisters-in-law who breast and bottle fed during that first year, 21% of the index mothers were breastfeeding and 58% were breast and bottle feeding. In addition seasonality was also a factor. Mothers who delivered their babies during the hot months of the year (June–August), were more likely to switch from exclusive breastfeeding to mixed breast and bottle feeding by the end of the second month [7].

In summary, the statistical data showed that the majority of mothers started using a supplementary bottle of milk powder by the end of the second month post-partum. The mothers were more likely to maintain exclusive breastfeeding if they had help with household work throughout the 40 day period, if they had female relatives who also exclusively breastfed their infants during this period and if their babies were born in the cooler months [7].

The crucial importance of help with cooking throughout the 40 day period was emphasized by the qualitative data. Traditionally the 40 days represent a period of rest and recuperation for the mother following delivery and a time to establish lactation while the newborn is secluded from various exposures. The ethnographic data revealed a contradiction between the seclusion of the mother and infant, which was observed with great variation, and the intensive pattern of visiting which took place at the home of the mother during the 40 day period.

The mother and infant are ideally meant to spend the 40 days secluded in the home. Although more than half of the mothers did not go out beyond the confines of the home, they were visited daily by close and distant female relatives who arrived each morning while their own children were at school. Convention required that they be given tea, coffee, fruit and, more often than not, lunch. These visits generated extra work for the new mother (an area which was missing from the questionnaire). Many mothers explained that they continued their regular household chores after a short interruption but had a reciprocal arrangement with their sisters-in-law and cousins who lived close by, for catering to guests. The variation in type of help with household chores was explained by women in terms of their particular family structure and their interpersonal relationships. For example, one mother had cooked for her sister-in-law's guests when she was "doing her 40 days" the previous year, and 14 months later, when she herself had her third baby by Caesarian section, her sister-in-law cooked for her visitors throughout the 40 day period.

Some of the insights of the qualitative data were not directly related to the subject of the epidemiological study on the changing patterns of infant feeding, but focused more on the myth, reality and meaning of the 40 day period [19]. For example, the meaning of visits was explored beyond the way in which they were forms of social support. It became apparent that the 40 day visits were multipurpose. They were not a

matter of personal choice or inclination. With the transition from semi-nomadism to settlement, more female kin would visit each other because previously isolated semi-nomadic families were living in closer proximity to each other. With sedentarization, men were at work away from the home and women who were living in sub-tribal neighbourhoods visited during the 40 days as a mechanism for 'family status maintenance work' [20]. Women visited other women to whom they were connected by virtue of their marriages, so that ties between families were maintained and information exchanged.

During the data analysis, we frequently faced a situation where several quantitative associations were not statistically significant. The ethnographic information, however, illuminated how these variables were interrelated and therefore needed to be tested in a multiple variable model. For example, we wanted to know whether eating with your in-laws on a daily basis was as important as help with routine household chores, or extra work generated by 40 day visitors, in maintaining exclusive breastfeeding during the first 2 months. Based on responses to the questionnaire item about eating with relatives, the association between eating with one's in-laws and infant feeding practices at 2 months was questionably significant at a *P* value of 0.13.

Items regarding help specifically with extra cooking during social visits were missing from the questionnaire, but the ethnographic data underlined that catering for guests was considered onerous by mothers. The variable, daily eating with in-laws was considered an indicator of having help with cooking for visitors and could thereby link the social context of the 40 day period in a society undergoing transition and a change in infant feeding pattern. Thus this variable, the duration of help cooking, the type of feeding pattern practiced by sisters-in-law, and the season of the 40 day rest period were entered into a multinomial regression analysis model to identify the factors associated with, and to estimate the odds of, maintaining exclusive breast feeding vs partial breast feeding (Table 6).

Duration of help with cooking was negatively associated with changing to breast and bottle feeding. Thus, the longer the duration of help, the greater were the chances of maintaining exclusive breast feeding after adjustment for covariates. The very hot, dry months of July and August were associated with an increased chance of breast and bottle feeding as well as the feeding patterns of the respondent's sisters-in-law [7].

Through this interfacing, changes in infant feeding practices were examined during the 40 day period using qualitative and quantitative data and placed within their socio-cultural context. The quantitative data analysis alone would not have led to the model that was tested. Rather the qualitative data modified the model formulation and data analysis of changes in infant feeding practices over the first 40 days.

Table 6. Odds ratio of changing feeding practices by 2 months those who exclusively breastfed at birth ($N = 255$): results of a multinomial logistic regression analysis

Variable	Beta	F	P
1. Duration of help cooking*	a1 -0.0467	5.09	0.02
	b2 -0.0003	0	0.98
	Odds ratio	χ^2	P
2. Date of second interview 0 = May/June; 1 = July/August	a1 5.02	7.61	0.006
	b2 4.00	7.87	0.005
3. Sister-in-law feeding mode (0 = breastfed; 1 = breast and bottle; 2 = cereal)	a1 2.98	3.39	0.06
	b2 3.09	6.06	0.01
4a. Eat with in-laws vs do not eat with them	a1 1.40	0.30	0.58
	b2 3.04	4.92	0.03
4b. Eat with in-laws vs in-laws are not alive	a1 0.24	2.18	0.14
	b2 0.94	0.01	0.92

*Beta coefficients rather than the odds ratio are presented because duration of help was a continuous variable.

a1: Odds ratio of changing after exclusive breastfeeding to breast and bottle feeding after adjustment of covariates.

b2: Odds ratio of changing from exclusive breastfeeding to cereal, breast and bottle after adjustment for covariates.

Thus the quantitative data provided a silhouette and the qualitative filled this in and altered some of the lines.

CONCLUSIONS

Certain themes and lessons emerge from the interface of anthropology and epidemiology during this study.

Map viewing in tandem with ethnographic identification of socioeconomic units led to a culture-specific quantitatively-based scale of socioeconomic status with high predictive validity. This iterative process created a dependency between the ethnographic and quantitative data. At each analytic step, confirmation was sought from the ethnographic notes and map.

The lessons learned from the process of developing a culture-specific scale of socioeconomic status include the following: (1) Ethnographic research must be done before quantitative data collection; (2) a census of the population at a 'recognizable' level of social organization should be available to utilize in tandem with a map. The census for this study was done at the sub-tribal level and permitted the identification of sub-tribal clusters by place of residence on the map. The third lesson relates to the study of a population undergoing dramatic social change. While we were sensitive to ethnographic re-assessment of social change during the study, we did not always perform a comparable quantitative re-assessment. Most notably, we failed to examine the Bedouin Arab residential map over time by sub-tribe. Following the baseline interview, we did not collect socio-economic data to evaluate the validity of the SES scale over time but did assure that information regarding changes in infant feeding patterns, anthropometric status, and morbidity were serially collected. The fourth lesson focuses on the items in the SES scale,

specifically water source, which had a seasonal variation and needed to be assessed at subsequent interviews. Moreover, 'water source' was collinear with the morbidity data and created problems in data analysis. Thus item selection for culture-specific SES scales needs to be examined in light of seasonal variation, of other hypotheses and data analysis. With hindsight, we would not select water source for a SES variable should this exercise be undertaken anew.

From the onset, the anthropologist periodically reassessed the study community of mothers and infants in light of the study objectives. This was essential to research in a community undergoing social change. Rather, it emerged as a tool for recognition of areas originally unaddressed but considered quintessential to understanding the context in which infant feeding practices were changing. The research design was modified to include the 40 day postpartum period and this led to a greater understanding of the meaning and determinants of changes in infant feeding patterns.

The dimensions of our research activities may be commonly referred to as team work. However, the actualization of the process was dependent upon a respect for the contribution of each discipline and recognition of working styles and norms. This aspect led to an integrated approach to theoretical and statistical modelling as evidenced by the final set of variables entered in the 40 day model.

In previous research, quantitative analysis of infant feeding data has led to the identification of factors 'associated' with different infant feeding practices [21]. With the interweaving of the qualitative and the quantitative data, the determinants became clearer as reflected in the analysis of the factors influencing the ability to maintain exclusive breast feeding from birth to two months.

The approach and process described here can be viewed in contrast with the usual approach of seeing epidemiology and anthropology as two disciplines on two levels or on different tracks which occasionally intersect but are located within separate research frames. The ethnographic material has often been used in an applied sense when designing questionnaires or as a means of getting access to or compliance from, the study population [22, 23]. This paper attempts to move from seeing these two disciplines as separate paradigms to viewing them as a double helix.

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